FAT LOSS FOREVER

HOW TO LOSE FAT
AND ***KEEP IT OFF***

PETER BAKER

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FOREWORD

We're at a great turning point of our time. Almost 40% of adults are obese and in excess of 70% are considered overweight. In 2008, the estimated cost of obesity was $150 billion as a whole and over $1400 per year for the obese individual. This is a staggering drain on our healthcare system and on the individual, not just physically, but financially, as well. Obesity significantly increases the risk for developing type II Diabetes, heart disease, cancer, and several other major chronic diseases that contribute to premature death. Not only does obesity increase the risk of disease and financial burden, but the psychological costs are significant. Obese people have a greater risk of developing depression and have lower self-esteem than non-obese adults.

As such, billions of dollars in research money each year is devoted towards nutritional, exercise, and pharmaceutical interventions to help us lose weight. Every year, the obesity rate continues to climb. Many diets, drugs, and exercise programs have claimed to be the "cure" to the obesity crisis, and yet still, it rises. Many obese and overweight people feel helpless and hopeless because they've tried every diet under the sun and the scale continues to climb. Unfortunately, we believe that much of the education toward obesity and weight loss has focused on the wrong things. Our society still largely believes that we have a problem with weight loss, but that is simply not true. Most people who attempt to lose weight (at least 10% of their body weight) are successful. If people are so successful at weight loss, why do we still have a growing obesity problem? While people are good at losing weight, they are not good at keeping the weight off.

It's not because of the weight loss. It's because they gain it all back. Weight regain statistics are shocking. The statistics are different depending on the source, but within one year of weight loss, around 50-70% of people will have regained all

the weight they lost. Further, 85% of people will gain it all back within two years of losing it. Within three years of weight loss, 95% of people will have gained it all back. Thus, the success rate of diets is ~5%, and most are equally terrible.

If this wasn't bad enough, out of the people who regain weight, one-third to two-thirds will add back more weight than they originally lost. Not only do they fail to maintain their weight loss, but they end up worse than before they ever started dieting. When these behaviors are cycled, we often refer to it as "yo-yo dieting" or "weight cycling," as scientists call it. There are a variety of physiological, psychological, and sociological reasons as to why this happens, and this book will cover these in great detail. In our opinion, yo-yo dieting may be the single biggest detriment to fighting obesity in existence. Sadly, many people get stuck in this cycle of losing weight, only to regain it, and more. It's important to look at our continual failures, note the similarities, and correct them so we don't continue to make the same mistakes. It's also important for us to understand what the successful ~5% of dieters do so that we can also learn from what is being done correctly.

In this book, we'll attempt to break down why diets fail, how you can lose weight successfully, and most importantly, how you can keep it off. This book is for the tired, frustrated, sad, and those who have little to no hope. There is a way, but it will require knowledge, hard work, discipline, and dedication. On top of that, it will involve letting go of fad diets, quick fixes, and "hacks." If you haven't figured it out by now, there is no "quick fix" that produces long-term sustained results. Period. If you do what you have always done, you will get what you have always gotten. It's time to make a change. If you're ready to walk with us, then we're ready to guide you, so let's begin the journey.

LAYNE NORTON, PH.D & PETER BAKER

1

DIETS ARE FAILING*

> *If you can't see yourself sticking to your diet one year from now, you need to re-think your strategy. If you don't like the way you eat, you won't stick to it for long, and it'll only be a matter of time before you jump ship and end up regaining all the weight.*
>
> SOHEE LEE, MS, CSCS, CISSN

Why Should I Care About Losing Fat?

This is *the* question. However, it's relatively easy to answer. For one thing, thinking about food is a part of our gestalt. As you read this, I want you to think back a few years. Then, think even further back. Think about all the diets you have ever heard of growing up. If you are keen on the details, you might notice that some of these diets and practices are cyclical—for example, the various iterations of a low carb diet. On a broader scale, it's the fact that named diets exist at all. While dieting is part of our culture, there are many benefits to weight loss, especially if you are overweight or obese. Benefits include but are not limited to, increased longevity, decreased risk for Cardiovascular disease (CVD),

* Before you dive in, remember you can pull up the studies cited by clicking the URL listed in each footnote

decreased risk for cancer, decreased risk of type II diabetes, improved quality of life, and let's not forget the obvious one—looking sexy.[1] [2] [3] [4] We should point out that these benefits can be achieved regardless of the type of diet you implement. Simply losing body fat and weight overall has a huge impact on all of these outcomes, REGARDLESS of the type of diet you use. Indeed, high carbohydrate, low fat diets that produce weight loss can also include health benefits.[5] In contrast, low carbohydrate, high fat diets have also shown similar health benefits when weight loss is achieved.[6] [7] More moderate diets? Same deal. Vegan?[8] You bet it does, if it produces weight loss.[9] [10]

We can't name one person we've known who hasn't been on or claimed to be on at least one diet in their lifetime. There are as many diets that claim to be the answer to all our problems as there are stars in the sky. Speaking of the sky, did we

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1 (2015, November 4). Effects on cardiovascular risk factors of weight losses ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4987606/

2 (2014, February 18). The importance of weight management in type 2 diabetes ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4238418/

3 (2017, September 6). Intentional weight loss and cancer risk - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5669836/

4 (2017, November 15). Effects of weight loss interventions for adults who are ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5682593/

5 "Comparison of the Atkins, Ornish, Weight Watchers, and ... - NCBI - NIH." 5 Jan. 2005, https://www.ncbi.nlm.nih.gov/pubmed/15632335. Accessed 4 Sep. 2018.

6 "Effects of Low-Carbohydrate Diets Versus Low-Fat Diets on Metabolic ...." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3530364/. Accessed 4 Sep. 2018.

7 "The effects of low-fat, high-carbohydrate diets on plasma lipoproteins ...." https://www.ncbi.nlm.nih.gov/pubmed/16255999. Accessed 4 Sep. 2018.

8 (n.d.). The BROAD study: A randomised controlled trial using a ... - NCBI - NIH. Retrieved September 4, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5380896/

9 "Comparison of the Atkins, Ornish, Weight Watchers, and ... - NCBI - NIH." 5 Jan. 2005, https://www.ncbi.nlm.nih.gov/pubmed/15632335. Accessed 4 Sep. 2018.

10 "Long-Term Effects of 4 Popular Diets on Weight Loss and ...." https://www.ahajournals.org/doi/abs/10.1161/circoutcomes.113.000723. Accessed 4 Sep. 2018.

mention there is a "Lunar Diet?" Seriously, we aren't making this up. Want us to get weird? How about the "Avoiding Swamps Diet?" In the 1700s Thomas Short observed that more fat people lived near swamps and hypothesized that avoiding them may be the key to staying svelte. "The Tapeworm Diet" is still a thing, too. Apparently people think it's a good idea to ingest parasites so that they can eat what they want and lose weight. Enjoy your alcohol? Get on "The Drinking Man's Diet" where there are no restrictions on gin and vodka. Don't laugh. Robert Cameron sold over 2 million copies of this diet in the 1960s. That might have been a diet of sin, but what about a diet void of sin? Sylvester Graham was a minister who believed that people were fat because they had too much sex. In the 1800s, he promoted The Graham Diet (vegetarian) and if his last name seems familiar, it's because he was the father of the Graham Cracker. You heard it here, Graham Crackers were developed in an effort to reduce obesity and stop people from having sex.

Today, some of the more popular diets are the Blood Type diet, Alkaline Diet, Paleo Diet, Carnivore diet, Ornish diet, Atkins Diet, Snake Diet (we aren't making this one up either), The Zone Diet, South Beach Diet, The Ketogenic Diet, The Mediterranean Diet, and the list goes on and on. Some of these diets have legitimate benefits and some are straight up fads (we'll cover these in a specific chapter later in the book). In fact, let's take a look at low carb dieting. At the time of this writing, it's *en vogue*. You can barely go out in the world or on the internet without talking to someone who is "on keto" or going low carb. Some might remember a popular diet in the late 20th century/early 21st century called the Atkins Diet. Maybe your parents were on the Atkins Diet, or maybe you went to your best friend's house to play *Dungeons & Dragons*, and you noticed a lot of bacon in the fridge (and all you wanted was cheap ramen). Then, you asked your friend, "Why do you have so much bacon?" Lo and behold, your friend said their parents were both on the Atkins Diet, and you thereby assumed that you could eat all the bacon you wanted on this diet. Cool, right?

Now, if any of you reading this are lucky enough to have been alive in the middle of the 19th century, right around the 1860s, you might remember the first low carb diet. It all started with an undertaker. This undertaker thought corpulence was a problem. So, William Banting, the 19th century English undertaker, wrote a letter called *Letter on Corpulence, Addressed to the Public.* Now, we must give a certain amount of credit to Banting. He said:

> It would afford me infinite pleasure and satisfaction to name the author of my redemption from the calamity, as he is the only one that I have been able to find (and my search has not been sparing) who seems thoroughly up in the question; but such publicity might be construed improperly, and I have, therefore, only to offer my personal experience as the stepping-stone to public investigation, and to proceed with my narrative of facts, earnestly hoping the reader will patiently peruse and thoughtfully consider it, with forbearance for any fault of style or diction, and for any seeming presumption in publishing it.[11]

Despite how happy he was on the low carb diet, he didn't claim it to be a panacea. He, in true scientific fashion, observed something, and questioned whether the results were repeatable by saying he hopes *his* experience can be a stepping-stone to more research. We should expect no less from a man who handled embalming fluids and dead bodies.

In August of 1862, the 5'5 202 lb Banting embarked on his low carbohydrate diet and dropped 35 lbs to a svelte 167 lbs. Banting even goes on to list his restricted foods. It's worth noting that both milk and butter are on his banned food list, but those foods aren't high carbohydrate foods. Butter and milk have quite a bit of fat in them. In the literary world, this is foreshadowing. We'll talk about why the fat content of these foods matter, and then you'll see why Banting was successful on

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11 (n.d.). Letter on Corpulence, Addressed to the Public - Wiley Online Library. Retrieved August 21, 2018, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1550-8528.1993.tb00605.x

this diet. But there was more than just butter and milk to rid himself of. Bread, sugar, beer, and potatoes were on the list, too.

So, now that Banting's diet had all the greatness stripped from it, what was left? Well, he was still allowed to drink gin for a nightcap, or a glass or two of sherry. Not only that, his meal plan looked like this:

- For breakfast, I take four or five ounces of beef, mutton, kidneys, broiled fish, bacon, or cold meat of any kind except pork
- a large cup of tea (without milk or sugar) * a fit tie biscuit, or one ounce of dry toast.
- For dinner, five or six ounces of any fish except salmon, any meat except pork, any vegetable except potato, one ounce of dry toast, fruit out of a pudding, any kind of poultry or game, and two or three glasses of good claret, sherry, or Madeira — Champagne, Port and Beer are forbidden.
- For tea. Two or three ounces of fruit, a rusk or two, and a cup of tea without milk or sugar.
- For supper. Three or four ounces of meat or fish, similar to dinner, with a glass or two of claret.
- For nightcap, if required, A tumbler of grog (gin, whisky, or brandy, without sugar) or a glass or two of claret or sherry.[12]

In sum, using that protocol, Banting did pretty well for himself. Then he got so pumped over his success that he wanted to share it with the rest of the world via his letter. Finally, he noted in his conclusion that he was able to attain a happy medium where he maintained his weight within a few pounds. He even stated that he was able to eat some of those once forbidden foods, though in moderation. In many ways, Banting was onto something. Caring about your weight, especially as you advance in years, *is* a good thing. I know it's hip to hate the BMI chart, but

12 (n.d.). Letter on Corpulence, Addressed to the Public - Wiley Online Library. Retrieved August 21, 2018, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1550-8528.1993.tb00605.x

there is an association with being bigger and all cause mortality.[13] Further, obesity is linked to cardiovascular disease, diabetes, cancer, osteoarthritis, liver disease, kidney disease, and depression. And, according to the previously mentioned BMI chart, so is anything above 30 kilograms per meters squared (kg/m^2).[14]

Banting wasn't the only one who was concerned with dietary intake. John Harvey Kellogg and his brother William Keith Kellogg were deeply concerned with the topic. If the name looks familiar, it's because you're no doubt familiar with many of their current modern culinary masterpieces, like Pop Tarts and Corn Flakes.

While Pop Tarts might be new, Corn Flakes have a history that dates back over a century to a place called Battle Creek, Michigan. There, the Kellogg brothers ran a health resort called the Battle Creek Sanitarium, which espoused the health principles of the Seventh-day Adventists.[15] Unlike Banting's prototype for a low carb diet, Ellen White—one of the founders of the Seventh-day Adventists who advocated for these principles of health—was a proponent of a vegetarian diet. According to her estate, people who ate meat were more at risk for disease and an early death. Moreover, White believed coffee and tea "[are] a sin, an injurious indulgence."[16] Unlike Banting's diet, whole grains were a preferred source of sustenance because of the dietary fiber, and the fact that grains were not meat products. In addition to that, the sanitarium focused on physical training for the under- *and* overweight.[17]

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13 (n.d.). Body-mass index and all-cause mortality: individual ... - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4995441/

14 (n.d.). The Medical Risks of Obesity - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2879283/

15 Thompson, M. (Producer), & Perkins, J. (Writer). (2005). *Kellogg Brothers: Corn Flake Kings*[Video file]. New York, NY: A & E Television Networks. Retrieved from https://www.youtube.com/watch?v=PgygIuf-8b8E

16 (n.d.). Chapter 28: Health Principles/5 - Reviewing a Century of Health .... Retrieved September 3, 2018, from http://www.whiteestate.org/books/mol/Chapt28.html

17 Thompson, M. (Producer), & Perkins, J. (Writer). (2005). *Kellogg Brothers: Corn Flake Kings*[Video file]. New York, NY: A & E Television Networks. Retrieved from https://www.youtube.com/watch?v=PgygIuf-8b8E

There's a lot more we could say about the Kellogg brothers' impact on culture. Here are a few takeaways, mainly to show you how the ideological becomes cultural and how we start to accept it:

- John Harvey Kellogg popularized exercising to music because he added it to the routine after his patients at the sanitarium thought regular exercise was boring
- He realized people absolutely hated the vegetarian diet and had his brother Will Keith hone the recipe for the cereal we have today
- The brothers came up with marketing tactics to get people spreading the good news by word of mouth, like wearing all white outfits to absorb the health benefits sunlight provides

Kellogg is also interesting because, as you have seen, he held deeply puritanical religious beliefs. This lead him on an anti-sex crusade, which was so extreme that he never consummated his own marriage and was fervently against onanism (the common word back then for masturbation).[18] That said, we see similar things occur today. People develop beliefs, and they look for the science to justify it, rather than the other way around. They, for lack of a better term, put the round peg into the square hole. This is very much the same mechanism for fad diets today.[19]

Not only have you been around long enough to have diets marketed to you, but you've also been around long enough to know that the world is getting a bit heftier, and you know the implications of that added heft. If you've ever been in a po-

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18 Thompson, M. (Producer), & Perkins, J. (Writer). (2005). *Kellogg Brothers: Corn Flake Kings*[Video file]. New York, NY: A & E Television Networks. Retrieved from https://www.youtube.com/watch?v=PgygIuf-8b8E

19 As a postscript, one of the Battle Creek Sanitarium residents also achieved some notoriety after having owned several failed businesses. CW Post (as in Post Consumer Brands, makers of Grape Nuts) lived in Kellogg's sanitarium and ripped off the Kelloggs's cereal idea and subsequently invented Grape Nuts. Yes, the same Grape Nuts you see today. His business acumen led him to make a million dollars back in the late 19th century, which John Harvey Kellogg didn't even dream of at the time.

sition where a doctor told you to lose weight, you might have gotten some nebulous methodology on how to go about this:

1. Eat no more than 1200 calories a day
2. Eat low carb
3. Eat low fat
4. Go vegan
5. Go vegetarian

In general, there's nothing wholly wrong with any of those methods. There will exist some humans who can and should eat 1200 calories a day. There might also be some people who really like potatoes and could thrive on a low fat diet. But it's erroneous to make blanket statements on what everyone should do. In this book, we'll talk about why the fads work in the short term but fail in the long term. We'll also discuss how to build sustainable habits you can use for your life.

Unlike most others, we won't blame the doctor. The doctor is there to practice medicine. So, in addition to covering ourselves, we want to be honest: we (Biolayne LLC, Layne Norton, and Peter Baker) are not medical professionals, absolutely none of this book is meant to be construed as medical advice, and as always, consult your physician before starting any type of diet or exercise program.

Diets Are Failing

Seems like Banting had all this stuff figured out over 150 years ago, so why all the fuss about diets now? Why do we need to write a book on it? Well, quite frankly, there's a lot of bullshit out there on the internet, media, and even in the newspaper. Every week, it seems like there's a new miracle diet that will solve everyone's problems. Then the next week, that same diet is labeled as unhealthy, will give you cancer, and will come into your house and kick your dog. With so much

contrasting information, it's no wonder that people flip-flop from diet to diet, seemingly making no progress or even going backwards.

When you hear the word "diet" what do you think of? Often times, "a diet" can conjure up many feelings, some of which are positive, and others maybe not as positive. Usually, you might think of:

- Beginnings and endings
- Restricted foods
- Point systems
- Low carb
- Low fat
- "Healthy" versions of food
- "Clean" versions of food
- Weight loss
- Health
- The word "diet" has the word "die" in it, so there's that, as well

And likely, more come to mind that we didn't list. None of these things are wholly right or wrong; some of these ideas are very much a part of any named diet you can find. But there might come a point where these ideas become problematic.

Case in point, a starting point and an ending point. Or the fact there's almost always an element of semi-elimination involved in a given diet. Right now, the ketogenic diet is pretty popular. That particular diet eliminates carbohydrates. Others, like Whole 30 or the Paleo diet, suggest eliminating processed foods, dairy, legumes, or added sugars as well (don't worry, apparently tequila is still paleo though). This becomes a problem because there's seldom a focus on the future and long-term sustainability. Many people end up losing weight following these protocols by reducing their calorie intake, but can't wait until the diet is "over" so that they can go back to eating "normal". At the "end" of a diet, many

people are left wondering, "What the hell do I do now?" This is a perfectly reasonable question. So what, then, do you do? To the credit of diets, most of them work in terms of helping people lose weight. In fact, anything that creates a energy/calorie deficit can work (more on this later). If an individual on the diet is considered obese, the results seem to be far more magnified than if they weren't.

Side note here before we continue: you may notice that we will use the terms "energy" and "calories" interchangeably quite a bit in this book. That's because calories are LITERALLY energy. So, energy restriction = calorie restriction and vice versa. We will also use the terms body fat interchangeably with energy stores, and fat storage with energy storage. This may seem strange, but as we will cover in the next chapter, your body's fat stores (aka adipose tissue) are by far the major energy reserve in the body. In most people, body fat contains far more energy than carbohydrate stores (glycogen), and protein stores (short term storage of protein is pretty non-existent, and typically the body doesn't liberate nearly as much lean body mass for energy as it does body fat). This will also be explained in much more detail in future chapters, but for now, just trust us that energy = calories and body fat (adipose tissue) = energy stores.

Well, quite frankly, diets are absolute failures. Not because people can't lose weight; people are actually great at weight loss. Six out of every seven people who are overweight will lose a significant amount of weight in their lifetime. The problem is, these same people cannot maintain their weight loss. The weight regain statistics are absolutely shocking and terrifying. Within one year of weight loss, nearly 80% of people will have relapsed to their pre-diet weight.[20] Within two years that number is 85% and within three years over 95% of people will have relapsed to their

20 "Biology's response to dieting: the impetus for weight regain. - NCBI - NIH." 15 Jun. 2011, https://www.ncbi.nlm.nih.gov/pubmed/21677272. Accessed 28 Aug. 2018.

pre-diet weight.[21] [22] You read that right: diets have less than a 5% success rate, which by any standard is terrible. If that wasn't bad enough, of those people who relapse to their previous weight, ⅓ to ⅔ of them will regain *even more* weight than they had before they started the diet.[23] This phenomenon is called "body fat overshooting" and is something no other weight loss book that we know of discusses.

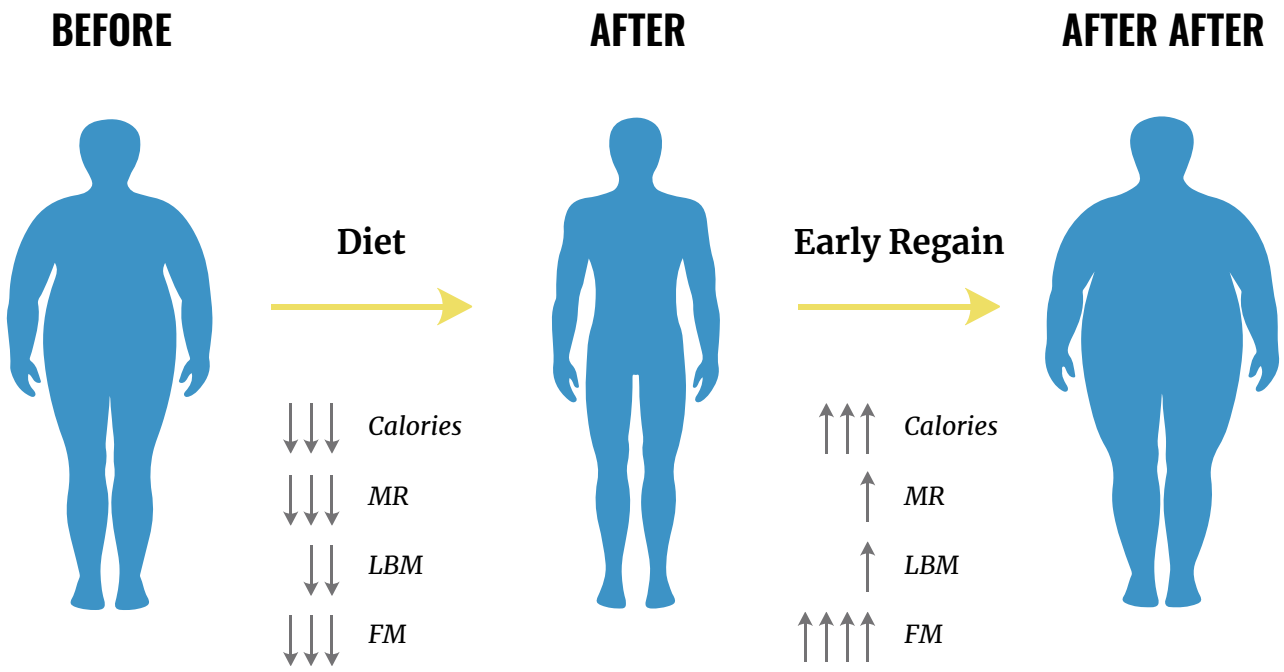

Figure 1: Weight regain after weight loss with body fat overshooting. As weight is lost metabolic rate decreases disproportionately to calories and fat loss. Both fat mass and lean body mass are lost. Post diet, weight is rapidly regained as calories rapidly increase due to disproportionately high hunger and low metabolic rate. Primarily fat mass is regained compared to lean body mass.

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21 "Long-term efficacy of dietary treatment of obesity: a systematic review ...." https://www.ncbi.nlm.nih.gov/pubmed/12119984. Accessed 28 Aug. 2018.

22 "[The mediocre results of dieting]. - NCBI." https://www.ncbi.nlm.nih.gov/pubmed/23859104. Accessed 28 Aug. 2018.

23 "How dieting makes some fatter: from a perspective of human ... - NCBI." 5 Apr. 2018, https://www.ncbi.nlm.nih.gov/pubmed/22475574. Accessed 28 Aug. 2018.

But hey, "X" diet worked because some celebrity/pro athlete/model/person you know lost weight on it, right? Damn right it did. The question should NOT be, "Did they lose weight?" The real question should be, "How much weight did they drop and sustain?" As we established, many people end up worse off than when they started because they actually put back on *more* weight than they lost in a process called "weight cycling." Oprah is a great example of someone who engaged in weight cycling or "yo-yo" dieting. Over the years, she gained and lost weight (unfortunately for her, very publicly) many times, but almost always seemed to gain more weight than she lost in the first place. To be clear, we aren't slamming Oprah. On the contrary, she's no different than millions of people. In fact, the research shows that frequency of dieting and weight gain over time are actually closely correlated.[24] That means many people will go on another diet after they regain the weight. Then they will lose some weight, and repeat the process over, and over, and over, and over again. Some people continue this process for many years. You may know a co-worker or family member like this, or maybe you've even experienced this cyclical trap yourself. If you were extra attentive, you might have noticed that for chronic dieters, losing weight became subsequently more difficult. This phenomenon appears to actually be the biggest issue in people who aren't obese. In fact, research has shown that people who were initially normal weight individuals when they began trying to lose weight had two times the risk of weight gain in a 6-15 year follow up compared to non-dieters.[25]

Further, in a study examining elite male athletes from age 20 to age 60, it was demonstrated that athletes who had to repeatedly diet to make weight classes gained significantly more weight over time than athletes who did not have to repeatedly diet to make a specific weight class.[26]

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24 (2018, April 5). How dieting makes some fatter: from a perspective of human ... - NCBI. Retrieved August 29, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

25 (n.d.). Weight-loss attempts and risk of major weight gain: a prospective .... Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/10584040

26 (n.d.). Weight cycling of athletes and subsequent weight gain in middleage.. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16568134

The Body's "Self Defense System"

Some skeptics might point to genetics and claim that these people who become fat from "yoyo" dieting just had "bad genetics" and were going to become obese regardless. However, this doesn't make sense from a teleological point of view. Obesity is a very new problem. It really only started popping up in the 1960s, yet less than 60 years later, it's a full-blown epidemic. Did our genetics suddenly change in the last few generations? Very unlikely, and data doesn't support that. A study examining homozygous twins (literally the same DNA code) and their experiences with dieting throughout their lifetime revealed a shocking revelation: the twin that dieted more often tended to be fatter even though genetics were *identical*.[27] How is it possible that people who diet more often actually end up fatter? Our opinion, based on data that will be poured into the pages of this book, is that it's not dieting itself that makes some people fatter, but the way in which most people attempt to lose weight, which often is in a weight cycling aka "yo-yo" dieting manner.

Dieting, you see, is treated by the body like controlled starvation, and it activates some pretty serious self-defense systems in the body. These self-defense systems are activated as a three-pronged defense to:

1. **Defend** - Prevent further weight loss (during the diet aka weight loss plateaus)
2. **Restore** - Increase the rate of weight regain once sufficient energy is consumed (post-diet)
3. **Prevent** - Decrease the probability of losing weight in the future.[28]

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27 (2011, August 9). Does dieting make you fat? A twin study. - NCBI - NIH. Retrieved September 4, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21829159

28 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 4, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

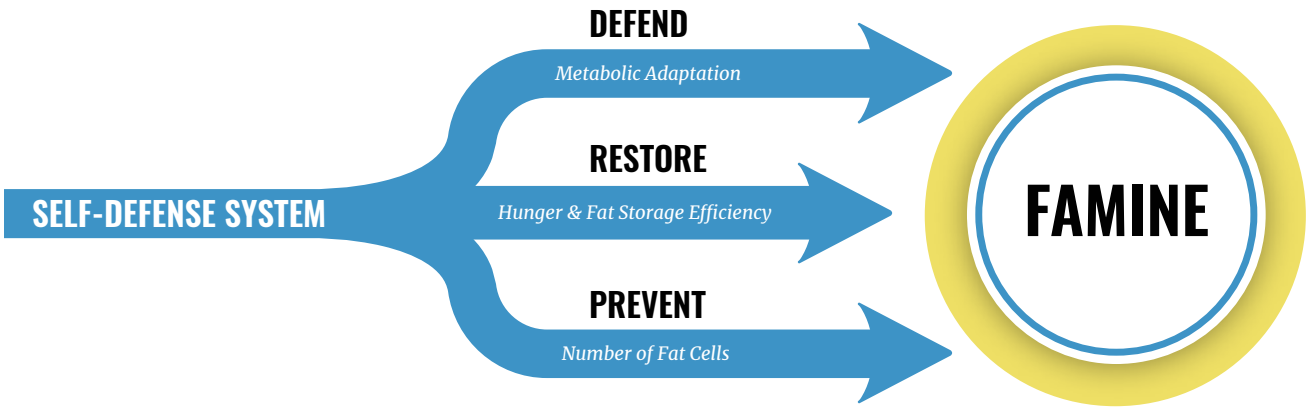

Figure 2: The body's 3 pronged self-defense system. Prong 1 is the "defend" prong where metabolism slows during caloric restriction to defend against starvation. Prong 2 is the restore prong where hunger exceeds the energy required to restore energy balance and systems that promote fat storage are enhanced while under caloric restriction. Prong 3 is the prevent prong where the body may increase the fat cell number if weight is regained too rapidly in order to defend against future energy deficits.

An obesity researcher named Paul MacLean has referred to this self defense system in several of his research publications, stating that:

> Weight loss awakens the body's defense system in a manner that is persistent, saturated with redundancies and well-focused on the objective of restoring the body's depleted energy reserves... Any weight loss strategy that fails to acknowledge and plan for this emerging metabolic influence is likely to have little success in facilitating long-term weight reduction... To ensure success, the regain prevention strategies will likely need to be just as comprehensive, persistent, and redundant, as the biological adaptations they are attempting to counter.[29] [30]

29 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

30 (n.d.). The role for adipose tissue in weight regain after weight loss.. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25614203

Why would our bodies evolve to make it difficult to lose weight and easy to regain it? Well, if you are deliberately placing your body in an energy deficit by attempting to diet frequently, what signal are you sending your body? You are telling your body that energy is sparse and that it needs to defend its energy stores from further depletion as stated in point one. Therefore, when the body comes across adequate food supply, it will do its absolute best to capture as much of that energy as possible so that the potential for starvation is lower in the future, as stated in point two. Finally, your body would want to defend its restored energy reserves even more staunchly against depletion in the future since it has already experienced "famine," as in point three.

You might be thinking, "This doesn't make sense." After all, energy is plentiful these days, and we don't have to worry about starvation. I can walk right down to McDonald's and shovel down a thousand calories for under $3, so why would my body ever think it was going to starve? Try to think about things from an evolutionary perspective. Plentiful food for most people even in western society has only been a reality for around 100 years. So while our circumstances have changed, our genetics haven't. Our genetics are lagging behind by several thousand years. Our very DNA still remembers famine from thousands of years ago, and it's still hardwired to protect us from starving to death. You're here today reading the pages of this book because our ancestors had the right DNA mileau to resist killers such as famine, disease, etc. In the case of resisting famine, that meant we required a mechanism that could protect us from starvation—our metabolism slowed down when the food supply was limited. It also meant having thrifty enough genes so that when food was sufficient, they could efficiently store large amounts of the energy consumed. We want to emphasize that when we refer to "energy," we are referring to the calories contained in food. A calorie is quite literally a measurement of energy. When we refer to energy depletion or energy storage, that is essentially the same thing as body fat loss or storage, since adipose tissue (aka body fat mass) is by far the largest form of stored energy in the body. Therefore, when you diet and cause energy depletion, it makes

sense that the body would activate a defense network with the purpose to make energy production and energy storage more efficient.

You may read the word "efficient" and think it's a good thing. Most times when we hear or read that word, there's a positive connotation attached to it. Not with regards to energy storage or production. Think of fuel efficiency. If your car is energy efficient, it can run a long way on a tank of gas. If the goal is fat loss however, you want to be as *inefficient* as possible. Think of your adipose/body fat stores (energy reserves) as a tank of gas. You don't want to be a Prius that takes forever to burn through a tank of gas, right? You want to be an all-American, enormous gas-guzzling SUV that burns through fuel quickly. Further, when it comes to preventing the recuperation of body fat, you don't want your body to be efficient at energy storage.

Using our car analogy again, you also wouldn't want a car with a large gas tank. If the gas is our energy and the tank our potential fat stores, then you wouldn't want it to fill up efficiently. You'd want a tank that leaked and wasted gas so that it was more difficult to fill up, not an efficient tank that easily stored all the energy you pumped into it. In this way, one of the body's major self-defense systems is to become more efficient with energy handling to prevent depletion of energy (adipose/body fat) stores and also refill them as efficiently and quickly as possible.

Body Fat Set Point Theory: Triggering the Self Defense System

Body Fat set point theory is a widely accepted theory of metabolism. It suggests that each individual person has a level of body fat where their body naturally sits, and the body defends that level in an attempt to maintain it. Everyone has a different set point, as well. If you're a 190 lb man and have weighed the same for over a decade, and your body fat has been sitting at 16% for that decade, it's safe to say your body might be a fan of that. Factor in genetics, nutritional habits

spanning a lifetime, activity, and everything else you've done, and it makes for a distinct variable for us all. We believe that this set point is largely controlled by the hormone leptin, which responds to changes in the size of the adipocytes (fat cells). Think of leptin as your body's adipose tissue thermostat. A thermostat controls the temperature of the room and keeps it at a set point. If the temperature drops below the set point, the heater kicks on and raises it back up. When the temperature rises above the set point, the air conditioning turns on and brings the temperature back down. Leptin is like that thermostat.

The body fat set point is sensed by the size of the individual fat cells. As the cells start to shrink during an energy deficit, the adipose tissue cells reduce their secretion of leptin. This reduces metabolic rate (calories out), increases hunger (calories in), and tries to drive the body back towards the set point by swinging the body's caloric balance to a positive direction. During a caloric surplus, fat cells expand and leptin secretion increases, which increases metabolic rate, decreases hunger, and drives calorie balance in a negative direction to bring the body back down towards your body fat set point. The defense of set point is so powerful that even after a prolonged diet, your body will fight to bring back your adipocyte size to within a nanometer of its original startpoint months previous.

By now, I'm sure you've known someone (or yourself) who has crashed dieted for several weeks to lose 10-20 lbs in an effort to be "vacation ready," only to go on a "food orgy" vacation and gain it right back within a few days. Or someone who dieted for nearly a year to lose 50 lbs, only to go back to eating the way they did previously and gain it all back in less than half the time. Further, many people who have dieted and lost a significant amount of weight (>5% of your body weight) may have noticed that weight loss was easy at first, but after a certain period of time, it became much more difficult not only to lose more weight, but simply to maintain the weight you lost. You may even begin to experience increased hunger that makes maintenance and further weight loss harder. Sure, it's a cliché, but there's actually some validity to it. If you've been in a prolonged

calorie deficit, your adipocytes shrink, leptin secretion decreases, metabolic rate slows, hunger elevates, and your ability for fat cells to assimilate nutrients will be enhanced. This is improving your body's efficiency to store energy (fat). So when you consume a lot of energy, you are better able to capture it and store it as body fat, driving you back towards your set point.

One of the central ideas we want to hit in this book is that every time you diet (eat in a caloric/energy deficit), you are activating the body's self-defense system. The more you attempt to diet, the stronger the signal to your body to strengthen this defense system. We believe (based on data) this is why people who diet more often during their life are more likely to gain body fat over time instead of losing it long term. It's not that dieting makes people fat; of course not. Someone can't gain fat in an energy deficit, because that would defy the laws of physics. It's because they diet repeatedly and interrupt each diet with regaining the weight more rapidly than they lost it. Thus they are activating this self defense system repeatedly. Then, when the diet is "over" and they can no longer sustain the energy deficit, they regain the fat they lost, usually relatively quickly, and often add more fat than they lost in the first place. In this way, the body has defended against famine and further protected itself against future potential starvation.

Finally, people who engage in this chronic weight cycling/"yo-yo" dieting for months, years, or even decades are further potentiating this self defense system every time they do so. Therefore, when we discuss any potential fat loss diet in this book, the emphasis will always be on what is sustainable. Success is only success if you can sustain the weight loss. Therefore, any form of diet you can't sustain ought to be banned from consideration as a long term solution. My father (Layne here) lost 30 lbs on a ketogenic diet in the early 2000s. He gained all 30 back over the next year and then an extra 30 over the next few years after. Why wasn't he able to sustain the weight loss? Quite simply because he couldn't sustain the diet. When he went back to eating "normally" he regained all the weight and then some, just like millions of other people.

Metabolic Adaptation: The Tip of the Spear of Self Defense

The next logical question is: how do our bodies do this? What self defense systems do our bodies activate to slow weight loss, increase weight regain, and prevent future weight loss? As you'll see throughout this book, the body's self-defense system is "persistent, saturated with redundancies, and well focused on restoring the body's depleted energy reserves."[31]

When we diet, the body's main defense system to limit energy depletion is called "metabolic adaptation." We'll discuss metabolic adaptation in depth in Chapter 3, but essentially, it refers to a series of biological adaptations to energy restriction (aka dieting) that result in a slowing of metabolic rate to a *greater* extent than is predicted based on pure physics and math alone.[32] This is the defensive prong of your body's self-defense system. It's as if your body overreacts to dieting and slows your overall total daily energy expenditure (TDEE), more commonly known as your "metabolic rate," and makes energy production in the body much more efficient to prevent further weight loss. Metabolic adaptation includes, but is not limited to; the adaptations that cause a decrease in your basal metabolic rate (BMR), massive decrease in your non-exercise adaptive thermogenesis (NEAT, which we will cover in depth in the coming chapters), alterations to your hormones including insulin, leptin, ghrelin, thyroid hormone, and others to a profile that decreases metabolic rate and increases hunger.

Almost anyone who has dieted has noticed that when they first start, it's pretty easy to lose weight, but you don't continue to lose weight at the same rate indefinitely. Indeed, weight loss slows down over time and eventually stops. But why? If

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31 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 4, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

32 (2012, April 24). Metabolic Slowing with Massive Weight Loss despite Preservation of .... Retrieved September 4, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3387402/

you were still eating the same amount of calories, shouldn't weight loss continue? Metabolic adaptation stops weight loss in its tracks, because what was once an energy deficit eventually becomes energy balance (calories consumed now equals calories expended) and weight loss stops unless further restriction is imposed.

That's not all. Your body also upregulates the systems that regulate fat deposition and increase hunger, so that eventually when you "finish" the diet or "fall off the wagon" and you eat more, you gain it back much faster and more efficiently than you lost it.[33] Even while you're dieting, your body is already setting you up for regaining fat by activating systems in the body that improve the efficiency of energy storage which directs the increased energy (aka calories) you consume in the post-diet setting towards preferential fat regain. Not only are you storing fat more efficiently during this initial "post-diet" period, but your hunger is also much greater due to lower levels of leptin, insulin, neuropeptide Y, as well as increased secretion of the hormone ghrelin which increases hunger. These mechanisms drive you to not only increase your energy consumption, but become more efficient at storing it so you regain fat much faster than you lost it.

If all of this was not bad enough, the body also has an enormous trump card that it can play to make energy storage more efficient. There's mounting evidence to suggest that if you regain body fat too quickly during the initial post diet phase, not only can you regain body fat quickly, but you can actually add new fat cells.[34] [35] You see, typically your fat cells simply shrink or expand as you lose and gain weight. However, in an effort to defend your body against future starvation, it adapts by increasing the *potential* for energy storage. Think back to the gas tank

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33 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 4, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

34 (2015, January 22). The role for adipose tissue in weight regain after weight loss. Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4371661/

35 (2017, January 27). Adipocyte hypertrophy-hyperplasia balance contributes to weight loss .... Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5477697/

from earlier. Now, not only does your car have to travel further to use up gas, it can also refill gas more efficiently, and increase the size of its gas tank so that more energy can be stored. This is the final prong of the body's self defense system, the prevention prong that makes it more difficult to lose weight in the future. In this way, the body elicits a massive and multi-faceted approach to slow/stop energy depletion (and thus slow/stop weight loss), quickly refill energy reserves, and make it more difficult to deplete energy/body fat in the future by increasing the potential for energy/fat storage.

If you think this sounds bad now, wait until we cover it in painstaking detail in future chapters. Dieting is not something to be taken lightly, and you need to do it and recover from it correctly. Otherwise these diets will not only fail, but they'll likely leave you worse off than you were before you ever began dieting.

Let's try an example of a hypothetical dieter who follows this typical "yo-yo" diet cycle, and what impact that might have on their metabolism based on the available data. If Joe has a metabolic rate that expends 2300 calories per day (his TDEE), and he begins a diet that puts him at 1500 calories per day, his energy deficit is 800 calories per day. With this deficit, he will lose weight. If he was 200 lbs when he started, maybe he gets to 180 lbs before metabolic adaptation catches up to him and he finally plateaus at 180 lbs. This means that 1500 calories per day is now his TDEE, and if Joe keeps eating 1500 calories a day, he will neither gain nor lose weight.

Maybe Joe is happy with this and decides the diet is done or that he can go back to eating like he used to. Or maybe Joe has some difficult life circumstances or stress and he "falls off the wagon." Whatever the reason, Joe starts eating more, except now the research data suggests that Joe will actually eat more than previously because his hunger hormones will be elevated, causing what's known as a hyperphagic response, which is well-documented in the literature.

If Joe is eating 2500 calories per day because he's so glad the diet is over or because he's stress eating, which is common for many people, now he's actually in an energy surplus of 1000 calories per day and will begin re-gaining weight rapidly. In fact, the research data suggests he's likely to blow past his original starting weight, since his hunger hormones won't likely normalize until he's regained more than he lost. What's more, these adaptations persist for *years* after the diet is finished in the case of people who lose massive amounts of weight.[36] Joe may end up weighing 210 lbs before his weight finally stabilizes and his metabolic rate returns to normal.

Moreover, if he initially regained some of that weight too rapidly, then he may have increased his total number of fat cells, making it more difficult for him to lose weight in the future. That and any subsequent weight loss will be even more likely to be short lived and result in weight regain.

Weight Cycling: A Recipe for Disaster

Our above example may sound like some scare tactic to simply feed our narrative. This stuff is scary, and the statistics are absolutely shocking, so if we're scaring you, GOOD. You should be concerned about the way you diet and whether or not you can sustain weight loss. Some of you may be thinking, "Well, if I lost it once, I can lose it again" and maybe all this stuff is simply a case of people pigging out post-diet and simply adding more body fat because they ate more total calories. That's a perfectly reasonable criticism to make, but there is data to suggest that it's not just a case of overeating calories. One study examined groups of subjects who either engaged in two bouts of weight cycling (lose weight, gain it back, then lose it again, and gain it back again) behavior or simply continuously over-

36 (2016, May 2). Persistent metabolic adaptation 6 years after The Biggest Loser .... Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4989512/

fed for the same duration of time.[37] What they found was absolutely shocking. In the second cycle, there was a massive (4x) increase in food efficiency, defined as weight gained per calorie of food intake by the researchers. During the second cycle, they lost weight at HALF the rate of the first cycle and then regained it at THREE TIMES the rate compared to the first cycle.[38] I want to point out that this study was in rats, so we need to take it in context. However, there is good evidence in humans that weight cycling leads to increased body fat gain over time and more difficulty losing body fat in the future.[39] [40]

Figure 3: Summary of a yo-yo dieting study performed by Brownell et al. where rats regained weight post diet twice as fast as they lost it, then during the second cycle of caloric restriction they lost it at half the original rate despite consuming the same calories. During the 2nd regain phase they regained weight three times faster than the original rate!

Freaked out yet? We aren't purposefully trying to scare you, but if we're being honest, you probably should be. The way diets have been pitched and marketed to you have been a complete betrayal. Why? They only care if you lose weight. Every

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37 (n.d.). The effects of repeated cycles of weight loss and regain ... - NCBI - NIH. Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/3823159

38 (n.d.). The effects of repeated cycles of weight loss and regain ... - NCBI - NIH. Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/3823159

39 (n.d.). Consequences of Weight Cycling: An Increase in ... - NCBI - NIH. Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4241770/

40 (2018, April 5). How dieting makes some fatter: from a perspective of human ... - NCBI. Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

fad diet is only concerned with getting enough people to lose weight to put some nice before and after pictures on their cover. But what about the "after after" photos? Those are strangely absent. *The Biggest Loser* television show is a great example of this. The people on this show are pushed to lose massive amounts of weight at any cost using extremely aggressive diets and exercise programs. Their dietary and exercise habits are completely unsustainable, so what happens to them? There have been several studies conducted on these participants that demonstrate exactly what we've spent a good part of this chapter discussing, which is metabolic adaptation: to resist further weight loss and favor weight regain. In fact, by the end of the show, the participants basal metabolic rates declined over 26% more than they should have based on the amount of weight they lost.[41] Further, virtually ALL the participants added back large amounts of body fat, and these adaptive changes to their metabolisms persisted at LEAST SIX YEARS AFTER the show ended.[42] Metabolic adaptation was so severe that their metabolic rate remained suppressed six years later, even though the subjects had regained the majority of weight they had lost.

At the start, the average metabolic rate was ~2500 calories per day. By 30 weeks on the show, this had dropped to 1996 calories per day. The subjects then regained 41 kgs (90.4 lbs) over the next six years, but their metabolic rate didn't increase. At all. Skeptics might say that the show was a success because, even though they regained 41 kg, they still kept off about 17 kgs from the beginning of the show—148.9 kg average starting weight, 90.6 kg ending weight after 30 weeks, and back up to 131.6 kg six years later—but this overlooks a major problem. Most of these people still aren't going to be happy at 130+ kg. If they *are* happy, awesome and kudos to them; we aren't into fat shaming. But many of them would still want to lose more weight. However, their metabolisms are now extremely suppressed at

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41 (2012, April 24). Metabolic slowing with massive weight loss despite ... - NCBI - NIH. Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22535969

42 (2016, May 2). Persistent metabolic adaptation 6 years after "The Biggest Loser ..... Retrieved September 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27136388

just over 1900 calories per day on average, even over six years later. This means for them to lose weight, it's going to be even MORE difficult than the first time, and they would likely have to be more aggressive or go for a longer duration to lose the same amount of weight. This is a prime example of activating the body's self-defense system in a major way.

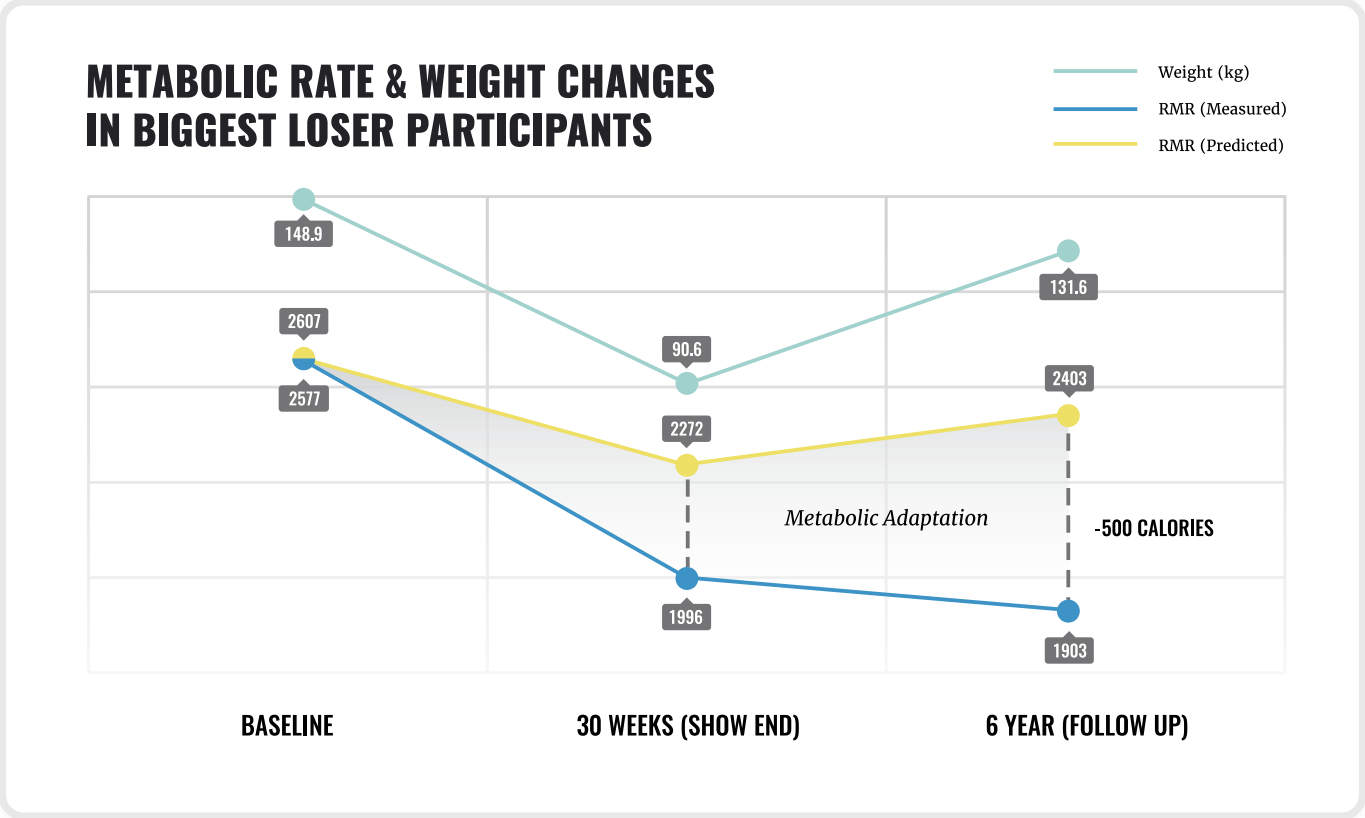

Figure 4: Data from the biggest loser study by Hall et al. demonstrating weight loss and regain with no increase in metabolic rate during the post diet weight regain. This demonstrates that metabolic adaptations can be persistent for years in extreme cases. In this case, the biggest loser subjects' metabolic rate was a massive 500 kcal per day lower than predicted.

Above all else in this book, we're going to hammer home the importance of adherence and sustainability. The best theoretical diet means absolutely *nothing* if the diet isn't sustainable for you. Consider the case of my (Layne here) father again. After 15 years of harping on him, he's finally listening to me and focusing

on sustainable weight loss. He has lost 30 lbs over the past six months and says that he feels he can sustain this current method of eating for the rest of his life.

If that is indeed the case, then this is the best method of dieting FOR HIM. It may not be the best for YOU. Some people love a low carbohydrate, ketogenic approach and feel it's sustainable for them, but that doesn't make it the answer for everyone and *vice versa*. More on that theme later. In addition to how dieting can activate your body's self-defense system and understanding that sustainability is paramount, another central theme we want to ingrain in you is this: **the best diet for you is the one that you can stick to in the long term.** It isn't sexy, but the research data says that's what is most likely to produce and sustain long-term weight loss. I'm sure this chapter was difficult to read for many of you who have undergone repeated bouts of weight cycling. You may be angry, frustrated, and possibly morose after reading this. We're sorry for the frustrations you may have endured, and we don't want to make you feel bad; that isn't the point. Our goal is to get you to recognize that this is a BIG problem, and we need to come up with solutions.

To come up with solutions, we need to better understand the problem. Therefore, we'll spend more time getting into the details of the body's self-defense system and then spend time talking about what makes for successful weight loss by studying the 5% of people who actually are successful. Our goal with this book is to provide you with the tools to lose weight, recover properly, and keep the weight off through sustainable methods, hard work, and science.

2

ENERGY BALANCE AND WHY IT MATTERS

You've seen the 100-calorie packs of food, right? What about no-calorie artificial sweeteners? Or the reduced calorie portion of the restaurant menu? We see the word "calories" strewn about in the course of our day to day life, but most of us do not understand what it really means. What *are* calories? Is a calorie something you burn? Is it an ethereal force that can make you turn into a Jedi or a Sith? Is it something you shouldn't eat as much of as you currently do?

Well, calories are quite literally energy. Like, *literally* energy. You can't see them under a microscope, they aren't a molecule that has a structure, and they don't have a chemical name. Calories actually refer to the energy that can be extracted from the nutrients (food) you consume. To be precise, calories are a unit of measurement of heat.

When we refer to calories in nutrition, we are really referring to kilocalories or kcals. This is where we confuse the hell out of you by telling you that the "calories" listed on food labels are actually "kilocalories" (within the metric system, "kilo" refers to a thousand of something, so in our case, a "kilocalorie" is technically one thousand calories). So, if a label says 100 "calories" it's actually 100 kilocalories and 100,000 calories. You see, one calorie is the amount of energy it takes to heat up one gram of water by one degree celsius. If it sounds confusing, don't worry too much. Just know that the food calories we talk about are a bit different than the ones you're accustomed to hearing about and using in your high school physics class. Try not to get too caught up in the details. It's just important to remember that we will use "calorie" when we are actually referring to kilocal-

ories because it's simply the popular way to refer to them. With that distinction out the way, if you see either the term "calorie" or "kilocalorie" throughout this, we are referring to the stuff on the back of your food label.

The other important takeaway is that the term "calories" refers to energy, something measurable. We don't want calories to be abstract concepts. So when we say fat has nine kcal per gram, that means that one gram of fat contains enough energy to heat 9,000 grams of water by one degree. Why does this matter? Well, what ultimately determines weight loss is how much energy you consume versus how much energy you expend.

The Body's Energy Currency — ATP

We know what you're thinking. "What the hell does heating up water have to do with gaining or losing fat?" Great question; we're glad you asked.

Your body is an amazing machine with tens of thousands (if not hundreds of thousands—we didn't count them all up, deal with it) of metabolic reactions occurring simultaneously, all to make you exist and do the shit you do everyday. Some of these reactions produce energy, but many of them require energy input.

Even some of the most basic things, like maintaining your sodium/potassium gradient across your cell membranes, requires energy. But energy is basically a measurement. It's not really a tangible thing, so in order to provide this energy to run these reactions and processes, your body uses an "energy currency" called adenosine triphosphate, or ATP. Why do we call it an energy currency? Because it acts a lot like monetary currency.

Have you ever thought about why currency developed all over the world? I mean, at the end of the day, it's just a silly piece of paper. If you took a million dol-

lars in cash back in time 10,000 years, you couldn't buy a damned thing with it. The pieces of paper themselves are not valuable because the currency itself is not what is valuable. It's what the currency *represents* that is valuable. We developed currency for a very practical reason. It was impractical to barter your goods and services for every transaction.

Imagine you were a cobbler and you had to barter for your daily necessities. You'd be making *a lot* of shoes. All of that cobbling might be fine, at least for a while. Let's say there comes a time when you need a great, two-handed sword. You head over to the local blacksmith and tell them what you need. Now, let's say the blacksmith doesn't need any shoes. You wind up leaving, dejected, with no sword and no way to defend yourself from a group of snow giants that want to raid your village.

Currency is a universal way to exchange value. ATP is not all that dissimilar from monetary currency. Many reactions require energy input to power them, and energy is measured as "heat." Imagine if you had to create heat to power every single reaction, and your body didn't have an energy currency to effectively "exchange" that energy in your body? Billions of simultaneous micro-explosions don't seem like the most efficient way to get the job done, right? Natural selection probably tossed that shit idea to the side a few billion years ago.

Instead, your body uses ATP as its energy currency to drive many reactions. If you want to know the intricate details of how this works, you'll find out if you ever take a biochemistry class. But basically, ATP is three phosphates attached to an adenosine. Those three phosphates are "high energy," and when ATP "donates" one of them to a reaction, that high energy phosphate gets all up in that reaction's business and pushes it forward even if it would otherwise be energetically unfavorable. Using these ATPs in this fashion is "spending" energy currency, that is, the "calories out" part of the energy balance equation.

Let's elaborate a bit further. We've all been told to exercise in order to increase our caloric expenditure (calories out), but why does exercise "burn calories?" Or perhaps a more accurate question is why does exercise "spend energy (ATP)?" There are quite a few reasons, but let's start at the most basic. Locomotion requires energy. In order to move, your muscles have to contract. Contractions require cross-bridging between contractile filaments called actin and myosin. When actin and myosin form a cross-bridge, they can pull each other closer together. When these cross-bridges happen all along the length of a muscle (that has thousands of cross-bridges at once) the muscle contracts and moves. That process requires ATP, and thus the body has to "spend" energy to move those muscles. Other processes like increased heart rate will also require more ATP, as it is involved in the process of muscle contraction in the heart.

In fact, there are likely so many processes that "spend" ATP that we would have difficulty naming them all. The point is that your body needs to make this ATP in order to function for even the most basic processes. Every cell has the ability to make and use ATP, although cells with mitochondria are way better at making ATP than cells without mitochondria, but that's a topic for a different book.

So how does ATP relate to you gaining or losing body fat? Is your fat just a bunch of stored ATP that gives you a belly and makes it hard for you to get noticed by the opposite sex at the beach? Not really. ATP can't really be stored to any large degree. It's a very high-energy molecule, so the body tends to only make the amount of ATP it needs at any given point. If you need more energy, your body just ramps up ATP production. But since you can't store ATP, evolution had to come up with another way to store energy so you didn't die. Because if you ran out of ATP, that is exactly what would happen. Therefore, if you consume more energy than you need to produce the right amount of ATP, your body finds a way to capture that energy so it can potentially produce ATP later. This energy can be stored in a few different ways, but the major energy depot of the body is adipose tissue, or body fat. Do you remember all of that metabolic adaptation stuff we

talked about at the beginning of this book? Think of this like the backstory to *why* we metabolically adapt. And the backstory only goes deeper.

Adipose Tissue — The Body's Energy Storage Depot

Adipose tissue is made up of adipocytes, which are cells that store massive amounts of fats in the form of triacylglycerides (TAGs). You can also store energy from carbohydrates in the form of glycogen, but this storage is limited at around 300-400 grams in the liver and another ~400 grams in your skeletal muscles. That may seem like a lot, but it really isn't. That's less than 1000 grams of total carbohydrate storage adding up to well under 4000 kcal of stored energy (carbohydrates contain 4 kcal of energy per gram). Whereas adipose stores *massive* amounts of energy.

Take an average-sized, non-obese male at 80 kilograms and 15% body fat. That would be 12 kilograms of body fat or 12,000 grams. This equates to almost 94,000 kcal of stored energy, and this is someone who is *not* overweight or obese. Protein, the other major macronutrient in our diet, doesn't really have a storage mechanism. It can be used for protein synthesis or oxidized for energy, but there isn't a viable storage mechanism.

That doesn't mean you just "pee or poop it all out" as some people have claimed. Just because there isn't a storage depot for protein the nutrient, doesn't mean your body can't capture that energy another way. Proteins are made up of amino acids, and the body has mechanisms to obtain energy from them. One of the major ways is through the process of gluconeogenesis. That's a big word, but it just means the process of forming glucose from non-carbohydrate substrates in the liver. Around 60% of the amino acids (the nitrogen-containing building blocks of proteins) are gluconeogenic, and their carbon skeletons can be used to form glucose once the nitrogen is removed. It's possible that this glucose can then be

stored as glycogen and theoretically fat, but it's a small amount, since protein is a more inefficient energy storage source compared to carbohydrates and fats. Don't worry, because there will be more on that later.

However, there is interplay between these three macronutrients inside the body. As we've already discussed, the carbon skeletons from amino acids in protein can be converted to glucose, and glucose can actually be converted to fat via a process called de novo lipogenesis (DNL), which occurs in the liver and adipose tissue. *Ah ha*! So that's how carbs make you fat right? Well, not really. DNL actually contributes a very small amount of fat to body fat storage.

In fact, a recent study examined overfeeding women by 50% above their maintenance calories (the amount of calories/energy where these women maintained their weight). Through sophisticated methods they were able to show exactly where the stored body fat within these women came from: carbs or fats.[1] What did they find? That the female participants, on average, stored a total of 282 grams of fat per day in adipose. A measly 4 grams of that fat resulted from DNL, and 278 grams *came from dietary fat*. So carbs only contributed to 1.4% of fat gain during overfeeding in this study.

So, if carbs aren't being stored as fat, then it must be dietary fat that is making us fat, right? Based on the last study, it has to be. After all, a *whopping 98.6%* of the body fat the women stored came from dietary fat. But let's not go crazy yet. Just as carbs have been the most recently demonized macronutrient, fats also had their trial by fire and were once theorized to be *the single cause of obesity*. While it's true that the body has an easier time storing dietary fat as body fat because there is little conversion required, the amount of dietary fat that is stored as body fat also depends on how much carbohydrate you consume.

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1 (n.d.). Short-term alterations in carbohydrate energy intake in humans .... Retrieved August 20, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC185982/

Say what? Well, carbs and fats are the two major fuels for the body from which ATP can be produced, and the intake of one affects the metabolism of the other. If you're on a high carb diet, you might not store virtually any body fat from the carbohydrates themselves, but the carbohydrates increase the secretion of insulin which impairs lipolysis (the breakdown of fats) and fat oxidation—the two crucial steps of the fat burning (and therefore body fat losing) process. *Ah ha*! So it *really is* those pesky carbohydrates making us fat! This is what supporters of the carbohydrate-insulin theory of obesity believe, but more on that later. Like every other physiological occurrence, it isn't quite so simple.

Interactions Between Carbohydrate and Fat Metabolism

If your total caloric intake remains the same and you eat a higher carb diet, then by default you will eat less at as a percentage of your total daily calorie intake . While you may not store many of the carbs in body fat, the increased carbohydrate intake will increase the efficiency at which you store dietary fats in adipose tissue. That's because your body will preferentially oxidize glucose, thereby sparing dietary fats for storage in adipose. If, by contrast, you consume a high-fat, low-carb diet, you will burn a lot of fat, because your carbs and insulin will be low, which increases the rate of lipolysis and fat oxidation. That's why your friend on the keto diet tells you it's the best diet ever—because you're always burning fat. That is absolutely true. Yes, you're burning a lot of fat, because you're *eating a lot of fat*. You're also simultaneously storing more fat. Your *net* fat balance (fat stored — fat oxidized — aka "burned") is what will determine overall loss of body fat.

Fat Balance = Fat Storage - Fat Oxidation
If Storage > Oxidation = Energy Surplus
If Oxidation > Storage = Energy Deficit
If Storage = Oxidation = Energy Balance

Figure 1: Fat balance as a function of fat stored minus fat burned (oxidized). The difference between stored and burned fat equals the net fat balance. In this example, a higher fat diet causes greater fat burning, but also greater fat storage compared to a calorie equated low fat diet that produces a lower rate of fat burning but also lower fat storage. The net fat balance between the two diets is equal.

I realize your head is probably spinning a bit here. What is important to know is that as carb intake rises, fat oxidation goes down and carb oxidation goes up. As fat intake rises, carb oxidation goes down and fat oxidation goes up. Same deal for fat storage: as carbohydrate intake goes up and fat intake goes down, you store less fat into adipose. As fat intake goes up and carbohydrate intake goes down, you store more fat into adipose.

What does all this mean? It means the body is extremely flexible in the fuels it can use, and it will base its preference on what it's exposed to. Some might find it reasonable to suggest that a low-fat diet is probably better than a low-carb diet from a physiological perspective, because you store less total fat. In reality, however, it's not the rates of fat oxidation, carb oxidation, or fat storage that tell the tale of obesity. It's the rate of fat oxidation versus the rate of fat storage, and this is determined by overall energy balance—or calories in versus calories out (CICO).

Energy Balance - Calories in vs. Calories Out

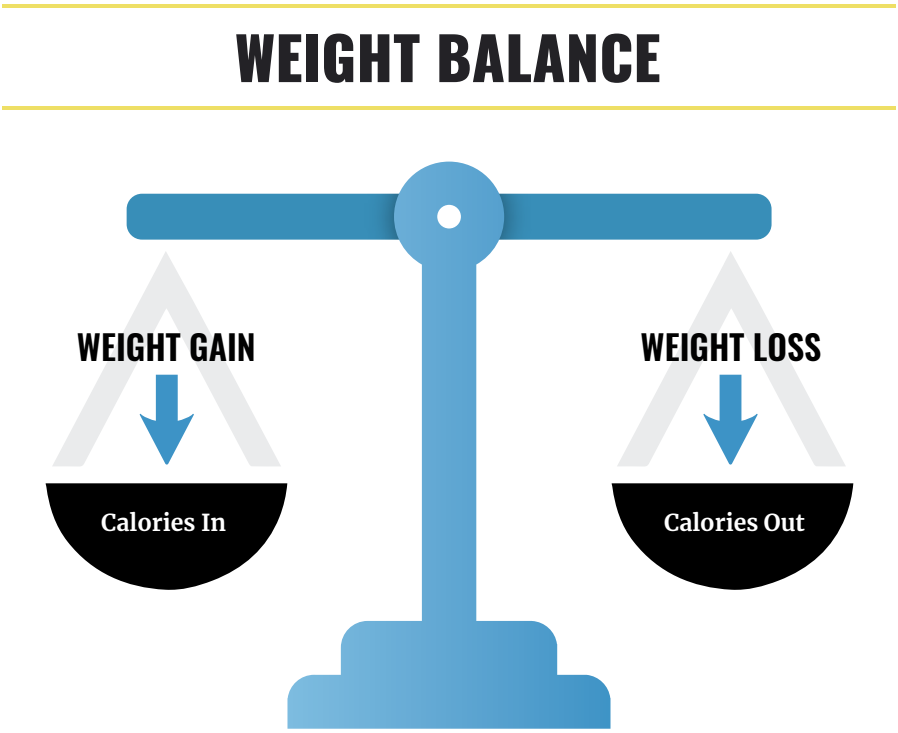

Figure 2: Energy balance as shown as a balance between calories in vs. calories out and how it impacts weight loss vs. weight gain.

Extremists from both the low-carb and low-fat groups will try to convince people that the "calories in, calories out" (CICO) model of obesity is antiquated and has been disproven, but were going to carefully and systematically explain that erroneous assumption. We want to be clear: different diets equal in energy/calories can have different effects on fat loss based on their macronutrient compositions, as we will discuss later, but that does *not* invalidate energy balance. It simply means these diets affect energy output in some way. In order to understand why energy balance matters, we first need to explain the components that make up "calories in" and "calories out." "Calories in" is exactly what it sounds like. This side of the energy balance equation is simple; how many calories did you eat in a

day? The "calories out" side of the energy balance equation is more complicated. "Calories out" is also known as your "Total Daily Energy Expenditure" (TDEE) and consists of 4 basic components:

1. Basal Metabolic Rate
2. Non Exercise Adaptive Thermogenesis (NEAT) and Non Exercise Physical Activity (NEPA)
3. Exercise activity (EA)
4. Thermic Effect of Food (TEF).

Basal Metabolic Rate (BMR) — The major component of your TDEE is your basal metabolic rate (BMR). Your BMR accounts for approximately 60% of your TDEE and is the amount of energy your body requires to run basic processes and "keep the lights on," so to speak. A more simple name might be "existence calories." Still, even though this is a baseline to keep you alive, for most people it's still the major determinant of your TDEE unless you do a lot of activity, in which case it may be a smaller overall contributor to your daily TDEE. Some commonly used synonyms of BMR are resting metabolic rate (RMR) and resting energy expenditure (REE); however these terms have slightly different definitions.

Non exercise activity thermogenesis (NEAT) and Non exercise physical activity (NEPA) — NEAT is the amount of energy you spend doing unconscious little movements throughout the day that aren't actually exercise.These include typing on the keyboard, talking, fidgeting, wiggling your toes, etc. NEPA refers to walking, standing, and any voluntary, non-exercise activity. This is actually the *most* adaptive component of metabolism, and it increases significantly during a caloric surplus and decreases significantly during a deficit. Everyone handles the deficit differently. Sometimes even a small deficit renders you into being as inactive as Jabba the Hutt, but your NEAT still goes down, in which case, some people consciously increase their NEPA to offset the stillness of their metabolic adaptation. NEAT is often used interchangeably with NEPA (non exercise phys-

ical activity), though the main difference is whether we are conscious of the activity or not. For our purposes—and in the interest of not being pedantic—we will just refer to it as NEAT.

Thermic Effect of Food (TEF) — As weird as it sounds, there is also a thermic effect of food, meaning that it costs you energy to extract energy from the food you eat everyday. Think of it like a combustion engine. The conversion of gasoline to energy isn't perfect; in fact, a lot of the energy is wasted and your car has to put energy into the system to extract energy from the gasoline. Different foods require varying amounts of energy to be processed and digested. Generally speaking, foods higher in fiber and protein have a higher TEF.

Exercise Activity - This is exactly what it sounds like. When you exercise, you expend calories. How many you expend depends on the duration and intensity of the exercise performed.

So when we get to the point where it's time to calculate these equations, you have to take all of these into account. If all this looked like an equation, it would be:

TDEE = BMR + NEAT + Exercise +TEF

Looks simple right? It is, but then again it isn't. Your TDEE can vary from day to day depending upon your activity, food intake, and a host of other factors. So attempting to pinpoint a specific daily number is going to be difficult, but it doesn't invalidate energy balance. It just means that "calories out" side of the equation will have a certain error margin from day to day, but as we'll discuss later, we can get pretty close.

Several groups of diet zealots including hardcore clean eaters, keto diet zealots, hard-line vegans, and a host of others have attempted to discredit the CICO model of fat loss and gain as outdated. One of the major arguments many of these

groups make is that CICO is based on the first law of thermodynamics, which only applies to a closed system. The first law of thermodynamics states that energy cannot be created or destroyed, only transferred. This applies to CICO because the energy you put into the system (your body) cannot just disappear. It has to be used somewhere, but it doesn't necessarily mean it's conserved in your body since it isn't a closed system. Indeed, you are not a bomb calorimeter (a device used to determine the energy content of compounds, including protein, carbs, and fats). All of the energy you take in is not perfectly conserved in the body. In fact, your body can dissipate quite a bit of energy as heat through the process of adaptive thermogenesis. What CICO critics don't realize is that dissipation of energy is already accounted for in the "calories out" side of the equation, since NEAT actually includes this dissipation of energy. So while energy is not perfectly conserved in the human body, our calculations already account for this fact.

Further, while the human body is not a closed system, the various components of "calories out" (TDEE) already take into account that the human body is an open system—making this argument a strawman. So if you eat 2000 calories, *something* happens to them. They won't all wind up as ATP or stored, and some will be wasted as heat through the process of thermogenesis, but this doesn't invalidate CICO. In fact, it supports it.

This also means that if any diet were superior to another diet, it would need to affect one of the components of TDEE in a meaningful way and cause an increase in caloric expenditure compared to other calorie-equated diets. For example, if a specific diet increased TDEE by 300 kcal per day, that would improve fat loss due to increased expenditure, or "calories out." If a diet also caused a shift to favoring increased weight loss from fat tissue versus lean body mass, that would an additional benefit. Any potential benefit of a diet on energy expenditure can be explained based on TDEE = BMR + NEAT + EA + TEF.

Numerous metabolic ward studies support these findings, demonstrating that when calories and protein are equated, weight loss is the same.[2][3][4] Metabolic ward studies are important because they are extremely tightly controlled. The patients are provided their meals by the researchers, and the researchers place them in a room where they can measure their TDEE based on a few fancy techniques. Some of the purported superior fat loss effects of various diets, such as the ketogenic diet, can actually be traced back to the fact that some people are more satiated by a ketogenic diet and simply eat fewer total calories.

CICO vs. The Carbohydrate-Insulin Model of Obesity

The fact that many nutrition studies do *not* equate for calories when comparing diets is a huge drawback in much of the nutrition research, and it's mind-blowing that more people aren't aware of it. Now, if certain diets help with satiety and cause people to eat less, then there *is* potential value in those diets. Helping with satiety to yield a decrease in energy intake is much different than some of the claims you hear about "good calories" and "bad calories" and "the types of calories you consume are *more important* than the quantity of calories you consume."

The low carb/keto proponents have gone as far as to say that you can gain fat while in a caloric deficit if you are eating carbohydrates because insulin drives obesity, not calories. This revolves around the carbohydrate-insulin hypothesis of obesity whereby insulin (a hormone that helps shuttle glucose into cells) is postulated to drive fat gain and obesity due to its inhibition on lipolysis and fat

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2 "Energy expenditure and body composition changes after ... - NCBI - NIH." 6 Jul. 2016, https://www.ncbi.nlm.nih.gov/pubmed/27385608. Accessed 21 Aug. 2018.

3 "Metabolic and behavioral effects of a high-sucrose diet ... - NCBI - NIH." https://www.ncbi.nlm.nih.gov/pubmed/9094871. Accessed 21 Aug. 2018.

4 "Metabolic effects of very low calorie weight reduction diets. - NCBI - NIH." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC425077/. Accessed 21 Aug. 2018.

oxidation. If insulin truly had that powerful of an effect and caused people to gain fat, then it must be somehow affecting one of the components of TDEE, thereby lowering your daily TDEE and thus creating a caloric surplus and tipping energy balance towards storage. The idea that eating carbs can cause you to gain fat even if you are in a deficit is a completely false claim. If eating *any* amount of carbs caused you to gain fat regardless of your caloric intake, that would mean that carbs must somehow cause your BMR, NEAT, or EA to go into the tank. The data does not support this claim in any way.

While we will specifically discuss this later, we'd like to point out that the carbohydrate-insulin model of weight gain and weight loss has been disproven several times over by several labs.[5] [6] [7] [8] [9] [10] We want to be very clear on this point: **it is impossible to gain weight in a caloric deficit.** If you gained weight, then *by definition* you were not in a deficit. When people say things like, "I ate in a deficit and gained weight," this probably means they calculated using an equation that didn't actually provide them the correct deficit. This doesn't mean CICO is untrue; it just likely means that they are an outlier and probably have a slower-than-normal metabolic rate that an equation couldn't predict (more on this later).

The idea that the type of calories is more important than the quantity of calories you consume is simply untrue and has been demonstrated through a number of

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5 (2016, July 6). Energy expenditure and body composition changes after ... - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27385608

6 (2018, July 9). Efficacy of ketogenic diet on body composition during ... - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6038311/

7 (2017, February 20). Impact of a 6-week non-energy-restricted ketogenic diet ... - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5319032/

8 (2015, August 13). Calorie for calorie, dietary fat restriction results in more ... - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4603544/

9 (n.d.). Ketogenic low-carbohydrate diets have no metabolic ... - NCBI. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16685046

10 (2017, February 11). Obesity Energetics: Body Weight Regulation and the Effects of Diet .... Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28193517

research studies. However, that isn't to say that the types of calories you consume don't matter at all; they do. A plethora of studies have demonstrated increased weight/fat loss and energy expenditure with diets that are higher in protein.[11] [12] [13] [14] [15] This is not completely unexpected when you consider the TEF for protein versus carbohydrates and fats. The TEF for protein is approximately 20-30% whereas carbohydrates are approximately 5-10%, and fats 0-3%.16 There have been numerous theories as to why protein is such an inefficient nutrient compared to carbohydrates or fat, but it's likely due to the effect of dietary protein on overall protein turnover. You see, when sufficient protein is ingested, it increases muscle protein turnover and muscle protein synthesis.[17] Muscle protein turnover is an ATP-requiring, energetically expensive process and may increase the usage of ATP and thermogenesis.[18] Dietary protein also improves the retention of lean body mass during caloric restriction, meaning more fat loss and less lean mass lost.[19] This may help maintain metabolic rate better and assist in limiting body fat regain post-diet.

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11 (n.d.). Protein quantity and quality at levels above the RDA improves adult .... Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15640518

12 (n.d.). Dietary protein and exercise have additive effects on body ... - NCBI. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16046715

13 (2009, January 21). Moderate-Protein Diet Produces Sustained Weight Loss and Long .... Retrieved August 21, 2018, from https://academic.oup.com/jn/article/139/3/514/4670368

14 (2017, June 8). A High-Protein Diet Reduces Weight Gain, Decreases Food ... - MDPI. Retrieved August 21, 2018, from http://www.mdpi.com/2072-6643/9/6/587/pdf-vor

15 (2014, February 6). Thermic effect of food, exercise, and total energy expenditure in ... - NCBI. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/24589371

16 (2004, August 18). Diet induced thermogenesis - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC524030/

17 (2012, July 20). Leucine content of dietary proteins is a determinant of postprandial .... Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22818257

18 (2016, November 30). Meal Distribution of Dietary Protein and Leucine Influences ... - NCBI. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27903833

19 (n.d.). effects of dietary protein on the composition of weight loss ... - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3629809/

Not only does the protein content of the diet appear to impact TEF and fat loss, but fiber also appears to have a similar effect on reducing body weight when substituted calorie for calorie with non-fiber carbohydrate.[20] This is likely due to a portion of fiber being non-metabolizable, which would effectively reduce its "net" calorie contribution since some of the fiber calories are "wasted" during digestion and assimilation. Both protein and fiber are also beneficial because they are very satiating. In fact, if calories, protein, and fiber are equated, the effect of the ratio of carbohydrate to fat appears to have zero influence on fat loss, but we'll get more into that later in the macronutrient chapters.

Based on the research data we have presented here, two things are very apparent. The first is not all sources of calories are created equal meaning they don't all produce equal weight gain or loss depending upon the macronutrient breakdown of different diets. The second is that the quantity of calories you consume still matters *more* than the source of calories you consume. TEF, while important, is still only about 15% of TDEE, so you can't just eat as much protein as you want and lose weight. If you consume a 1000 calories from protein, you are going to dissipate around 300, but you will also retain 700. Now, that's better than 1000 calories from fat, which is at best around 30 kcal dissipated, with 970 kcal being retained. How much does this matter in reality? If you were on a diet of 2000 kcal per day with 400 kcals from protein, 800 kcal from carbohydrates, and 800 kcal from fat, then you should end up with a net of 1796 kcal based on the TEF of each (assuming a TEF of 30%, 7.5%, and 3%, respectively). If you doubled your protein to 200 grams per day and got 800 kcal from protein, 600 kcal from carbohydrates, and 600 kcal from fats, then you would end up with a net of 1697. So effectively, you should have reduced your "net" calories by about 100. This is a nice benefit, but it hardly justifies gorging yourself on protein just because it's more thermogenic. If we use our previous example of a person who increases their protein from 100 grams per day to 200 grams per day (800 kcal) but does

20 (2015, October 17). Effect of an isocaloric diet containing fiber-enriched flour ... - NCBI - NIH. Retrieved August 21, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4639584/

not decrease their carbohydrate and fat intake (800 kcal from each) then we end up with a net calorie amount of 2,076. If this person's maintenance calories were 1900, for example, increasing their protein without decreasing their carbohydrate and fat intake to compensate would have actually led to weight gain. This is why calorie intake *does* matter, and is the *most* important overall determinant of weight and fat loss. This *doesn't* mean that total calories are the only thing that matter; it just means they are the most important.

Still, others will attempt to discredit or question the CICO model by bringing up topics like thyroid hormone. We can't tell you how many times someone has said that CICO doesn't work for them because they have low thyroid hormone or some other ailment. While low thyroid hormone can indeed make it more difficult to lose weight due to reduced BMR, that does *not* negate CICO or energy balance. It simply means the "calories out" side of CICO is less than you would predict. You see, any criticism or "gotcha" critique of the CICO model is simply hand-waving in order to confuse you to believe in magic. However, energy balance and CICO are not "opinions" or "discussions" anymore than the earth being round is a discussion. Someone may have a lower or higher BMR that doesn't fit with energy expenditure equations, but that doesn't invalidate CICO anymore than an inaccurate thermometer invalidates the existence of heat.

Hopefully, we've convinced you that CICO/energy balance is a viable model of weight loss/gain. Understanding how energy balance works is critical to understanding the chapters to come. Now we're ready to dive deep into the physiological and psychological mechanisms behind why diets fail.

SUMMARY

- Energy balance regulates weight and fat loss.
- A negative energy balance is a requirement for weight loss.
- If you don't lose weight, then you weren't in a caloric deficit.
- Many people believe CICO doesn't work because they ate at what "should have been" a caloric deficit based on calculations, but they didn't lose weight. This doesn't invalidate CICO but rather means that their energy expenditure (calories out) is lower than predicted, or they are underestimating their intake or overestimating their expenditure, or both.
- Not all sources of calories are created equal for the thermic effect of food since higher protein intakes have demonstrated better fat loss and LBM retention.
- When calories and protein are equated, there does not appear to be a significant difference in fat loss between diets varying in carbohydrate and fat intake (though low-fat diets may have a very small advantage).

3

THE BODY'S SELF DEFENSE SYSTEM

In the first chapter, we spent a lot of time explaining why the body defends against weight loss and favors weight regain after weight loss—and why it makes sense from an evolutionary perspective.

This "self-defense system," as we referred to it, utilizes a three-pronged attack to defend your body against perceived famine:

1. It slows metabolic rate through metabolic adaptation.
2. It activates genes that favor weight regain.
3. It causes changes to your biology that make it more difficult to lose weight in the future.

Now it's time to dive deep into the biology of this self-defense system.

What is "Metabolism"?

We use the term "metabolism" a lot in this book, and it sure sounds fancy. But what exactly is metabolism? Webster's Dictionary defines metabolism as "the chemical changes in living cells by which energy is provided for vital processes and activities and new material is assimilated."

On a basic level, it's the process of extracting energy from the food you eat and producing energy to power your cell's biological processes. The molecules in food, like amino acids, sugars, fats, and others, all contain energy that can be extracted

through the process of metabolism. The end product of macronutrient metabolism is the molecule adenosine triphosphate (ATP) as well as water and carbon dioxide.

As discussed in Chapter 2, ATP is essentially the energy currency of the cell. The process of hydrolyzing ATP is used to drive many cellular reactions. If we eat an excess amount of energy compared to the ATP we use (burn), then we store this energy in adipose tissue (and, to a lesser extent, lean mass and glycogen). If we eat fewer calories than required to produce the ATP needed to run these chemical processes, then that energy must be liberated from storage in the form of adipose tissue—body fat and, to a lesser extent, lean body mass (LBM) and glycogen.

When we refer to someone who has a "fast metabolism," we mean that their body is *inefficient* at production and usage of ATP on a cellular level, and that they end up wasting a lot of potential energy. These people are the Ferraris of metabolism, and they burn through a lot of energy. If we refer to someone as having a slow metabolism, then that person is likely very *efficient* at ATP production and utilization. Someone with an efficient (slow) metabolism is able to waste less ATP and produce more ATP from less energy intake, meaning fat storage is easier for this person. Think of these people as the Prius of metabolisms; they are efficient with energy.

How much energy goes to "waste" is in large part determined by the level of thermogenesis occurring in the body. Thermogenesis refers to production of heat through dissipation (aka "wasting") of energy (aka calories). On a cellular level, much of this occurs in the mitochondria through the activity of uncoupling proteins. These proteins cause "uncoupling" of the mitochondrial membrane, which makes ATP production less efficient, and the wasted energy is given off as heat. This process is complicated, but if you really want to nerd out about it, the production of ATP is powered by an enzyme called ATP synthase, which is located in the inner mitochondrial membrane and catalyzes the production of ATP from ADP + Phosphate ion. In order to drive this reaction, a hydrogen ion gradient is created by pumping out hydrogen ions from the inner mitochondrial membrane.

This hydrogen ion gradient then drives ATP synthase. Uncoupling proteins make this process inefficient by making the membrane "leaky," so that the hydrogen ion gradient is dissipated, less ATP is produced, and the dissipated energy is given off as heat. Thus, increased thermogenesis means more calories are "burned." When we talk about people who have "fast" metabolisms and "burn" through more calories, this is a big part of what we're referring to on a cellular level.

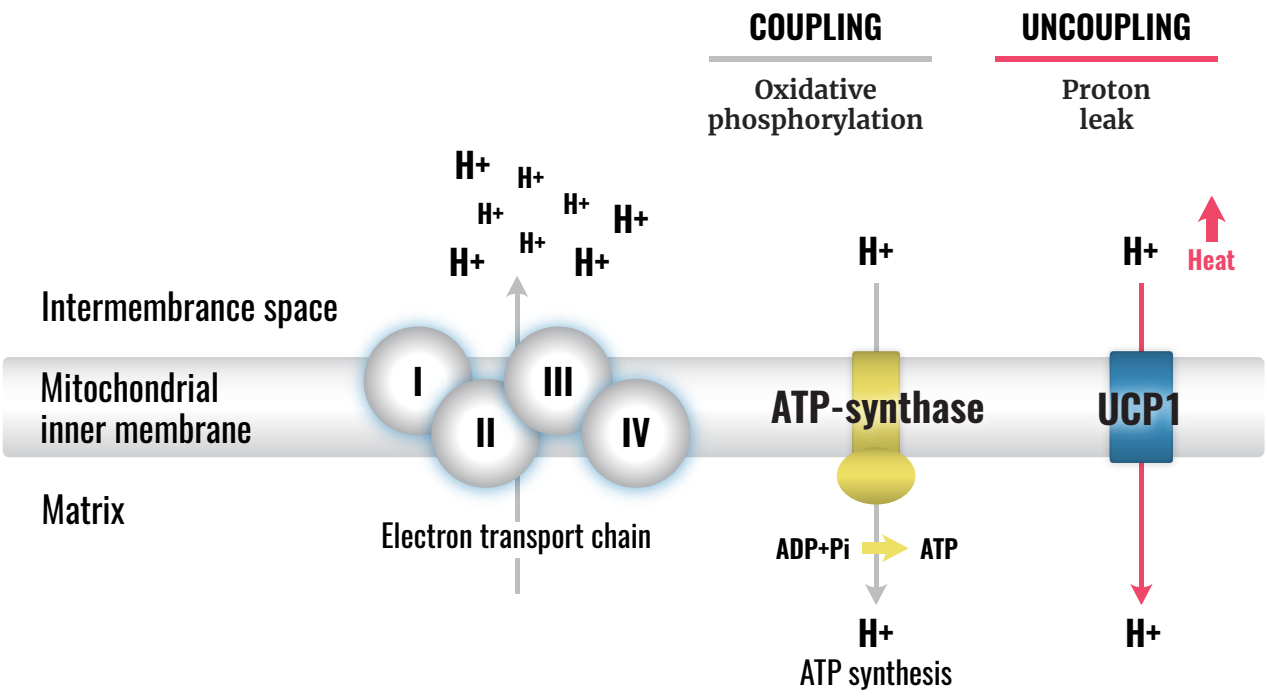

Figure 1: Uncoupling proteins cause the mitochondrial membrane to become 'leaky' reducing the H+ proton gradient, making ATP production inefficient, and wasteful through dissipation of energy as heat, increasing metabolic rate.

This may all seem a bit complicated, but it's the crux of the age-old idea of "calories in versus calories out" or, as we have referred to previously, energy balance. This is a broad overview, but it's important to understand generally what we're referring to when we say "metabolism," "metabolic rate," and why "efficient" typically means "slow" and "inefficient" typically means "fast."

The Metabolic Consequence of Dieting

As we discussed previously, dieting activates your body's self-defense system. However, this isn't an "on" or "off" switch—it's a proportionate response. The more severe the energy deficit and the longer it's imposed, the greater the signal to activate this system. If a person who doesn't typically diet goes on a 2-week shortcut to lose a few pounds, it's not nearly the same problem as someone trying for the 20th time in a series of yo-yo diets to drop 20 or more pounds.

There are three main factors that will determine how strong the activation of the self-defense system will be:

1. The severity of the energy deficit.
2. How long the deficit is imposed.
3. How frequently the deficits are imposed.

It's important to clarify that not all diets have the same impact on this system. We don't want you to be petrified of trying to lose weight, or to simply assume that any weight loss attempt is futile. They aren't futile, but they need to be planned correctly and executed correctly, or there's a high likelihood you'll be no better off than when you started—or, in many cases, you'll actually be *worse off* than when you started.

As we mentioned, the first prong of the body's self-defense system is metabolic adaptation to reduce your total daily energy expenditure. What's interesting is that the drop in metabolic rate is almost always greater than you would predict based on the person's LBM and activity level. We can predict with relative accuracy what someone's metabolic rate *should* be based on different equations that calculate basal metabolic rate (BMR). However, in people who diet, especially those who have dieted for long periods of time, we find that their BMR is much lower than it

should be. It's as if the body *overreacts* to dieting.[1] Many people find it pretty easy to lose initially during a diet, when their metabolic rate is still normal (assuming they haven't already engaged in a lot of yo-yo dieting that slowed their metabolic rate) but over time, your metabolic rate slows to adapt to the calorie deficit.

A great example of this is the case study by Russow et al. where their subject's BMR plummeted from 2424 calories per day to a meager 1283 calories per day. Keep in mind that this subject was not a tiny person; this was a 100 kilogram male bodybuilder with about 85 kilograms of LBM.[2] In fact, if we plugged his data into one of the body composition equations like the Műller equation (one of the more accurate equations to predict metabolic rate, which we will discuss this more in a later chapter), we would get the following predicted BMR data:

Pre-Diet:
(13.587 x 87.65) + (9.613 x 15.2) + (198 x 1) – (3.351 x 27) + 674 = **2118 calories/day**

Post-Diet:
(13.587 x 84.87) + (9.613 x 4.0) + (198 x 1) – (3.351 x 27) + 674 = **1973 calories/day**

If we assess the pre-diet measurement, he actually has a faster metabolic rate than we would predict: 2424 (actual) vs. 2118 (predicted). However, check out the difference in predicted metabolic rate versus actual metabolic rate by the end of the study. Let it sink in. His predicted BMR was 1973, but his ACTUAL BMR was 1283! He got way more efficient during the 24-week caloric restriction. His metabolic rate was almost cut in *half*. The metabolic adaptation (actual BMR - predicted BMR) is an astonishing -690 calories/day difference and about 35% lower than predicted! This massive difference is what's known as metabolic adaptation, and it's a major facet of the body's self-defense system.

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1 "Metabolic adaptation following massive weight loss is ... - NCBI - NIH." 19 Sep. 2014, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4236233/. Accessed 10 Sep. 2018.

2 Natural bodybuilding competition preparation and recovery: a 12 - NCBI. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23412685

We've referenced metabolic adaptation multiple times now as one of the prongs of the self-defense system, but what is it? It's really a catch-all for various metabolic changes in the body that work to slow down your total daily energy expenditure (TDEE), and nearly every component of your TDEE is affected. Let's discuss the major factors of metabolic adaptation.

BMR

During caloric restriction, the body's basal metabolic rate adapts to the decrease in energy intake by dropping energy expenditure significantly. Now, BMR encompasses *many* metabolic processes, so referring to it as a single aspect of metabolic adaptation is a bit misleading. However, for the sake of not turning this into a thesis, we'll keep it that way. Most available research suggests that the reduction in BMR during dieting is about a 15% decline below predicted on average—but can be far greater in extreme cases.[3] [4] [5] Much of this decline in BMR is due to the reduction in weight and lean mass from dieting. Since lean mass (and, to a much lesser extent, fat mass) are metabolically active tissues, you'll have a reduction in BMR as you lose weight just due to less overall tissue and less energy needed to carry around the reduced body mass. This change in body mass, however, is not nearly enough to account for the total decrease in energy expenditure.[6] It's likely that the level of adaptation is proportionate to the level and duration of restriction. As we saw above, the Russow case study saw *a 35% BMR*

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3 (2014, February 27). Metabolic adaptation to weight loss: implications for the athlete. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3943438/

4 (2016, May 2). Persistent metabolic adaptation 6 years after "The Biggest Loser .... Retrieved September 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27136388

5 (2013, February 14). Natural bodybuilding competition preparation and recovery: a ... - NCBI. Retrieved September 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23412685

6 Metabolic slowing with massive weight loss despite preservation of fat .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22535969

reduction during that individual's diet. Further, participants from the TV show *The Biggest Loser* demonstrated over a 20% metabolic adaptation that persisted even six years *after* the show ended.[7]

NEAT

NEAT is probably the component of your TDEE that has the biggest relative adaptation during caloric restriction. Indeed, research has shown NEAT to be reduced by a massive 400 calories per day in people who lost at least 10% of their body weight.[8] While some people dismiss the changes in NEAT, claiming that it's modifiable and that people can make up for it by simply "moving more," this isn't the case. True NEAT is non-voluntary movement such as fidgeting, postural, and ambulatory movement. If you have to think about fidgeting or pacing more, then it's no longer truly NEAT. Some people think that they can make themselves fidget more, but that requires conscious effort, which can likely take away from other conscious tasks you're trying to do. For example, if you're consciously thinking about needing to fidget so you can burn more calories, you'll probably have a harder time effectively doing jobs that require higher functioning. There are a few ways to "cheat," such as getting a standing desk if you're confined to a desk. However, by expending more energy standing during the day, you may have less energy for other tasks, or you may move less when performing them, or become more efficient with movement during those tasks. We aren't trying to make it seem hopeless, but we also don't want you to think there are "hacks" or "tricks" to help you burn more calories without thinking about it.

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7 (n.d.). Persistent metabolic adaptation 6 years after "The Biggest Loser .... Retrieved September 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27136388

8 Long-term persistence of adaptive thermogenesis in ... - NCBI - NIH. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18842775

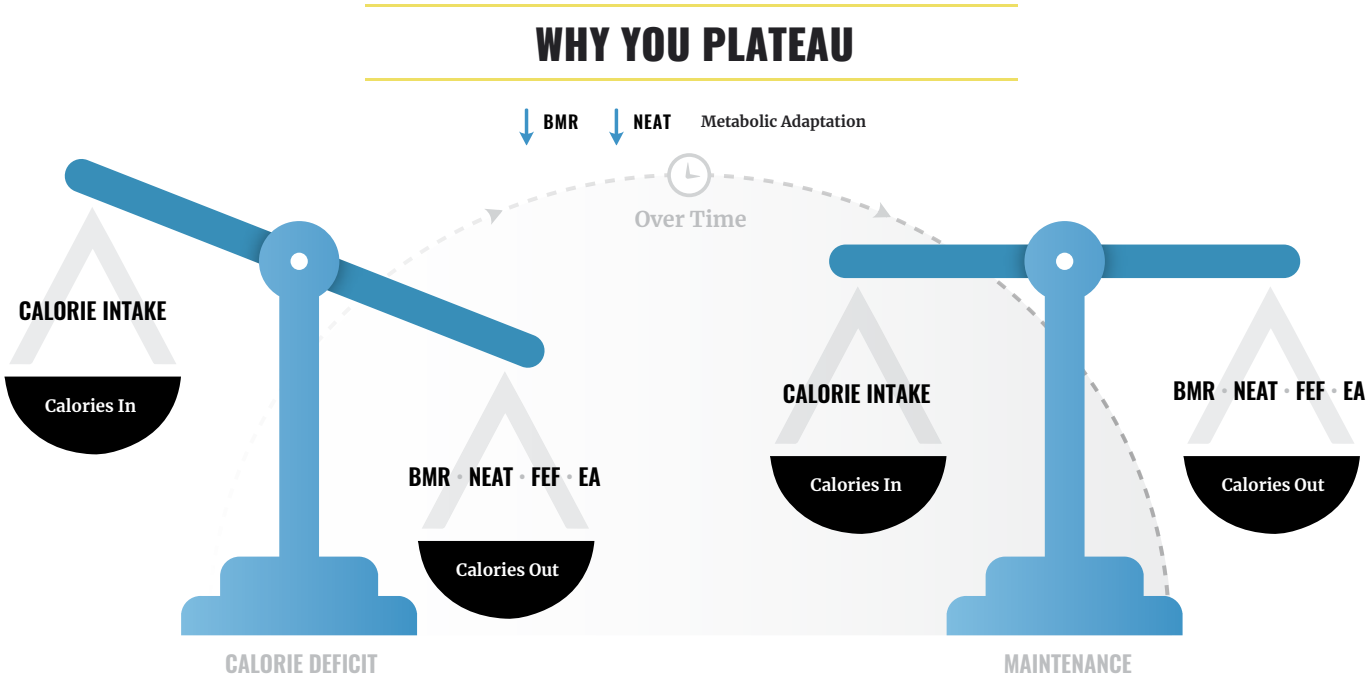

Figure 2: Plateauing of fat loss during a diet due to metabolic adaptation: decreased BMR and NEAT lead to a decrease in total daily energy expenditure, eventually bringing overall energy expenditure back to balance with your intake, thus demonstrating how over time 'deficit' calories can become 'maintenance' calories.

TEF

TEF as a percentage of TDEE seems to be largely unaffected by dieting. However, since you're eating less food, the absolute amount of calories burned from TEF will be lower while the relative rate may be unchanged.[9] Keep in mind that TEF is a very small proportion of your daily calorie output, so even if it's unchanged, it doesn't seem to have a huge impact one way or the other.

9 Effect of weight reduction on resting energy expenditure, substrate .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/1570799

EA

Dieting reduces the amount of energy you expend during exercise.[10] Ever hear someone say something to the effect of, "I don't understand why I can't lose weight when the cardio machine says I'm burning 1000 calories!" The hard truth is, you're most likely burning far less than that during exercise. Just think about times in your life when you've been overfeeding for long periods of time. You might have broken a sweat just standing up and moving around, whereas when you're dieting, you find yourself constantly cold. This is another example of reduced thermogenesis. In fact, studies examining people who add cardiovascular exercise to their normal daily routine show only small, short-term reductions in body weight.[11][12] We aren't saying don't exercise, because exercise has many other awesome health benefits *besides* weight loss. We also aren't saying that exercise won't help you lose weight. We're just saying that it's only going to give you an initial boost, and then it will become your new "maintenance" level.

Other Metabolic Adaptations

While adaptations to weight loss and low-calorie dieting happen on a grand scale, they also occur on the smallest cellular level, as well. During low-calorie dieting and weight loss, the body adapts by increasing mitochondrial efficiency so that you're able to produce more energy and less waste from the food you eat. Like we said before, efficiency is the bane of fat loss. Your cells' mitochondria are able to pump out more ATP energy with less input. Part of this may be explained by the

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10 Greater than predicted decrease in energy expenditure during ... - NCBI. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12617720

11 "The impact of exercise and diet restriction on daily energy expenditure.." https://www.ncbi.nlm.nih.gov/pubmed/2017606. Accessed 10 Sep. 2018.

12 "[Adaptation of food ingestion to energy expenditure]. - NCBI." https://www.ncbi.nlm.nih.gov/pubmed/3550978. Accessed 10 Sep. 2018.

reduction in uncoupling proteins from weight loss.[13] Uncoupling proteins reduce the efficiency of ATP production in the mitochondria and cause extra energy to be given off as heat. Thus these uncoupling proteins are very thermogenic. From an evolutionary perspective, it makes sense that these adaptive thermogenic proteins are "turned off" during weight loss as part of the body's self-defense system—so that you don't waste energy when food is scarce.[14] In fact, it's been demonstrated that a greater decrease in the expression of uncoupling proteins in skeletal muscle is associated with greater metabolic slowing during weight loss.[15] 20,000 years ago, these people would have been genetic ideals because they could resist famine much more effectively due to their superior metabolic self-defense system. In today's world, however, they are people who have a much more difficult time losing body fat.

Hormonal Adaptations

The endocrine system is also a target for metabolic adaptation. Most scientists agree that fat loss typically occurs not through a reduction in fat cell (adipocyte) numbers, but in *fat cell size*. As fat cells shrink from weight loss, they reduce their secretion of a hormone called leptin.[16] Leptin is a major control hormone for hunger, metabolic rate, and many other metabolic outcomes. It's often viewed as a central control hormone for fat loss and fat gain. When you reduce your calories and drop your body fat levels, the shrinking fat cells reduce their leptin out-

13 Decreased mitochondrial proton leak and reduced expression ... - NCBI. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12145158

14 (2014, February 27). Metabolic adaptation to weight loss: implications for the ... - NCBI - NIH. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3943438/

15 (2018, May 17). Response of skeletal muscle UCP2-expression during metabolic .... Retrieved September 11, 2018, from https://www.nature.com/articles/s41366-018-0085-2

16 Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

put. Leptin not only responds to the long-term changes in fat cell size, but also to short-term energy flux across the adipocyte. That is, fat cells can be smaller in size, but short-term overfeeding can increase leptin—but more on this later when we talk about preventing body fat regain.

Interestingly, several studies have demonstrated that leptin levels are reduced to a greater extent than would be predicted by the amount of fat loss that occurs, even after weight has stabilized.[17] [18] [19] [20] This is consistent with the data cited previously demonstrating that caloric restriction causes metabolic slowing to a greater proportion than the amount of fat that is lost.

Not only that, eating at a deficit and losing fat lowers the output of thyroid hormone (T3) and raises thyroid stimulating hormone (TSH), which also contributes to a lower metabolic rate.[21] Furthermore, energy-restricted weight-loss is also accompanied by reduced sympathetic nervous system tone.[22] While the previously mentioned hormones fall, the hormone ghrelin increases as a result of the deficit and weight loss.[23] Increased ghrelin contributes to an increase in appetite with weight loss. There's a reason it has the nickname "the hunger hormone."

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17 (2016, May 2). Persistent metabolic adaptation 6 years after "The Biggest Loser …. Retrieved January 3, 2018, from http://onlinelibrary.wiley.com/doi/10.1002/oby.21538/full

18 (2018, September 23). Metabolic adaptation to caloric restriction and subsequent … - NCBI. Retrieved November 27, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26399868

19 (n.d.). Sixteen years and counting: an update on leptin in energy balance.. Retrieved November 27, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21633176

20 (n.d.). Basal metabolic rate in anorexia nervosa: relation to body composition …. Retrieved November 27, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/10837290

21 Moderate weight loss is sufficient to affect thyroid hormone - NCBI - NIH. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23902316

22 Baseline sympathetic nervous system activity predicts dietary weight …. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22090279

23 Weight loss increases circulating levels of ghrelin in human obesity.. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/11874411

The increase in ghrelin and decrease in leptin could explain why dieting becomes progressively more difficult. Together they cause hunger levels to rise and make it more difficult to feel satiated.

These aren't the only hormones that change during caloric restriction and may affect metabolic rate. Other hormones that have less of an effect on metabolic rate like testosterone, estrogen, and other sex hormones also change during a caloric deficit.[24] Interestingly, cortisol concentrations have been observed to significantly increase during caloric restriction.[25]

These hormonal adaptations only examine the energy expenditure side of the equation. Remember energy balance is *calories in* versus calories out. Not only is your self-defense system activating metabolic adaptations to slow down metabolic rate, thus decreasing energy expenditure, but it's also altering the milieu of hormones that impact satiety. Hormones like PYY, CCK, and GLP-1 are anorexigenic (aka anti-hunger) hormones that increase satiety.[26] [27] [28] All of these hormones are reduced to a significant extent during energy restriction.[29] [30] [31]

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24 (2012, October 31). Sex hormone changes during weight loss and maintenance in .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3635052/

25 (2017, August 3). Case Study: Unfavorable But Transient Physiological Changes During .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28770669

26 (n.d.). The satiety hormone peptide YY as a regulator of appetite. - NCBI. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18441153

27 (2016, November 16). Cholecystokinin-induced satiety, a key gut ... - NCBI - NIH. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5485878/

28 (n.d.). Effects of GLP-1 on appetite and weight - NCBI - NIH. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4119845/

29 (n.d.). Peptide YY levels are decreased by fasting and elevated ... - NCBI - NIH. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16362815

30 (n.d.). Effect of weight loss and ketosis on postprandial cholecystokinin and .... Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18469245

31 (2017, May 6). Attenuating the Biologic Drive for Weight Regain Following ... - NCBI. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28481261

On the other hand, orexigenic hormones like ghrelin and orexigenic peptides such as neuropeptide-Y and Agouti-related peptides in the brain are significantly elevated during caloric restriction.[32] [33] This reduction in total daily energy expenditure combined with an increase in hunger and decrease in satiety form the 'energy gap' proposed by MacLean et al., where more energy is *desired* than is *required* in response to caloric restriction and weight loss.[34]

It's worth mentioning that insulin levels decline during caloric restriction.[35] As fat cells shrink, they become more insulin sensitive, and thus less insulin is required to dispose of glucose and drive fats into adipose. This is a good thing from a health perspective, but a terrible thing from a weight regain perspective. You see, small, insulin-sensitive adipocytes also typically secrete low amounts of leptin, which makes them extremely efficient at storage of fats. Think of adipocytes like sponges. If a sponge is soaking wet, you can't then use it to soak up anything else (in this case large, insulin-insensitive fat cells). If you wring out that same sponge as much as you can, then it becomes extremely efficient at soaking up liquid (small, insulin-sensitive fat cells). Further insulin and leptin both circulate in the body in proportion to fat mass and bind to receptors in the brain that increase expression of anorexigenic peptides and decrease expression of the orexigenic peptides. This is part of the second prong of the body's self-defense system, which prepares your body for regaining body fat even *before* you've finished your diet!

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32 (2017, May 6). Attenuating the Biologic Drive for Weight Regain Following ... - NCBI. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28481261

33 (n.d.). Twenty-four-hour ghrelin is elevated after calorie restriction and .... Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/17299118

34 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

35 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

Decreased Energy Expenditure During Refeeding

Not only do hormonal adaptations to dieting increase your propensity to regain body fat, but other aspects of metabolic adaptation activate during dieting that predispose your body to regaining body fat once you finish dieting. Possibly the most powerful adaptation is the increased efficiency of refeeding during caloric restriction.[36] You see, when you diet and impose an energy gap, the body becomes more efficient at using energy during the restriction—which we've hammered home repeatedly. But research has also shown that when you increase food intake above maintenance after you've been dieting, your body more efficiently stores it as fat compared to weight- and LBM-matched controls.[37] Not only that, but it appears that both LBM and body fat are regained differentially from where it was lost. Research has demonstrated that as weight is regained in the post-diet period, fat is preferentially stored in the trunk and LBM is preferentially regained in the extremities first (meaning the trunk regains it's LBM last).[38] This is significant because it appears that LBM in the trunk has a greater effect on metabolic rate compared to LBM in the extremities.[39]

How does all of this affect our bottom line? Let's look at a hypothetical example of two genetically identical people. Person A goes on a diet for a month and loses weight and body fat, while Person B eats at maintenance. After one month, let's assume both people are at the same weight and body fat level (meaning Person A had to lose body fat to reach Person B's level). If you challenge both of them with

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36 (2014, February 27). Metabolic adaptation to weight loss: implications for the athlete. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3943438/

37 (n.d.). Adaptive changes in energy expenditure during refeeding ... - NCBI. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/2393003

38 (2018, April 5). How dieting makes some fatter: from a perspective of human ... - NCBI. Retrieved November 7, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

39 (2018, April 5). How dieting makes some fatter: from a perspective of human ... - NCBI. Retrieved November 7, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

a high-calorie day that is the same relative increase in calories, Person A will store significantly *more* body fat than Person B due to the increased refeeding efficiency, while person B is more likely to waste some of that energy through thermogenesis. We've heard people say, "You aren't going to gain fat from one bad meal." Usually, this is said in an effort to comfort someone who might have fallen off the wagon. While it's commendable and possibly even necessary, depending upon that person's psychological makeup, it's certainly not true. We wish we could say that it's impossible to gain fat from overeating at one meal, but that would be a lie, and not consistent with the scientific data or what we know about the body's self-defense system. On the contrary, your body's self-defense system is designed to do *exactly that*! Ensure that you *can* store energy when you come across a surplus of food; it's almost literally written in our DNA.

Adipose Tissue Adaptations

The adaptations that occur within the adipose tissue in response to weight loss and caloric restriction are perhaps the most fascinating of all. It was long believed that adipose was a biologically inert tissue. That is, it was believed that adipose tissue only existed as a storage depot for energy, mainly in the form of triacylglycerides (TAGs), which occupy the vast majority of adipocyte volume. We now know that adipose tissue is an organ that integrates hormonal signals and secretes its own hormones (like leptin) called "adipokines," which communicate with other tissues of the body including the brain.[40] Research has demonstrated that adipose tissue itself plays a large role in the self-defense system. During energy restriction, adipocyte volume decreases, signaling a reduction in nutrient availability and an energy gap. This is conveyed to the brain via decreased leptin secretion from adipose, a reduction in circulating insulin (insulin levels are inversely related to adipocyte

40 (n.d.). Narrative Review: The Role of Leptin in Human Physiology - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2829242/

volume), and possibly decreased sympathetic nervous system (SNS) tone.[41] Signals to the brain reflect not only long-term nutrient availability but short-term nutrient availability as well. Thus, the body senses not only how much energy is currently stored, but the direction and intensity of energy flux across the adipocyte.[42] This is demonstrated by the ability of short-term overfeeding to restore leptin levels even though pre-diet body fat levels have not been achieved.[43] For example, even at high levels of body fat when your adipocytes are plenty big, you may notice a pretty good surge in hunger in the first few days after you begin dieting. This short-term increase in hunger is likely triggered by the short-term drop in leptin due to decreased flux of glucose and fats into the adipocytes. In contrast, even at lower levels of body fat, hunger may be temporarily reduced by short-term increases in leptin due to refeeding as the flux of glucose and fats into the adipocytes is high even though the adipocytes are smaller. That said, it's overall size of the adipocytes that seem to have the biggest impact on overall energy expenditure and satiety, in most cases (there may be an exception, which we'll discuss later). These short- and long-term signals integrate in the hindbrain and hypothalamus, which serve as the control center for energy balance regulation.[44] In response to these signals of reduced energy reserves from the adipose, energy expenditure declines and appetite increases through increased expression of peptides like neuropeptide Y, agouti-related peptide, and decreased expression of proopiomelanocortin.[45] [46]

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41 (n.d.). The role for adipose tissue in weight regain after weight loss.. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25614203

42 (2011, June 15). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

43 (n.d.). The role for adipose tissue in weight regain after weight loss.. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25614203

44 (n.d.). Brain regulation of energy balance and body weight. - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23990408

45 (n.d.). Chronic exercise lowers the defended body weight gain ... - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/14695115

46 (n.d.). Increased hypothalamic melanin concentrating hormone gene .... Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15165723

This produces the previously referred to "energy gap" where more energy is *desired* than *required*. It's not just the hormonal and neuro-endocrine signals that impact the energy gap. The actual structure of the adipose tissue seems to make an impact, as well. As fat mass is lost and the adipocytes shrink, the extracellular matrix must be remodeled around them to accommodate the change. It has been hypothesized that weight loss places a strain on the extracellular matrix of adipocytes, which results in an altered metabolic profile that favors weight regain to relieve the cellular stress and mechanical strain on the adipocyte.[47] This fits with the theme of the body's self-defense system setting you up for weight regain even while you're still dieting.

Perhaps even more interesting is the notion that massive refeeding in the immediate post-diet period may increase the production of small fat cells called pre-adipocytes. This was first demonstrated by MacLean, who noted the formation of a population of small fat cells produced from a process called pre-adipocyte differentiation (a process by which pre-adipocytes turn into fully formed adipocytes) during overfeeding in early weight regain in the post-diet period. This resulted in an increase in total fat cell number by almost 50%.[48] Normally, total fat mass is a reflection of the size of the adipocytes, and the total cell number does not change. This is *not* to say that adipocytes stay around forever once they're formed. In fact, we now know that there is fat cell turnover where new adipocytes are produced and mature adipocytes are cleared at a rate of about 8-10% per year—but this turnover is under extremely tight regulation that normally prevents changes in cell number.[49] [50]

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47 (n.d.). Human biology of weight maintenance after weight loss. - NCBI. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22472972

48 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

49 (n.d.). Adipocyte turnover: relevance to human adipose tissue morphology.. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19846802

50 (n.d.). Dynamics of human adipose lipid turnover in health and ... - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21947005

That regulation can be overridden under certain circumstances, including morbid obesity when the maximum capacity of the adipocyte to store lipids is exceeded, thought to be around 100 micrometers in diameter per cell. As the adipocytes approach this size, new fat cells can be formed through differentiation of pre-adipocytes into fully formed adipocytes to provide more storage for additional energy.[51] Interestingly, it appears that this increase in fat cell number can also occur even when the maximal cell size is *not* approached, specifically in the early post-diet period where weight relapse begins.[52] MacLean noted that the unique hormonal milieu (low T3, increased TSH, low leptin, low insulin) combined with decreased SNS tone and severely reduced rates of fatty acid oxidation created an environment that favored pre-adipocyte differentiation into fully formed adipocytes when subjects engaged in rapid weight regain in the post-diet period.[53] Both SNS and T3 have an inhibitory effect on pre-adipocyte differentiation, and these hormones are reduced during the early post-diet period from the previous energy restriction. During this early post-diet period, it has also been suggested that signals reflecting short-term nutrient availability play a more critical role in pre-adipocyte differentiation than long-term energy storage signals.[54] That is, during the immediate post-diet period, if massive amounts of energy are made available, it may override the existing adipocytes' ability to effectively clear the nutrients (namely glucose and fatty acids) due to 1) the unique milieu previously mentioned and 2) the drastically decreased rates of fat oxidation in adipocytes (fats literally being stuffed into adipocytes way faster than they can oxidize them). This could theoretically trigger pre-adipocyte differentiation in an attempt by the body to preemptively create greater capacity for storage of energy rather than wasting it.

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51 (2010, June 22). Single-cell analysis of insulin-regulated fatty acid uptake ... - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20570821

52 (2008, February 20). Weight regain after sustained weight reduction is ... - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18287221

53 (2008, February 20). Weight regain after sustained weight reduction is ... - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18287221

54 (n.d.). Biology's response to dieting: the impetus for weight regain. - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21677272

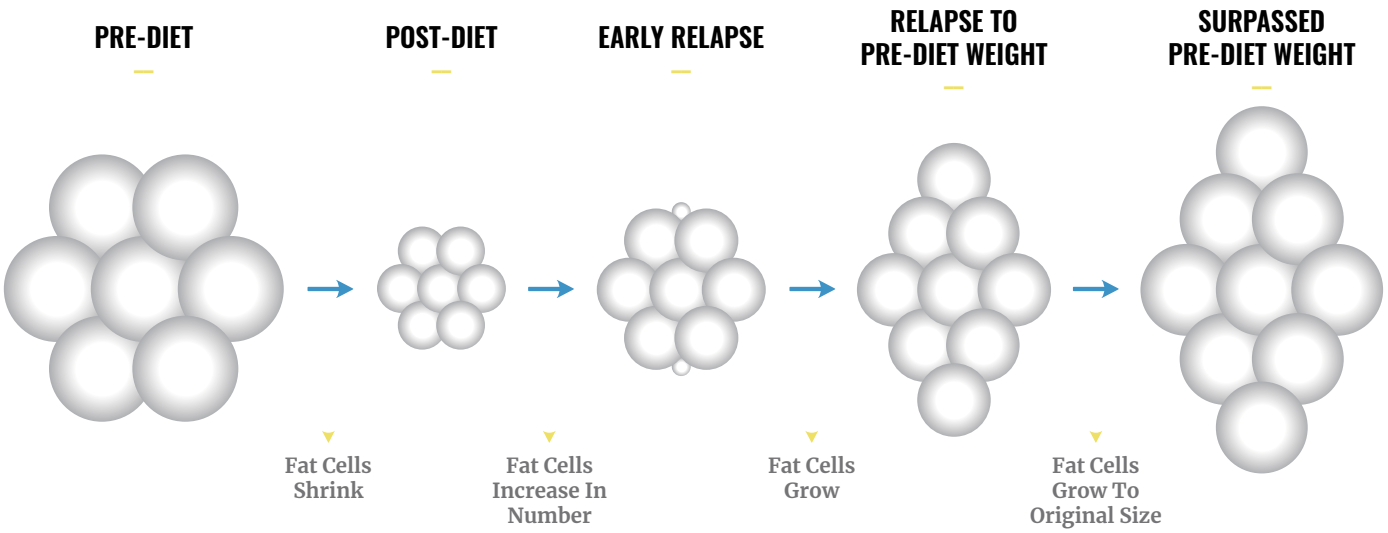

Figure 3: Body fat adaptations resulting from excessive eating in the post diet setting. As calories rapidly increase, differentiation of nascent pre-adipocytes into fully formed adipocytes may occur. This increase in fat cell number may cause establishment of a new, higher body fat set point, making it more difficult to lose fat in the future. Figure adapted from MacLean et al.

Now, we know that was a whole lot of science crammed in there for you. If we lost you in the milieu, let us explain. Essentially, what we're saying is that if you re-gain weight too fast in the early post diet period, you might actually *increase* your fat cell number. This is potentially a huge problem for weight regain and may, at least in part, explain the phenomenon of body fat overshooting. Remember our discussion of body fat set point? The set point is thought to reflect the size of the individual fat cells. Thus, even though one may have regained the total amount of fat back after massive refeeding post-diet, their individual fat cells may now be smaller due to an increase in overall fat cell number, and this may signal to the body that the setpoint hasn't been met. As a result, leptin levels may not be as high as they were previously at the same body fat level, and it may drive your body to continue gaining fat until the adipocytes each return to their previous

cell size.[55] While the current data demonstrating this phenomenon is in animals (since demonstrating it in humans is problematic), there is evidence that this process occurs across species based on some human data.[56]

This is the final and perhaps most powerful prong of the self-defense system. Increasing the total number of fat cells (hyperplasia) would make future weight loss efforts even more difficult and cause the body to defend a new, higher body fat set point. This is a major reason we'll spend so much time on the diet *after* the diet— because if you don't get that part of the equation correct, it can really screw you up. Now imagine what several yo-yo dieting cycles could do, when weight is repeatedly regained too quickly. Yikes.

We want to be clear, however, that this is a unique situation (post-diet dynamic rapid weight regain) where fat cell hyperplasia may take place. This is *not* going to happen to someone who regains all their body fat, but does so at a slowed pace. This situation likely only occurs in those who lose significant weight, then aggressively gain a significant amount back in a short period of time (likely a few weeks or less). We know some of our readers may be feeling extremely disheartened and angry reading this section of the book. In fact, you may identify with this exact scenario and be convinced that you've added more fat cells and things are now hopeless. Maybe you did, maybe you didn't, but all you can do now is move forward—and we'll do our best to arm you with the tools to facilitate long-term healthy weight reduction. Other readers may now think that liposuction is the best option—but this procedure has its own drawbacks. Liposuction has been shown to have similar relapse statistics as normal weight loss, only the fat comes

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55 (2008, February 20). Weight regain after sustained weight reduction is ... - NCBI - NIH. Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18287221

56 (n.d.). Long-term prospective and controlled studies demonstrate adipose .... Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16131581

back in different, sometimes odd places.[57] Recall that fat cells are constantly being turned over and produced thus, if weight is regained post-surgery, the new, small fat cells are more than eager to dispose of the nutrients. It's very difficult to fool mother nature, and almost everything has a price.

Why Do We Get Fat?

Now that you've read this chapter on the body's self-defense system, some of you may be wondering: *Why do we get fat?* If body fat set point is so highly regulated, then how do we exceed it and gain weight past our set point? A researcher named Speakman proposed an interesting answer to this question. Essentially, regulation of body fat set point weighs human survival at risk of starvation (low end of set point) versus. the risk of predation (exceeding the set point).[58] [59] That is, the power of your body's self-defense system to prevent you from starving to death versus your body's self-defense system for letting you get so fat that you can't avoid a predator. He argues that a substantial reduction in predatory risk within the human population over the last several thousand years has caused a substantial genetic shift. So much so that there is a significantly less robust defense against weight gain than against weight loss. While this is only a theory, we think it makes sense and tend to agree with him.

These data have led some people to speculate that genetics drives the obesity crisis, but that's unlikely. Large-scale changes in genetics take many generations, but obesity became a crisis in less than a generation; a "blink of an eye" when put

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57 (2011, April 7). Fat redistribution following suction lipectomy: defense of body fat and .... Retrieved September 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21475140

58 (n.d.). Thrifty genes for obesity, an attractive but flawed idea, and an ... - NCBI. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18852699

59 (n.d.). If body fatness is under physiological regulation, then how ... - NCBI. Retrieved September 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/24583765

in terms of evolution. Therefore it's extremely unlikely that all or most people who become obese simply have "bad genes." It's more likely that genetics can predispose us to obesity, and when you combine that with an obesogenic environment; free access to highly palatable, cheap, and calorie dense foods; and a sedentary lifestyle, the obesity epidemic arrives. As my (Layne) PhD advisor Dr. Donald Layman was fond of saying, "Genetics can only load the gun for obesity, behavior pulls the trigger."

It's not all just physiological, however. Overeating isn't just driven by physiology; it's also psychology and sociology. Portion sizes are bigger pretty much across the board. If you examined a dinner plate from the 1800s, you'd notice it's about 50-60% the size of current dinner plates. Also, consider instructions for you to always "clean your plate." Or eating out and feeling like you got a good value if you got a lot of food for the price. Heaven forbid you go to an all-you-can-eat place, because that typically turns into "eat all you can." Finally, consider the last time you went to a social event that *didn't* have food? How would you feel if you went to a social event that didn't have something to eat? Probably like it wasn't well planned, right? These are just a few examples demonstrating how ingrained food is into our culture, and why overeating isn't as simple as physiology.

Evolution has helped us develop an elaborate, redundant, and powerful self-defense system that defends us against starvation. Unfortunately, this self-defense system also pre-disposes us towards weight regain and reduces the chance of future dieting success. Therefore, we need to heed the advice of MacLean, who stated: "To ensure success, the regain prevention strategies will likely need to be just as comprehensive, persistent, and redundant, as the biological adaptations they are attempting to counter." The purpose of this book is to lay out what we know about weight loss, weight regain, and the best ways to counter weight regain and produce lasting weight loss. Now that the bad news is out of the way, it's time to start talking about how to lose weight—and how to *keep* it off.

4

WHAT REALLY WORKS?

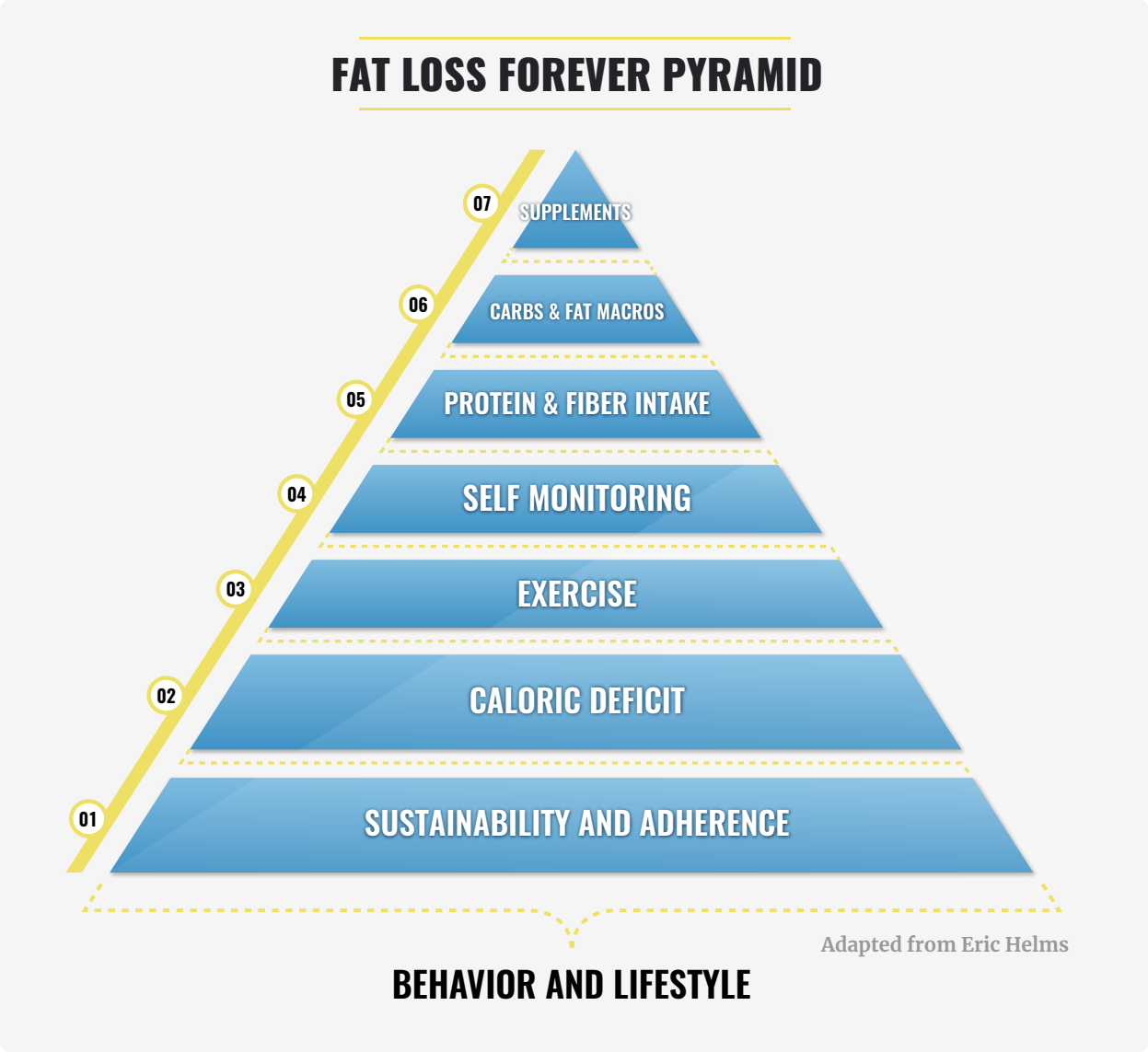

Figure 1: Fat Loss Forever Pyramid (Adapted with permission from Eric Helms' Muscle and Strength Guide Pyramid) depicting the priority of of importance for lasting fat loss. The most important factors begin at the bottom and as they ascend the pyramid, become of lower importance.

We just spent a good portion of time going over energy balance, which is the single most important physiological factor in weight loss, weight gain, and weight maintenance. We also spent a lot of time emphasizing why yo-yo dieting is such a terrible idea, and why 95% of diets *fail* in the long term. If you identified with the information in the first few chapters, you're probably feeling morose, frustrated, and possibly even angry. Why has no one ever told you these things before? To be frank, most diets have *zero* incentive to help you get weight off and keep it off. They're only concerned with producing short-term results and gathering testimonials so they can make their diet seem like the easy way to lose weight. Funny, how you only see before and after pictures, but you almost *never* see any of those people in an after-the-after picture over a year later.

You may have read the first few chapters and felt that sustainable weight loss is hopeless. We want to strongly emphasize that this is *not* the case. We wanted to show you how big the problem of weight regain is, and why most diets fail: a lack of sustainability. That being said, there are people who lose weight and keep it off. We've spent the first few chapters explaining why 95% of people fail. But what about the ~5% who succeed? We definitely need to focus on them and see what kind of behaviors they employ to lose weight and keep it off. Ironically, not one specific diet has emerged as the clear "winner" in people who have lost weight and kept it off.Instead, patterns of *behavior* have become indicators of sustainable weight loss.

This is unsurprising to legitimate scientists, since we know that energy balance is the most important factor for producing weight loss. To that end, you can accomplish weight loss through any number of different diet strategies: low fat, low carb, flexible dieting, the ketogenic diet, intermittent fasting, or *any* dietary plan that allows you to sustain caloric restriction/maintenance. We'll talk in depth about how to set up a nutritional plan for you and your individual metabolism and personal preferences. However, first it's important to talk about

the habits and behaviors of successful dieters, since these behaviors will have a bigger impact on your ability to lose weight and *keep it off* than any particular diet. While we usually get questions on weight loss, it's important to remember the bigger picture; if you do have a weight problem on either side of the spectrum, it helps to know how you got there. You don't get from Point A to Point B overnight, and you won't get back to Point A so quickly either. We'll go over the finer details later, but for now, there are strategies you can implement to save yourself time. And every little step is a bit of progress. Some steps might be big, some small. Never let that deter you. Progress is progress.

Most Important: Sustainability and Adherence

Sustainability and dietary adherence are by far the *most* important factors in losing weight and keeping it off.[1] The research data is extremely clear; if you cannot sustain the methods you used to lose weight, then the question is not "if" but "how rapidly" you'll put back on the weight after you lose it. This goes for any method. My [Layne's] father lost 30 pounds on a ketogenic diet, then added back 60 pounds because he couldn't sustain the diet for more than four months. Once he went back to eating "normally," he rapidly packed the pounds back on because of the state of his metabolism. Remember the self-defense system? Now, there are people who lose weight on a ketogenic diet *and* keep it off, but they typically don't view it as a "diet" with a beginning and an end. Instead, they view it as a "lifestyle" that they must continue in perpetuity in order to maintain their weight loss.

This goes for *any* dietary intervention style. Your absolute caloric intake may change (we'll talk about this later in our chapter dealing with the diet *after* the diet), but whatever method you used to create a deficit, you must be able to

1 (n.d.). Dietary adherence and weight loss success among ... - NCBI - NIH. Retrieved October 9, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18268511

sustain that long term. For some people (ourselves included), a strategy like "flexible dieting" works wonders. It relieves the burden of feeling like there are "good" and "bad" foods and allows you the freedom to consume whatever food you want as long as you hit your dietary targets. This involves tracking your protein, carbs, and fats (which we highly recommend) in order to give you that flexibility. We'll explain in the coming chapters why your calorie and macronutrient intake is *far* more important than individual food choices. Suffice it to say, this is a great strategy for many people to create a sustainable lifestyle, since they can consume anything they like to hit their "macros" but still make progress towards their goals. Like all great things, it's probably not for everyone. Some people have extreme anxiety about tracking their intake. For these individuals, tracking their macros may *not* be the best method to create sustainability.

Another example is time-restricted eating, which is also called "intermittent fasting." We'll touch on intermittent fasting in more depth later, but this is one method of restricting calories that doesn't make sense to us, personally. It doesn't create greater weight or fat loss when you equate calories between non-time-restricted eating, so in our mind, why would you want to not eat for 16+ hours of the day? *However*, for some people, time-restricted eating is just a strategy that allows them to be more adherent to their diet.

For example, many people aren't hungry upon waking and can go several hours before they feel the need to consume food. Because they didn't eat for several hours after waking, these people can have more calories in a shorter span of time during their "feeding hours." Some people find dieting more tolerable if they know that they can have a big meal or two—simply because they didn't eat for a good chunk of the day. Some people, on the other hand, don't do well with this method. They get extremely hungry during the "fasting" hours and then end up overeating during the "feeding" hours because they were so restricted previously. Further, some people use time-restricted eating to validate binges. They fast for long periods of time so they can go crazy for a few hours.

This isn't healthy or productive. Something like intermittent fasting needn't exist in a vacuum, either. You can track your macronutrients *and* eat within a certain window for a variety of reasons. For instance, I [Peter] often employ intermittent fasting. Not because of any dietary magic, but because it allows me to accomplish other things in my day-to-day life. So, on a given day during writing this book, I know I have certain deadlines to meet. I'll wake up, look in the mirror, and say, "You don't eat until you put out, you son of a bitch." Then I get to writing. No dietary magic, just a way to incentivize doing what I know I need to do based on years of my own behavior. Or, maybe you just want to sleep in and not get up to make food. Whatever you decide, make sure it doesn't stifle your progress, and make sure you can sustain it.

We're trying to emphasize that what makes a diet sustainable to *you* is very individual. It's probably important to try different behaviors and strategies to see what works for *you*. One of the big reasons we don't see differences in adherence between most diets in meta-analysis (all diets have terrible adherence) is that adherence and sustainability isn't just about physiology. It's also about psychology and sociology, which are different for each person. The sustainability of different diets isn't predicated on the feeling of satiety. That is, diets must also accommodate your social life and provide psychological and emotional well-being, while still progressing you towards your goals.

Some people love low-carb diets, while others hate them. Some people love low-fat diets, while others hate them. Ditto for many other dietary strategies. If you try to force someone who hates eating low carb into a low-carb lifestyle, their adherence is probably going to be pretty terrible—and thus, unsustainable.

We aren't saying that losing weight and keeping it off should be easy. It may be at some points, but it will also be monumentally difficult, as well. It requires discipline, dedication, and willpower. However, we want to use a dietary strategy and employ behaviors that require the minimal amount of willpower needed

to adhere to the strategy. Why? In the words of Dr. Kori Propst, "self-control is fatiguing." That is, any type of weight loss strategy will require some form of sacrifice and self-control, but this isn't the only area of your life where you'll need to exercise self-control. You also need self-control for your career, your family, your personal life, your spouse, etc. In isolation, these things may not be that "fatiguing," but put them all together, throw some stress into the mix, and maintaining your diet can become difficult.

People don't typically blow their weight loss diets when things are going smoothly. They blow their diets when work stress is high, their kids are screaming at them, their boss has them in a time crunch, they aren't getting enough sleep...you get the point. If you're just sitting in your comfy home by yourself and all you have to worry about is eating correctly and exercising, it's actually not that difficult to adhere to a weight loss strategy. This is why it's *so* important to find the easiest dietary strategy for you. Don't pick a plan that requires maximum willpower right from the beginning; that's going to fail 100% of the time. Your weight loss strategy should feel "easy" when stress is low and the other areas of your life are going well. This way, when stress is high (we're just being real, shit happens) hopefully your dietary strategy isn't working to compound it significantly.

By now, you're probably wanting us to give you more concrete ideas of "what works" rather than telling you, "It's individual and try it out for yourself." We get it, but since there's no one size fits all, we want to frame the conversation appropriately before we start discussing specific strategies in behaviors. That said, there are some clear strategies and behaviors that emerge as commonalities amongst people who successfully lose weight and keep it off.

HOW TO KEEP IT OFF: CHARACTERISTICS OF SUCCESSFUL DIETERS

1. Cognitive Restraint in Some Form

The most common trait of people who lose weight and keep it off is that they practice some form of cognitive restraint.[2][3][4] This includes any form of restraint that limits food intake, whether it's limiting calories, time-restricted eating, limiting certain macronutrients (like low carb or low fat), portion control, tracking macros or calories, etc. While it's important to employ a strategy that requires minimal willpower and sacrifice to be effective, every diet *will* require some level of willpower and sacrifice. You'll need to decide what you're willing to sacrifice. Do you hate the idea of never eating carbs again? Keto probably isn't a good idea. Hate the idea of tracking your macros every day? Flexible dieting may not be for you. Find that you're ravenously hungry at breakfast? Intermittent fasting, at least at that particular time, may not be for you. You need to decide what you want to sacrifice. Make no mistake, sacrifice will be absolutely necessary to achieve your goals and maintain your success—but you don't want to purposefully make things more difficult than they already are.

In the case of flexible dieting, you're sacrificing some time and energy by tracking your macros. To me [Layne], that's not really a big deal. I've been doing it for 20 years now, and while the first few weeks were pretty labor-intensive, it got progressively easier after that. To the point where 20 years later, I don't even have to use a food scale or calculator to figure out what I just ate, because my estimations are so good. That would probably fall closer to the category of

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2 (2010, May 18). Long-term weight loss maintenance in the United States - NCBI - NIH. Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3671378/

3 (n.d.). Successful Weight Loss Among Obese US Adults. Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3339766/

4 (2006, July 19). Dietary and physical activity behaviors among adults successful at .... Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1555605/

"intuitively eating," but please keep in mind that *most* dieters *can't* do that and have success. If we could intuitively eat and lose weight, we wouldn't have an obesity problem. Intuitive eating to us is more about not needing to take a food scale everywhere you go but still being able to estimate within reason what you ate. At this point, I can do that and lose weight pretty well when I want to. To me, flexible dieting is my favorite option; it's extremely accurate in terms of your nutrient intake because you *know* what you're taking in. If you're taking in 170 grams of protein, 200 grams of carbohydrate, and 65 grams of fat per day and you aren't losing body fat, then you know you need to adjust down (we'll show you how to do this later). But if you're losing at the proper rate, then you know what you need in order to maintain that weight loss, at least in the short term, because you will eventually stall in most cases.

If you're following a program like "clean eating" (FYI: there's no objective definition of this, and depending on who you ask, you'll get different "clean" food options) where you restrict specific "unclean" foods but don't practice portion control, what do you do if you stop losing weight? Eat cleaner? If you're following a keto diet but not tracking your intake, what happens if you stop losing weight? Eat fewer carbs? You're already essentially eating zero. Time-restricted eating? Eat for six hours instead of eight? Hopefully you understand our point, which is that some of these dietary strategies don't offer an objective measure unless you're also tracking your intake.

That being said, you can combine flexible dieting with almost any of the methods listed, because there's never a downside to tracking your intake. If you like time-restricted eating, you can still track your macros—and now your dietary strategy is even more accurate, and you're likely to be more successful. You could also do a ketogenic diet but track your macros within the framework of the restrictions of keto. In fact, any of these methods will work *better* if you track your macros. Regardless of the form of cognitive restraint you choose, it's essential to practice *some kind* of cognitive restraint to lose weight and keep it

off. And you *must be* willing to continue that strategy into weight maintenance after weight loss—otherwise you'll likely add back all the weight you lost.

2. Self-Monitoring

Self-monitoring falls in line somewhat with number one. Surveys of successful "losers" showed that they took their body weight daily, weighed their food, or practiced some form of measuring food intake.[5] The implications for measuring your food are pretty self-explanatory—if you're measuring your intake, you can better control it and ensure that you're actually in an energy deficit or in maintenance, depending on your goal. Daily weighing may be less intuitive, but it speaks to similar habits of being mentally engaged in the process of weight loss and maintenance. Many people finish their weight loss journey and stop weighing in so frequently because they don't want to be bothered with it—or perhaps they don't want to see it climbing. But weighing daily acts a bit like a self-regulator. Many people may find that not weighing puts weight gain "out of sight, out of mind," and they may become lax in other areas of their weight loss goals. In contrast, if someone becomes lax but weighs themselves more often, they're more likely to self-correct their behaviors due to the negative feedback of the scale number climbing. If they're weighing daily, they're more likely to self-correct faster than people who weigh in weekly or biweekly. With the latter group, more weight could be added before the individual begins to self-correct.

While weighing in daily is associated with better weight maintenance, for some people, weighing in that frequently can promote neuroticism, unhealthy self-image, and negative habits. We recommend trying to divest yourself from the daily number you see on the scale. Instead, focus on the *average* weight for the week. Just like you wouldn't sell a stock based on one bad day in the market, you

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5 (2006, July 19). Dietary and physical activity behaviors among adults successful at .... Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1555605/

shouldn't drastically reduce your calorie intake just because you weighed in high one day. By taking the average of your weekly weight, you're less susceptible to day-to-day fluctuations. Weight fluctuations of up to 1-2% per day are natural and not cause for concern. If you find that weighing in freaks you out, another strategy is to step on the scale each day and have your partner, roommate, or significant other take the weight and write it down somewhere. Then you can avoid looking at it until the end of the week. If you don't live with someone, you can always step on the scale and look away but take a picture with your camera—as long as you can resist the urge to look at it for a week. If all those don't work for you,then you may have to just do weigh-ins once per week. However, if you can weigh in daily, it's the best method for tracking progress in our opinion.

3. Regular Exercise

This may seem obvious, but exercise is a *huge* deal. In fact, we could argue that exercise should be your number one priority. Over 70% of people who lost weight and kept it off engaged in regular exercise programs. Of the people who didn't keep it off, less than 30% engaged in regular exercise programs.[6] Besides the obvious benefit of exercise increasing your TDEE, it also has some metabolic benefits that are less obvious. For one, exercise has been demonstrated to lower the body fat set point that your body will defend.[7] That is, even if you regain weight, it will likely be *less* than it would be if you weren't exercising. That fact in and of itself should be enough incentive to exercise. Further, maintaining or increasing exercise in the post-diet setting has been demonstrated to prevent the increase in fat cell number that is sometimes seen with rapid weight regain post-diet.[8]

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6 (n.d.). Successful Weight Loss Among Obese US Adults. Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3339766/

7 (2009, July 8). Regular exercise attenuates the metabolic drive to regain ... - NCBI - NIH. Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2739786/

8 (2011, June 15). Biology's response to dieting: the impetus for weight regain - NCBI - NIH. Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3174765/

Now, we're not saying you need to live in the gym once you finish a diet, but we *are* saying that if you only exercise to lose the weight and then quit exercising once you've lost it, you're setting yourself up for disaster. That said, if you never intend to be a physique competitor, you don't need to spend an hour every day training. Even performing 30 minutes per day, three days per week of rigorous physical exercise can produce robust benefits compared to being sedentary. If you *can* work up to 1-2 hours per day, 4-5 days per week of intense exercise, then you're on another level of awesome for your body. But we don't want you to think it's pointless if you aren't able to get to the gym every day. In fact, if you hate going to the gym, try to find some kind of exercise that you love, whether it's biking, crossfit, jogging, Brazilian Jiu-Jitsu, dancing, etc. The important thing is to do something that you enjoy so you'll work hard at it and perform it regularly.

Exercise also decreases the expression of lipogenic genes that may be typically increased by dieting (part of the "Restore" prong of the body's self-defense system).[9] It also traffics excess nutrients away from energetically efficient storage mechanisms and towards more energetically costly mechanisms, decreasing the likelihood of energy storage in adipose.[10] While exercise increases the caloric output side of the equation of energy balance, surprisingly it may also affect the input side, as well. There is some evidence to suggest that regular exercise actually reduces hunger and decreases food intake in the post-diet setting.[11] This may in part be attributed to the ability of exercise to sensitize the body to satiety signals.[12] This was very apparent in a study of Bengali workers

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9 (2016, February 10). Frontiers | Exercise Decreases Lipogenic Gene Expression in Adipose .... Retrieved September 25, 2018, from https://www.frontiersin.org/articles/180610

10 "Exercise reduces appetite and traffics excess nutrients away from ...." 29 Jun. 2011, https://www.ncbi.nlm.nih.gov/pubmed/21715696. Accessed 30 Oct. 2018.

11 (2015, January 22). The role for adipose tissue in weight regain after weight ... - NCBI - NIH. Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4371661/

12 "The Effects of Exercise on Food Intake and Hunger: Relationship with ...." 1 Jun. 2011, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3761859/. Accessed 30 Oct. 2018.

from the 1950s where they examined laborers who performed increasing levels of physical activity.[13] The researchers found that energy expenditure and energy intake very closely matched for the workers doing these labor jobs. Those workers with the highest physical demands consumed the most food, and those who had lower demands consumed proportionately less food. This was only true up to a point, though. For those whose work was sedentary, their lifestyle was *not* associated with a corresponding decrease in energy intake, but on the contrary was associated with higher food intake. This is matched by other data showing that a reduction in physical activity to a sedentary lifestyle fails to produce a corresponding reduction in energy intake.[14]

Most studies on this topic focus on cardiovascular exercise, but there's also a big role for resistance training. Recall that LBM is the biggest determinant of your BMR. Additionally, research demonstrates that your BMR typically doesn't return to normal until all the LBM lost during dieting returns to pre-diet levels.[15] Resistance training increases LBM significantly, possibly attenuating the reduction in metabolic rate during dieting, but also helping to restore metabolic rate in a post-diet setting and limit body fat regain. Some researchers would argue that regular exercise is the *most* important factor for keeping weight off, but we think #1 and #2 are slightly more important. However, the fact that regular exercise has a strong association with keeping weight off is:

1. Due to the physiological reasons we just discussed but also because
2. People who regularly exercise typically have more discipline and make fitness overall a priority in their lives.

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13 "Relation between caloric intake, body weight, and physical work - NCBI." https://www.ncbi.nlm.nih.gov/pubmed/13302165. Accessed 30 Oct. 2018.

14 "A decrease in physical activity affects appetite, energy, and ... - NCBI." https://www.ncbi.nlm.nih.gov/pubmed/14684398. Accessed 30 Oct. 2018.

15 (2018, April 5). How dieting makes some fatter: from a perspective of human ... - NCBI. Retrieved September 25, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

Make no mistake, if you want to lose weight and keep it off, that isn't going to happen by accident. You'll have to be mindful and make it a priority every single day. That may seem unfair if you know other people who seem to stay lean without having to put in much effort, but that's just the facts of life. Not everything is fair, and there are two options. You can complain about it, or you can do the work and make the changes necessary to achieve what you want. By purchasing this book and reading this far, we assume you're ready to make those changes. Exercise is amazing, and it's one of the best medicines you can give your body. In fact, exercise is pretty much the only thing (other than some medications) that can cause huge improvements in insulin sensitivity, blood lipids, blood pressure, and other health markers independent of weight loss. It's the only thing that we'll tell you that you need to be doing. Trying to lose weight and get healthy via dieting without exercising is like trying to bail water out of a ship with a hole in the hull while refusing to fix the hole. Did we mention that exercise is also the one thing you can do to improve cognitive function, mood, and depression?

4. Structured Programs

It's popular to make fun of different diet programs like Weight Watchers, Nutrisystem, or people who hire diet coaches. This is the age of information, so why not save money and just find all the info you need online? Well, we're human beings, and just having the information isn't always enough to make a change. Humans like structure, and they enjoy having someone to put their trust in. We tend to second-guess ourselves quite a bit, and people do better when they have some kind of structured program to follow, which takes the guesswork out of their hands. Believe it or not, we [Layne and Peter] both have coaches for these reasons.[16] There is scientific data to support this, too. Successful dieters tended to participate in structured programs more so than those who could not keep

16 Hi, Andres Vargas, Bryan Krahn, and Scott Tousignant

the weight off.[17] [18] It's also important to note that by engaging in a structured program, adherence may increase due to increased confidence. Whereas many dieters have very low confidence in their ability to lose weight, participation in a structured plan may improve their confidence since it's not up to themselves to provide direction.

5. Ability to Focus on the Long-Term Goal

People who maintain weight loss tend to be able to think about the long term, and they don't let short-term feelings and desires dictate their behavior. Rather, they keep their focus on the "prize." For example, they may feel hungry in the short term, but they use self control and self-talk to realize that hunger doesn't last forever. Regardless of how they feel in the short term, they make a conscientious effort to stay mindful of their eating because their goals are most important to them. This was clearly demonstrated in a study showing that successful weight-loss maintainers had a much lower level of what the researchers called "recency."[19] Recency is the reliance on recent information at the expense of time-distant information. Example: someone who focuses on the fact they are hungry *now* versus the fact that they'd like to lose weight and maintain it in the long term. Additionally, people who have low recency are much less likely to engage in unproductive fad dieting.

Dieters who lose weight and keep it off don't focus on quick fixes. They likely have low recency and focus on the long-term goal. Instead of trying to lose 10

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17 "Long-Term Weight-Loss Maintenance by a Meal ... - NCBI - NIH." 5 Apr. 2017, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5644929/. Accessed 4 Oct. 2018.

18 (n.d.). Efficacy of commercial weight loss programs: an updated ... - NCBI - NIH. Retrieved October 4, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4446719/

19 "The Biggest Loser Thinks Long-Term: Recency as a ... - NCBI - NIH." 8 Dec. 2015, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4672063/. Accessed 7 Oct. 2018.

pounds *right now* no matter the long-term cost, they focus on trying to lose 10 pounds in a sustainable way so that they can *keep it off*. The research is very clear that they typically don't engage in popular fad diets, weight loss supplements, or liquid diets/fasts.[20] This last point is extremely important, because yo-yo dieters tend to engage in these behaviors, seeking any short-term weight loss that they can get. These methods of achieving weight loss don't lead to sustained weight loss and may place dieters at risk to lose more lean body mass while negatively impacting their metabolic rate.

6. Social Support

Social support is a bit more complicated. Social support during diets (and in weight maintenance) has been linked to both positive *and* negative outcomes for weight maintenance.[21] [22] Why would that be? Much of the disagreement in the literature is probably due to differences in study design and definitions of social support. Based on the research, it appears that compliments and active participation with the weight loss subject produce favorable outcomes, while providing instruction actually seems to have a negative impact.[23]

It may be difficult to tease out some of these differences, but the nuances don't surprise us. There's nothing more disheartening—and frankly annoying—than everyone trying to tell you how to diet. Compliments, however, are motivating.

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20 "Successful weight loss among obese US adults.." https://www.ncbi.nlm.nih.gov/pubmed/22516488. Accessed 7 Oct. 2018.

21 (n.d.). The role of social support in weight loss maintenance: results ... - NCBI. Retrieved October 4, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26801339

22 (n.d.). Role of social support in lifestyle-focused weight management ... - NCBI. Retrieved October 4, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16052189

23 (n.d.). The role of social support in weight loss maintenance: results ... - NCBI. Retrieved October 4, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26801339

In fact, if you want to make someone feel amazing, tell them how great they look. Not only will they have a twinkle in their eye, but it will put a pep in their step. If someone compliments what you're doing, it makes you more likely to keep doing it. What's even better, however, is active participation. If you have a friend or loved one doing the same thing you're doing, it might make you more adherent. So, if this weight loss thing is intimidating, find a buddy or family member to get active with. Hold each other accountable. Create challenges to push yourselves. If we look at an extreme example of losing weight and body fat, bodybuilders typically have training partners because they find it pushes them to train harder. You may not be a bodybuilder, but you can still get pushed to do better. It can also make you more adherent to your diet, since you won't want to let your partner(s) down.

Other Characteristics of Successful Dieters

- Eat lower-calorie foods
- Consume high protein
- Consume high fiber
- Flexible control of diet versus rigid controls (all or nothing thinking)
- Consume lower glycemic index (GI) sources of carbohydrates
- Limit snacking
- Limit stress
- Eat mindfully
- Don't eat in response to stress or emotions (this is tricky, since it's not exactly a choice for some people. If this is you, we highly recommend seeking help from a specialist)
- Don't stay up very late
- Satisfaction with results
- High level of emotional intelligence and mindfulness

Some of this stuff is more about personality traits, so working with a therapist to help you change some of the more ingrained behaviors might benefit you. Therapy/support seems to have mixed results in the scientific literature, but that's likely because some people with high levels of emotional intelligence and mindfulness don't gain much from therapy—because frankly, they already have the characteristics to be successful. Others may get great benefits from therapy due to changing important behaviors. If you're someone who struggles with emotional eating, or you have a difficult time focusing on the long term versus the short term, then we highly recommend finding a therapist who specializes in these behaviors.

Some of these behaviors may seem obvious to you, and some may surprise you. You may be wondering how we recommend implementing some of these behaviors in a practical way. Some of these methods might work great for you, while others might not. We recommend trying various methods and seeing what works for you, always remembering that consistency and adherence trumps everything else.[24] The methods that allow you to be the most consistent *are* the best for *you.* We could write a thesis on just this section alone, but here are some of our most general strategies and recommendations:

Tracking Food Intake

We talked about the benefits of tracking your calories earlier. We even talked about how you can actually build the skill over the course of years. However, we also mentioned that for some people, it can be a major source of stress or anxiety. And we don't want that. In addition to tracking macronutrients/calories, there are other ways to go about tracking your food intake. We've coached clients who have done some (or even all) of the following methods of tracking, like:

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24 (2008, February 12). Dietary adherence and weight loss success among ... - NCBI - NIH. Retrieved October 9, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4005268/

1. Writing it down in with a pen and paper. You simply write down what you eat, when you eat it, and how satiated (full) you feel. If weight loss is your goal, you don't want to gorge yourself to where you feel bloated and stretched out after a meal.
2. Taking a picture. We all have cell phones now, and they can take pictures. For this method of tracking, you simply photograph a picture of what you eat. After that, you review it and make changes based on what you see. If you see no vegetables and several dozen doughnuts over the course of a week, the visual will not only startle you, but it will inform you of what to change.
3. Calorie/macronutrient counting using an app. We'll go over the finer points of this, but think of it as a good starting point. For all the inaccuracies of the apps when it comes to food entries, it's still better than not tracking at all.

Tracking your food intake is the epitome of cognitive restraint, and in our opinion, it's probably the *best* thing you can do for your nutrition knowledge. You'll never learn more about nutrition than you do simply by tracking and understanding what's in your food. Now when we say things like "high protein," or "high carb," or "high fat," etc, you'll have better context for what kind of foods we're talking about. Not only that, but you'll also understand what exactly your maintenance calories are when you've tracked for long periods of time while also weighing yourself consistently. You'll see how your weight responds to various fluctuations in your macros over time, which gives you a great baseline to understand what a calorie deficit or surplus is for you and your metabolism. This means tracking everything that goes into your mouth. That handful of nuts? Track it. Bowl of salad? Track it. Quick bite of chocolate? Track it. Tracking it makes you more accountable. Many people believe they're eating in a deficit, but in reality, they snack so much that it takes them out of a deficit—which means they can't lose weight. It may seem hard to believe, but just a few handfuls of snacks here and there can add up to several hundred calories per day and cause fat loss to come to a screeching halt.

At first, tracking is going to be a pain in the ass. There's no getting around it; the first week will suck. It won't be intuitive, and it will take a good hour of your day to figure out what you ate. Once you get through the initial learning curve, however, things get exponentially easier. At this point, I've [Layne] been tracking for over 15 years, and it probably takes 10 minutes of my day, maximum. I also don't even need to weigh my food if I'm just looking to maintain my weight or lose a little bit of weight, because I've tracked for so long that I can estimate accurately. That skill takes a long time to develop, but it's possible. The great thing about tracking your intake versus just eating off a set meal plan is that you *learn* so much. A meal plan teaches you nothing. Tracking teaches you everything. I've done over a decade of publishing research in nutrition, and the most I've ever learned about nutrition was by tracking my intake. It's the difference between giving someone a fish and *teaching* them to fish.

Make it Hard to Eat Energy-Dense Foods

For weight control, it's good to eat at home. It has nothing to do with chemicals, eating "clean" or whatever fuckery you might be thinking of. It serves two purposes:

1. You know exactly what you're putting into the food. So you'll know, without a doubt, whether or not you're dripping butter and olive oil all over your vegetables and thereby feeding yourself hundreds of unwanted calories.
2. You'll know whether you actually want the food item you think you want. Eggs, grits, biscuits, and a short stack of pancakes might sound good in theory, but they also take a significant amount of time to make—especially if you're lazy.

Another option is to allow whatever you want, but not keep it in the house. For instance, if you want a doughnut, you have to go buy the doughnut from Dunkin' Donuts, one at a time. To make it more difficult, walk there. Want to drink a soda? Walk to the store and buy it. The reasoning behind this is that it's harder to

eat what you don't have in the house. If you have it in the house, you might find yourself mindlessly snacking over the kitchen sink at night. Recall that people who successfully maintain weight loss don't engage in frequent snacking.

In addition to keeping the calorically dense foods out of the house, keep better options *in* the house. You know what these are. Eggs, rice, tofu, legumes, vegetables, chicken, apples, and basically all the other stuff your grandma told you to eat when you were a kid so you could grow up and be strong.

The doughnuts, pastries, pancakes, and the like are known as hyperpalatable foods, meaning they taste great, but they also lack a lot of the nutrients you get from other foods we've listed. That being the case, hyperpalatable foods are easy overeat. Foods like salmon, chicken breasts, broccoli—you know, the good but boring stuff—are quite hard to overeat. It's not impossible, but you will definitely have more trouble eating four pounds of chicken breasts than you will a dozen doughnuts. Not only that, but the doughnuts will yield around 1500 more calories than the four pounds of chicken—approximately 3500 calories for the doughnuts and around 2000 for the chicken, in case you wanted real numbers. Hopefully you can picture that, because it accurately depicts caloric density in some foods—that is, a lot of calories in a small space.

Measure Your Food

In this particular case, we're not talking about weighing everything by the gram (though we will address that later). No, we're talking about making some solid, educated guesses. In fact, we in America have an easy way to go about this. It's called "My Plate." This concept is relatively new, and it's a visual representation of how to sensibly eat five food groups in a given meal.[25] The plate is es-

25 (2016, November 16). MyPlate Tip Sheets | Choose MyPlate. Retrieved August 24, 2018, from https://www.choosemyplate.gov/myplate-tip-sheets

sentially divided into quarters (with some variance). In those quarters, there is a section for protein, grains, vegetables, and fruit. As you can see in the picture of the plate, some of the quarters are not quite quarters—grains and vegetables are a bit bigger, with protein and fruit being slightly smaller in size—and on the side, a little tiny portion of dairy.

So, the American Government puts out some recommendations that emphasize the importance of vegetables and fruit, but if you go on the internet or read any other book, people vilify the government's food suggestions. We won't be doing that here, of course. The government has a tough job, after all; they have to make recommendations for *everyone* based on the data from thousands of studies, while in all likelihood the appropriate dietary recommendations are very individual. Some people have claimed that the food guide pyramid is what made us unhealthy, or that the government's recommendations have made us fatter. You'll even have the real conspiracy theory quacks who claim that the government *wants* us to be sicker so that they have more control over us. If you believe that, you might as well stop reading this book; it isn't for you, because we deal with evidence.

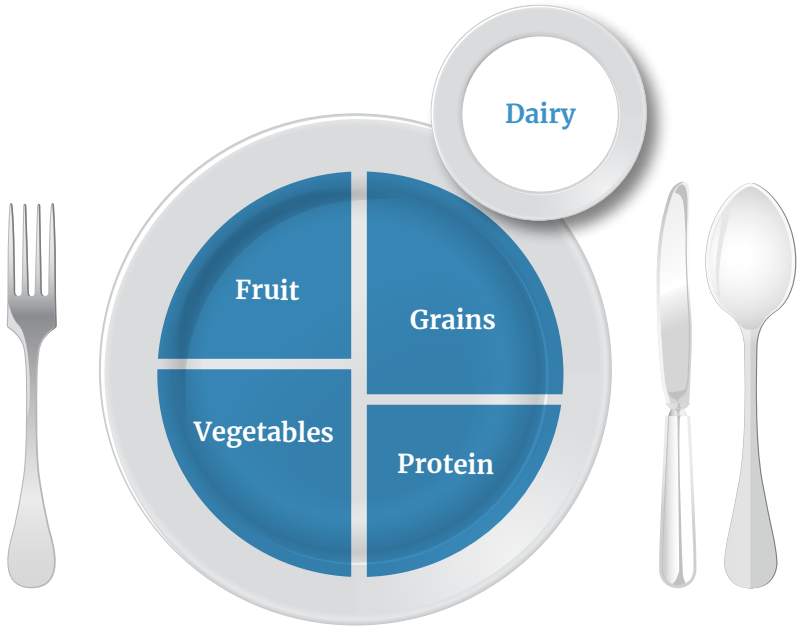

Figure 2: Government 'My Plate' depiction showing recommendations from the US government regarding portion size recommendations.

The government's recommendations did not make us sicker. In fact, we are living longer than we ever have. What increased the rate of obesity and heart disease is that we continued to over-consume calories. In fact, the increase in obesity almost perfectly correlates with the increase in calories, much more so than the increase in fat or carbohydrate intake.[26] So, just because the government recommendations may not be perfect for the individual, let's not toss the baby out with the bathwater as many people have suggested after losing weight via alternative methods. Can't blame them, though; we're always quick to use ourselves as a data point. But one thing to remember is that the recommendations aren't for people who want to get jacked or shredded. Another reason, perhaps, is that authors want to sell books. And some of these authors are misinformed due to a lack of in-depth understanding on the subject and possible misinterpretation of the data. Though if we look at the stories throughout history, humans always want to blame someone. So, we might as well blame the government while using their studies to further our cause simultaneously, right? That said, it's a decent form of measurement, if you actually follow it.

Planning and Structured Flexibility

When we say "planning," we don't mean you have to eat out of a tupperware container for every meal (though there can be a place for that). What we mean is that you should try to have some regularity with your meals. Research shows that eating similar foods from day to day can decrease appetite and reduce calorie consumption.[27] It seems that limiting overall variety can reduce cravings, and it also has the added benefit of making tracking your macronutrient intake

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26 (2017, January 11). Americans Eat Too Much Cake, but the Government Isn't To Blame .... Retrieved October 10, 2018, from https://www.cato-unbound.org/2017/01/11/stephan-guyenet/americans-eat-too-much-cake-government-isnt-blame

27 (n.d.). Dietary variety, energy regulation, and obesity. - NCBI - NIH. Retrieved October 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/11393299

easier. If you eat the same or similar foods and portions every day, then tracking your food intake becomes far less difficult. There's a fine line here, however, since too little food variety becomes inflexible and unsustainable. We also want to differentiate between purposefully restricting variety to improve adherence and increase satiety versus limiting variety because you deem omitted foods "bad," "unhealthy," or "unclean." This is nonsense designed to scare you into thinking that eating a certain type of diet is the only way to lose weight. There are *many* ways to lose weight and become healthier. Further, when people use an orthorexic style of food labeling and attach ethical value to food, it increases the likelihood of disordered eating. In fact, one study found that people who purposefully restricted various foods because they believed they were "unclean" or "unhealthy" had a much higher incidence of what they called a "disinhibition reflex," or binge eating.[28] [29] [30] One study even demonstrated that a flexible eating behavior predicted greater weight loss.[31]

We have observed that many people who attempt to "eat clean" or "eat healthy" end up developing a very black-and-white view of food. The problem is that these people feel the only way they can lose weight is by making healthy or "clean" food choices—and this can work for them. For a while. However, what tends to happen is that when they are exposed to "unclean" or "unhealthy" foods, instead of practicing cognitive restraint and portion control, they end up unmindfully binge eating. This is the disinhibition reflex. Many of you reading this book have likely experienced this. You purposely omit various foods from

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28 (2018, March 1). Flexible Eating Behavior Predicts Greater Weight Loss Following a .... Retrieved October 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/29494790

29 (2009, May 13). Dieting, restraint, and disinhibition predict women's weight change .... Retrieved October 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2696993/

30 (n.d.). Aspects of Eating Behaviors "Disinhibition" and "Restraint" Are .... Retrieved October 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2713727/

31 (2018, March 1). Flexible Eating Behavior Predicts Greater Weight Loss Following a .... Retrieved October 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/29494790

your diet, deeming them "unclean." Then, once you can no longer resist, you end up elbow deep in a jar of nutella or throwing down an entire pizza. While you could easily fit a reasonable portion of each into your macronutrient intake and still make progress towards your goal, you ended up going down the rabbit hole and shoveling as much into your mouth as possible. Why? The first reason is because you didn't allow yourself flexibility or gray area, so to speak. You were all in or all out. Any deviation from "clean" foods was going to make you feel guilty, which brings us to the next problem: attaching ethical value to food also attaches guilt to consuming "bad" foods.

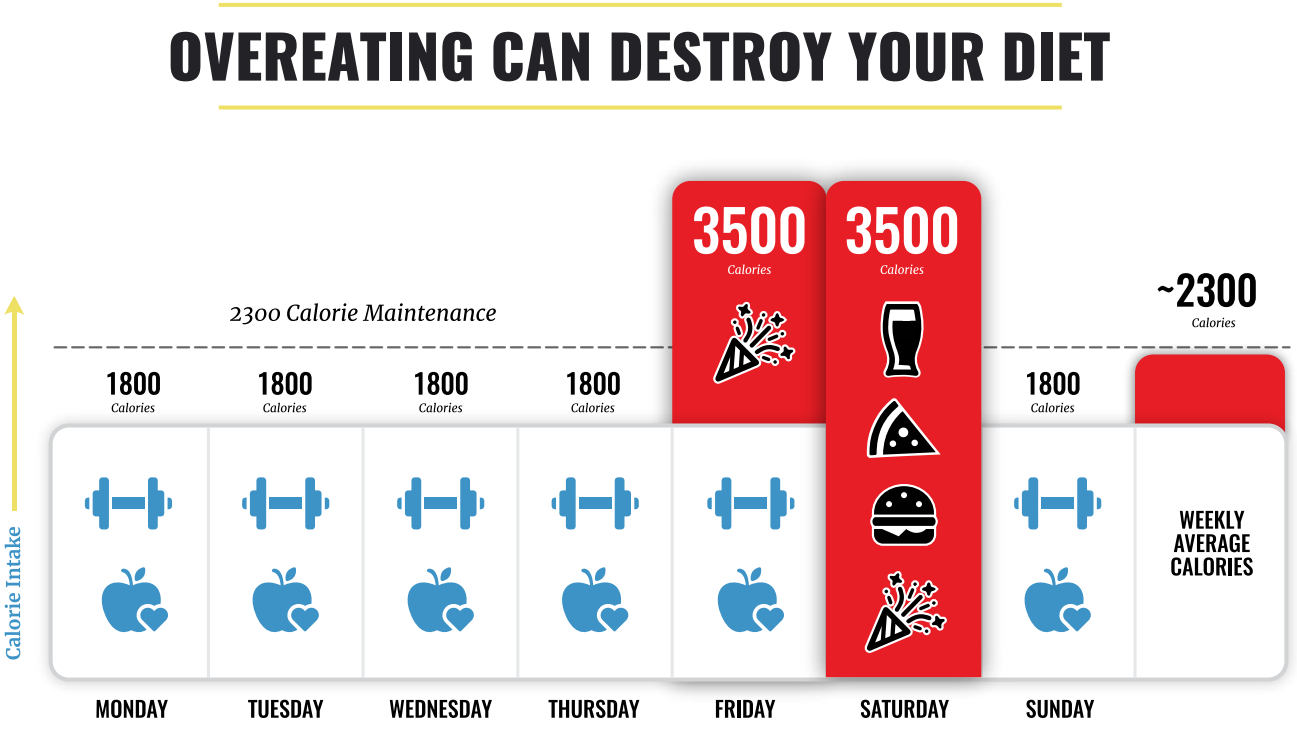

Figure 3: Depiction of weekly calorie deficit importance for fat loss. This demonstrates how many people believe they are in a deficit but not losing weight due to improper self monitoring on the weekends. Adapted with permission from @cartergood instagram.

This is why many of you who tried this sort of dieting also experienced episodes where one small bite of "bad" food turned into complete binge. Then you had to spend the entire next week trying to lose all the weight you gained on that food

bender—until the next time, when you did it again. Many people who diet this way *live* in this cycle of eating "clean" most of the week only to binge for one or two days and completely undo all their hard work. This is the disinhibition we talked about. Because you attached a black-and-white label to foods, there was no room for moderation. Thus, consuming any of the "bad" foods was more likely to trigger an all-or-nothing response. This is why it's so important to use a form of eating that does not attach labels to food and instead focuses on sustainability. There are no good or bad foods. Some foods have more calories than others, and some have less. Some have more sugar, and some have less. Some have more fat, and some have less. None of these make foods inherently good or bad, but rather they must be considered in the context of the entire day's intake and caloric "budget."

While flexibility is crucial, too much flexibility can also be a bad thing. If you're too flexible and sporadic, you may struggle with adhering to your diet, because tracking and self-monitoring becomes more difficult. When you're eating similar meals every day, tracking is easier. If you're eating completely different things every day, then tracking will take more time and energy, and you're more likely to end up with weird numbers at the end of the day that are difficult to hit. Thus, it's probably good to eat in a structured way for most of your day and allow flexibility for "fun" meals a few times per week, while still making sure you're tracking those foods. If you know that you want to have a higher calorie meal or a meal out with friends/family, then you can accomodate for that in a few different ways:

1. Fast until your calorie-dense meal so that you have more macros available for the big meal.
2. Eat mostly protein and fiber until your big meal so you have more carbs and fats to allot to your fun meal. Since most events and restaurant outings involve carbs and fats, this can be a helpful strategy.
3. Best case scenario is to plan your fun meal ahead of time and pick out what you'd like to eat ahead of time. Subtract those macros from your daily intake and then simply hit the remaining macros the rest of the day.

This is a great way to have structure, but also flexibility. I don't recommend or advise "cheat" meals for the reasons we discussed before. It's not a good idea to attach ethical judgements to meals or food. If you budget correctly, structure, and plan, then you can have fun foods that you like without impeding your progress or making you feel guilty.

Time-Restricted Eating

Time-restricted eating is another item in your tool box. You can even use this tool in conjunction with many other tools or, depending on your skill level, you can do it by itself. If you've ever asked a gym rat how they lost weight (provided they didn't do any fad diet), they might say something like, "I didn't eat carbs after 6 p.m.," or some variation on that. It could be 7 p.m., it could be "I didn't eat *anything* after 6 p.m.," or something close. The point is, they didn't consume a substantial portion of calories based on an arbitrary time restriction.

Hypothetically, let's say someone has a nine-to-five job, and they get home at 6 p.m. They *usually* sit back on the couch eating potato chips and binge-watching *Game of Thrones* before having a big dinner at 8 p.m., and then going to sleep at 11 p.m. , It's safe to say that person is eating a lot of calories. Based on what we've covered so far, you now know the time doesn't matter much—certainly not nearly as much as overall energy balance.[32] But, if the nine-to-fiver up there imposes an arbitrary time limit to cut into their times of calorie consumption, they eat less, thus lowering their energy intake, inducing a calorie deficit, and eliciting weight loss.

If you have ever encountered someone who didn't eat for most of the day, usually in the early morning and afternoons, and had one or two big meals spread out over the course of hours (usually eight hours), then you have seen something

32 (2015, April 9). The Health Impact of Nighttime Eating: Old and New ... - NCBI - NIH. Retrieved October 10, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4425165/

similar to the previous scenario. In fact, we talked about it earlier when we spoke of intermittent fasting. Whereas the people in the previous scenario restricted at night, these people restrict food intake during the day. The previous scenarios are precisely indicative of various forms of intermittent fasting. Moreover, intermittent fasting, in general, usually comes down to the following:

- You live life alternating between fasting periods, where you don't eat, and feeding periods, where you do eat.
- More often than not, the fasting period lasts longer than the feeding period, and some of the more common time splits are 16/8 and 20/4; this simply means that you fast for 16 or 20 hours, and eat for eight or four hours, depending on the split you choose.

Despite common belief in the insulin model of obesity, which we went over earlier, intermittent fasting, alas, is also not a magic bullet. However, that doesn't mean it's not useful, especially if it's something you can adhere to. For some people, time-restricted eating or intermittent fasting helps them spontaneously eat less. They don't feel hungry during the fasting periods, and they enjoy being able to eat bigger meals during their feeding period. However, keep in mind that intermittent fasting still must obey the rules of energy balance. Indeed, studies show no difference in fat loss, adherence, or cardioprotection between normal diets and time-restricted eating when calories are equated.[33] So don't think of intermittent fasting or time-restricted eating as a "cheat code" where you can disregard the laws of energy balance, because the laws of energy balance *always* apply. Thus, if you're going to practice time-restricted eating, we still recommend tracking your energy intake.

There are some people who abuse time-restricted eating and use it as an excuse to binge-eat during their feeding period. When they have trouble losing weight,

33 (2017, July 1). Effect of Alternate-Day Fasting on Weight Loss, Weight Maintenance .... Retrieved October 10, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28459931

they reduce their feeding period further so that they can still have their binge. Anecdotally, we've seen people go down to 23 hours of fasting and one hour of feeding just so they "don't have to track." Trust us when we say most people can get down 3000+ calories pretty easily in an hour when they're binging. Thus, we always recommend mindful eating and tracking your intake even when employing time-restricted eating. It's not better or worse than regular dieting, so if *you* like it better and it improves your adherence, then perhaps it's a useful tool for you.

Calories aside, another important consideration regarding any type of fasting is protein intake. When fasting, you're also limiting your protein intake, which in turn can negatively impact muscle mass or limit muscle growth. Sacrificing precious muscle tissue can also have a negative impact on metabolic rate. So if you do fast, make sure your protein intake is where it should be.

Consistency, Habits, and Your Life

When we talk about consistency, it's important to know that it doesn't mean doing the same exact thing every single day for the rest of your life. That would drive you nuts, unless you absolutely thrive on routine to that high of a degree. Consistency is about making the proper choices so often that they become habitual. A good example of this is Maslow's hierarchy of learning, and learning to make better food choices is indeed a skill. Maslow's hierarchy looks like this:

1. **Unconscious incompetence —** You are straight fucking up, and you don't know why, and you don't know how to fix it. This isn't a bad thing, mind you. It's simply is the first stage of learning. It leads to...
2. **Conscious incompetence —**You still have a few snafus along the way, but at this point in the game, you can correct them with some effort, leading you to...
3. **Conscious competence —** You know exactly what to do, but you have to spend some time thinking about it. After a long time at this stage, you will

finally arrive at...

4. **Unconscious competence —** At this stage of the game, you're so skilled that it becomes effortless. You know how Bob Ross painted beautiful landscapes so quickly? He was at that level, and he spent *years* getting there.

And how do you get there? Consistency. Not only that, but adherence to your style of tracking and eating. You could theoretically have a perfect diet, but if you only adopt it for one day, it's not going to do you a whole lot of good. Just how important is adherence? Well, in a recent study, Gibson and Sainsbury state:

> Adherence is an important key to weight loss success, and there are a number of strategies that can be used to improve adherence that are applicable in research or real-world settings. An increased drive to eat is a major contributor to unsuccessful weight loss attempts, and thus it is a key target in improving adherence. Diets which induce ketosis (such as VLEDs or KLCDs) [very low energy diets and ketogenic low carb diets, respectively] *may help to control the increased drive to eat associated with weight loss, but further research is needed on the level of carbohydrate restriction that is required to achieve this* [Our emphasis]. Ensuring that a diet contains adequate protein may also help to prevent an increase in the drive to eat. In addition, a dietary intervention that is tailored to a person's dietary preferences (whilst still aligning with nutritional recommendations), may also improve adherence. For this reason, government-based dietary guidelines are a very useful tool to use when tailoring a dietary intervention, as they are intended as population approach that are designed to be adapted to different dietary, cultural and cost preferences. Encouraging individuals to self-monitor their food intake has also been shown to improve the success of weight loss attempts and maintaining dietary changes overtime.[34]

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34 (2017, July 11). Strategies to Improve Adherence to Dietary Weight Loss ... - NCBI - NIH. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5618052/

The crux of all this is simple: find what works for you. We merely have some ideas for strategies you can adopt. You might like some of them. You might hate others. But when you find something you *can* do, it's imperative to stick with it. As referenced above, there *may* be some beneficial effects of the ketogenic diet on satiety (we'll cover these in the chapter discussing ketogenic diets), but satiety is not necessarily the same thing as adherence. Many people don't respond to satiety signals how they should, and they eat well past them. So while increasing satiety is a useful tool, it does *not* mean maximal adherence. For example, if a ketogenic diet caused you to feel full and not hungry, then that's great. However, if you found that you couldn't maintain it as a lifestyle because of your work or the fact that you simply couldn't see yourself never eating carbs again, then it might not be the right diet for you. A high protein diet has been demonstrated to improve satiety and increase thermogenesis, but if you hate eating protein, then it may not be best for you overall. The research data seems to suggest that the vast majority of beneficial effects of dieting are simply from fat loss.[35] [36] Therefore, if the vast majority of health benefits are simply due to the weight loss itself, then the *best* diet for each individual person is the one that allows them to induce weight loss and *keep it off.* Plainly stated, the best diet is probably the one that you can stick to. Try various different methods, strategies, and behaviors, and see what works *for you* and fits your lifestyle best.

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35 (2018, August 11). Carbohydrate quantity in the dietary management of type 2 diabetes: A .... Retrieved October 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/30098129

36 (2014, July 9). Low Carbohydrate versus Isoenergetic Balanced Diets ... - NCBI - NIH. Retrieved October 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4090010/

5

FLEXIBLE DIETING

Flexible dieting is a pretty straightforward concept. Like it sounds, the goal is to be able to live life, eat some of the things you like, and still make the progress you desire. It's synonymous with moderation. It's based on the things you like. Don't like asparagus? Don't eat it. Do you prefer white potatoes over sweet potatoes? Perfectly fine. There are no hard and fast rules, but there are some caveats and general guidelines, which we'll go over later. Over the years, flexible dieting has seen a lot of different names. Depending on how long and how far you've been on the internet, you might have run into the following:

- If It Fits Your Macros (IIFYM)
- Not eating like an asshole
- The Macro Diet
- Something that could never ever possibly work because sugar is the devil and will kill you even if you eat a little bit of it

And those are just a few of the names you've probably seen. And while that last bullet is a joke, it's not far from some of the reactions people have about flexible dieting. So what, exactly, is it?

It's just like it sounds. Flexible dieting. No foods are off limits. The first thing you have to remember—and this is something you'll have etched into your memory long after you finish reading this book, because it's that important—is that your diet is neverending. The Skittles you eat off the floor of Denny's, the beers you pounded before you made that terrible choice to eat off the floor, the hot skillet

they bring you, all the way to Thanksgiving dinner—all of these comprise the totality of your diet. Like we mentioned, your diet is not two fixed points in time denoting a starting and stopping point. Your diet is not something you engage in solely to lose weight (though it can facilitate that, if you want it to). No, your diet is everything you eat, in addition to why you eat it.

Some of the harsher fitness circles view food as fuel for the body. Nothing more. While we don't knock them for their dedication, we like to think of food as more than that. In part, flexible dieting:

- Takes into account your social, cultural, religious, and political ideologies
- Allows you to enjoy the things you like with little restriction
- Prioritizes good food choices
- Doesn't delineate between "clean" or "dirty" foods

So, why flexible dieting? Why do we think not omitting specific foods or food groups from your diet is a good idea? For many people, flexible dieting is a great way to increase adherence, and as we have discussed, adherence is king. Many people fail at diets due to their lack of ability to adhere to and sustain them. Cut out bread. Only eat organic. No sugar. No carbs. Super low fat. No meat. No animal products. Only eat "clean" (whatever the fuck that means) foods. All these super restrictive diets are very difficult (though not impossible) to maintain long term. So you cut out carbs, but are you telling us that you're never going to eat carbs again? More power to you if that's the case, but that's extremely difficult to sustain for the vast majority of people, and weight regain will be inevitable because of it.

We love flexible dieting and find it to be the most sustainable nutrition strategy for many people, because no foods are restricted. You are only restricted by your macronutrient intake, or your total daily intake of protein, carbohydrate, and fats. If you want something, you can have it, so long as it "fits your macros."

Think of your macros as a budget. If you're someone with a fast metabolism who can lose weight on a substantial amount of calories, you have a bigger budget. If you're someone with a slower metabolism who has to eat less macros to lose weight, then you have a smaller budget. Eating something like a Snickers bar (256 calories: 4 grams of protein, 33 grams of carbs, 12 grams of fat) is like buying sports car. It's a "waste" of money from an investment perspective, but if that sports car makes you happy and gives you positive feedback about having saved money, then it's good for you in a way—but only if you can afford it. So, is it okay for a person who makes $10 million per year to buy a $60,000 sports car if they still can take care of their other responsibilities (mortgage, utilities, kids college fund, etc)? Of course it is, because they have the budget for it. What about someone who only makes $80,000 per year? Should they buy the same sports car if it means they won't be able to pay their mortgage? Of course not. So the Snickers bar might not be a big deal to someone who is dieting on 180 grams of protein, 220 grams of carbs, and 70 grams of fat per day, because this person can still easily hit their macros and get enough quality nutrients from other foods. However, it would be a terrible idea for someone on "poverty macros" who is only eating 100 grams of carbs and 35 grams of fat per day, because it's a third of their carbohydrate and fat budget. They could theoretically do it, but then it would be difficult to consume enough nutrient-dense foods with what they have left. It's also not very filling for something that takes up such a big part of their "macro budget."

To emphasize this point, bikini pro and fitness author Sohee Lee performed a case study while prepping for her bikini pro qualifier. She called it The Snickers Experiment.[1] She committed to consuming one Snickers bar per day, every single day of her contest prep diet. Clean eating zealots would tell you there's no way to lose significant weight by eating a Snickers every day, but she did. When she started the diet her, nutritional intake was 1560 calories per day with

1 (2015, November 1). A Snickers a Day Keeps the Cravings Away: A Case for ... - Sohee Fit. Retrieved November 28, 2018, from https://soheefit.com/everyday-snickers/

one high calorie day every 10 days at 2300 calories. Thus, the snickers bar was approximately 16% of her daily calorie intake on her normal, non-high calorie days. While that may not seem like much, 16% of your calorie intake for a tiny candy bar is a pretty good chunk, but it was still doable for her. By the end of her 10-week diet, her calories were down to 1280, and Snickers bar now occupied over 20% of her daily calorie intake. She utilized structured flexibility by subtracting her Snickers bar calories and macros from her intake at the start of the day, then filling in her remaining macros and calories with her meals. She also utilized elements of intermittent fasting by fasting until 11 a.m. and then eating her final meal at 7 p.m. This allowed her to have 3 larger meals rather than eating smaller meals more frequently. She said this strategy made her feel more satiated. Her experiment is a perfect example of using multiple strategies and adjusting them to your individual preferences. During this time, she lost 5.2 pounds (from 110.8 pounds to 105.6 pounds) and 2 inches off her waist. Some of you may be saying, "The weight loss is great, but having a Snickers every day can't be healthy for you!" Sohee also had her blood work done at the end of the experiment. All of her blood lipids were great, and her fasting insulin and blood glucose were also in great shape; in fact, her fasting insulin was near the lower side of normal, which is what you'd expect based on reduced body fat (visit the link cited to see the full blood work results). Oh, and did I mention she also ended up winning her bikini pro card?

What a dream, eating Snickers every day and losing weight. Who wouldn't want in on that? Not so fast, because it wasn't all sunshine and candy-coated rainbows. Sohee actually grew to dislike eating the Snickers bar everyday. She said:

> One note I'd like to make about this is that the last few weeks of my contest prep were excruciatingly difficult because each Snickers bar took up a good chunk of my calories per day. Clocking in at 4 g protein, 33g carbohydrates, and 12g fat per bar, that totaled 250 calories that effectively ate up 20% of my allotted daily calories. I found myself feeling especially low-energy

> and drained in the final weeks leading up to my show, and I know that the diet would have been far easier had I been able to opt for another food that was less calorically-dense. Nevertheless, for the sake of this experiment, I pushed through.[2]

So, just because you can eat anything with flexible dieting, doesn't mean you should. In fact, the majority of your foods should come from whole-food, nutrient-dense, filling sources of foods. What we're saying is that if you have some treats here and there to keep your sanity, that's totally cool. Just fit them into your macro budgets.

Many of you are probably reading this and salivating at the idea that you don't have to skip all the foods you love to lose weight. On the other hand, some of you are likely having heart palpitations and pounding your fists because we just shattered all the dogma that you've been told. Sugar in particular has recently been demonized as the cause of the obesity epidemic and a host of other comorbidities. This is untrue, because sugar only causes an increase in body fat and decreased insulin sensitivity when it causes people to over-consume calories in general.[3][4][5] But we won't go into specifics just yet, because we do a thorough debunking of the "sugar is the devil" myth in Chapter 7.

This might seem like blasphemy if you've been indoctrinated into the "clean eating" or "never eat processed foods because they will kill you" mantra. The

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2 (2015, November 1). A Snickers a Day Keeps the Cravings Away: A Case for ... - Sohee Fit. Retrieved November 28, 2018, from https://soheefit.com/everyday-snickers/

3 (n.d.). Metabolic and behavioral effects of a high-sucrose diet ... - NCBI - NIH. Retrieved October 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/9094871

4 (2013, April 5). The Effects of Sucrose on Metabolic Health: A Systematic ... - NCBI - NIH. Retrieved October 12, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3630450/

5 (2015, July 7). Sugars and Health Controversies: What Does the ... - NCBI - NIH. Retrieved October 12, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4496732/

fact is that processed foods are associated with disease because they are highly palatable and easy to over-consume. Thus people eat more of them, consume more calories, and experience negative health effects due to overconsumption—not because of "chemicals." Did you know that everything is a chemical? True story. The pages you're turning? Made of chemicals. The oxygen you're breathing? It's a chemical. The water you drink? Almost 100% dihydrogen monoxide (H_20 aka water). Sounds scary when you type out the chemical name, right? How about all the "chemicals" in an organic banana. Let's list them shall we?

Organic Banana

Ingredients:
Dihydrogen monoxide, glucose, fructose, sucrose, maltose, starch, fiber, glutamic acid, aspartic acid, histidine, leucine, lysine, phenylalanine, arginine, valine, alanine, serine, glycine, threonine, isoleucine, proline, tryptophan, cysteine, tyrosine, methionine, palmitic acid, linoleic acid, linolenic acid, oleic acid, palmitoleic acid, stearic acid, lauric acid, myristic acid, capric acid, ash, phytosterols, E515, oxalic acid, E300, E306, tocopherol, phylloquinone, thiamin, riboflavin, E160a, ethyl hexanoate, ethyl butanoate, 3-methylbut-1-YL ethanoate, pentyl acetate, E1510, ethene.

Sounds pretty damned scary, doesn't it? This is why it's so important to ignore fancy hand-waving arguments about "chemicals." Everything is a chemical, and almost everything can be toxic if you get a high enough dose. I'm not going to pretend that the government has never gotten anything wrong, but food additives have to go through substantial scrutiny to be approved by the FDA. To my knowledge, there is no evidence that the chemicals (natural or unnatural) found in foods are dangerous in the normal doses that would be acquired through diet. Sure, you can find a study out there that says yellow dye #5 is toxic, but the dose given to the lab animals is much higher than you'd ever find in your diet. Now,

don't get us wrong; we aren't saying you must eat processed food. We're just telling you that it certainly won't derail your fat loss if you account for it, and it's most likely not going to harm your health, either. Further, even if there were minor downsides to some processed foods, if eating those foods helps keep you more adherent to a diet so that you can lose weight and keep it off, then that will have a more positive impact on your health than if you cut those foods out but end up "falling off the wagon" because you're miserable and can't sustain it. If you want to eat only organic foods, that's fine, and you can certainly lose weight that way—but there are no fat loss or documented health advantages to organic food versus non-organic food.[6]

I'm sure many of you are still very skeptical about flexible dieting and refuse to believe it's possible to lose weight while eating whatever you like as long as it "fits your macros." Weight Watchers is essentially flexible dieting, but it uses a point system instead of tracking macros—and Weight Watchers is one of the most successful commercial weight loss programs in existence.[7] 8 million of people have had long term weight loss success with this method (assuming they were able to adhere to it), so it shouldn't surprise you that flexible dieting can be effective. In a way, it's even more effective than other diets because you're practicing cognitive restraint and self-monitoring by tracking your food intake. It will also help you learn about what's actually in food so you can become better at intuitive eating and "guesstimating" in the future. These are crucial skills for long-term adherence and sustainability. If you don't track what's in your food, you simply won't have a concept of your actual intake versus expenditure. Some of you may still be skeptical based on concerns about eating sugar, "non-

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6 (2012, September 4). Are organic foods safer or healthier than conventional alternatives?: a .... Retrieved October 9, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22944875

7 (n.d.). Efficacy of commercial weight loss programs: an updated ... - NCBI - NIH. Retrieved October 9, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4446719/

8 (2016, April 26). The Role of Commercial Weight-Loss Programs - NCBI - NIH. Retrieved October 9, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4845909/

clean" foods, or other things, but we'll address these concerns in the chapters discussing specific macronutrients (7 and 8).

Flexible dieting has gotten a bad rap from people who believe it's a "diet" (it's not really a diet but rather a nutritional strategy) that promotes eating as much junk food as possible. It seems that a large part of this perception comes from fitness enthusiasts who post pictures of all their treats on social media with the hashtag #flexibledieting. Usually, the intentions are good—promoting the idea that you can be fit and have some "naughty" foods. Unfortunately, this gives some people the impression that flexible dieting is all junk food. As we've discussed previously, if you're doing it correctly, that isn't the case. We definitely eschew the idea of viewing food as unanimously "clean" or "dirty.". We talk about food distinction more in depth later, but for now, let's look at food under one big umbrella. That umbrella, obviously, is that all food has calories. It all provides us with energy. Some foods have higher calories than others. Some foods have more nutrients than others. That's it. When you take social media into account, what looks more appealing for Instagram: a doughnut with some gooey icing topped with Cap'n Crunch, or a picture of a skinless, boneless chicken breast with pepper on it and and a side of broccoli? This probably explains, in large part, the zeal for flexible dieters to only post their "fun" foods rather than giving an accurate representation of the totality of their diets.

There are a few other points to keep in mind when you're browsing Instagram and you see "food porn." For one thing, we don't know if the poster actually ate what was in the picture or not. We'd like to think they did, because food is pretty awesome. We also don't know their history. We don't know what they did to get a BMR so high that they can afford to eat such high calorie foods so often—if they are in fact eating them. We don't know if they burn off those calories by working a brutal, labor intensive job for 40 or more hours a week or if they walk 50 miles a day. Or it could be for the likes. Or a combination of all of the above.

Overall, we don't recommend eating a lot of junk food, because, as Sohee found out during her contest prep, it's going to be difficult to feel satiated on a fat loss diet eating foods that are calorie dense and not very filling. Thus, we recommend making the majority of your choices filling, whole, minimally processed foods like lean meats, vegetables, fruits, and high-fiber sources of carbohydrate. But that doesn't mean you can't have pasta, peanut butter, a big juicy steak, or even a Snickers bar—it just means you have to "budget" for them. It's the difference between going out, getting absolutely hammered, then going to IHOP right after and slamming down an entire stack of pancakes, an omelette, some hashbrowns, and bacon versus going out with your friends, having a drink or two, and calling it a day. It's the difference between eating two doughnuts at the office every day versus having a doughnut once or twice a week and opting for apples or oranges the other days. Flexible dieting means having white rice occasionally and not worrying to the point of exhaustion that you didn't have brown rice, instead.[9] Flexible dieting is realizing that 112 grams of skinless, boneless chicken breast isn't much different than 112 grams of skinless, boneless chicken thighs.[10] Flexible dieting is acknowledging that you can lose body fat on more than white fish, chicken, and broccoli. Flexible dieting is realizing that you are an adult and can make your own decisions when it comes to your body and food. Flexible dieting takes the guilt out of food.

Flexible dieting most assuredly is not a free-for-all Pop Tart binge. Flexible dieting doesn't eschew any one food (unless, of course, you have an allergy) and embraces all foods. We can simplify flexible dieting with a quote from Mike Doehla, a colleague and owner of Stronger U: "You can eat whatever you want. You just can't eat how much of it you want." Oversimplified as it is, that's the crux of flexible dieting. However, to get you started on your flexible dieting journey, there are some guidelines to be aware of. Remember, this whole life-

9 Basmati rice is better than both.

10 The thigh will have one less gram of protein and two more grams of fat, for those who want exactitude

style and the process of developing it is about your health more than it's about simply being leaner. Though the two are often associated.

So, with that in mind, here are some rules:

- Eat enough fiber
- Eat enough protein to encourage tissue growth (not just muscle tissue, mind you)
- Eat enough fat to keep your hormones in check
- Eat enough carbs because you like them, they make you feel good, and they provide you with energy to live life
- Or don't eat a lot of carbs. It's flexible dieting, so you can decide
- How about this: eat your protein most days, and maybe on some days you can have more carbs than fats and on other days you can have more fats than carbs. Flexibility is the operative word here.

In short, flexible dieting is less rigid than other forms of eating. And there is evidence to suggest that flexible dieting versus rigid dieting yields fewer disordered eating behaviors, less concern with body image, and a lower BMI.[11] [12] What's really cool about flexible dieting is that you can combine it with almost anything else. Want to do intermittent fasting? Cool, you can still do that and track your macros, and it will work better! Decide that the ketogenic diet is for you? Great! Track your macros and it will work even better. It just means that within the framework of that particular restriction (for example, keto being low carb and high fat) that you can choose whatever foods you like to make up those protein, carb, and fat targets.

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11 (n.d.). Rigid vs. flexible dieting: association with eating disorder ... - NCBI. Retrieved September 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/11883916

12 (2018, March 1). Flexible Eating Behavior Predicts Greater Weight Loss ... - NCBI. Retrieved September 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/29494790

So, what we have now is a list of some guidelines for flexible dieting. Take what we just said in the context of everything you learned up until now. You know the factor that drives weight loss is a caloric deficit (eating less than you use) and that other strategies in the previous chapter are vehicles to get you there. So while flexible dieting does allow you fewer restrictions, you still have to eat at a certain level of caloric intake for the results you desire. That is the caveat. Whether you eat a ketogenic diet or a high carb/low fat diet, you still need to burn more than you take in for it to yield weight loss. Now that you understand this strategy, the next chapters will dive deep into the application of it. It's time to discuss how to set up a fat-loss diet that is sustainable based on your own body and preferences.

6

WHERE TO START: HOW MANY CALORIES?

Hopefully by now you're convinced of the virtues of tracking calories and energy balance. If you've read this far and aren't convinced, I'd say it might be time to hang up your science card in the closet with your shortwave radio and your guitar. However, knowing the importance of energy balance is different than understanding how to implement that knowledge. Many people have said shit over the years like "eat fewer calories than you burn." Good advice, but without addressing habits, behavior, and also coming up with a plan specific to your individual needs and preferences, it's a pretty worthless statement.

If you haven't noticed, telling people to '"be less fat" doesn't seem to be having the desired effect. Much like a smoker who *knows* smoking is bad for them, the knowledge doesn't make it any easier to quit. There's also a prevailing misconception that these things are all about willpower, but it's much more complex than that. The smoking crisis was stopped by information, yes, but what really killed it was cultural change. Smoking became less cool. It became less socially acceptable, and society slowly made it more difficult to be a smoker without feeling ostracized. But, more to the point, none of that made quitting cigarettes easy for smokers, because that behavior was already ingrained in their habits. Break at work? Have a smoke. Stressed? Have a smoke. Great sex? Have a smoke. So, how did smoking rates decline so much when it was still so difficult to truly quit? One of the biggest reasons was that fewer and fewer people *started* smoking in the

first place. But smokers who *did* quit had to work hard not only on beating their physical/psychological addiction to cigarettes, but also on changing their habits.

Juxtapose smoking with the obesity crisis, where society is making it *more* comfortable to be an obese person (and we're not saying they shouldn't; we don't endorse fat shaming). In addition, food is becoming even more prevalent in our daily lives beyond just eating to sustain life. Add all of this together, and you have recipe for a crisis that is not easily fixed. It requires good information, meaningful changes in habits, and constant self-monitoring to ensure long-lasting change. We're going to help with all of these aspects, but first we'll begin with the nuts and bolts of nutrition. What should you be eating? How many calories should you be consume to set you on the path toward your goal? As you might have guessed, the answer depends on a multitude of variables, but we'll try to break things down more simply. Before we begin discussing your nutrition plan, we need to define a few terms:

Calorie - A calorie is simply a unit of energy. One thousand calories yields a kilocalorie, which is also called a food calorie. We went over this earlier in Chapter 2, but we wanted to have a small little review for you, nonetheless.

Maintenance Calories - Maintenance calories are exactly like they sound. The number of calories you must consume in a given day to maintain your weight.

Calorie Deficit - Simply stated, a calorie deficit is when you consume less calories than is required to maintain your bodyweight. This will, by definition, produce weight loss and (hopefully) body fat loss. It means you're using more energy than you're taking in via food calories. We'll get into more details later, but in the vast majority of cases, in order to lose fat, you need a deficit.

Calorie Surplus - The exact opposite of the deficit, a surplus is when you consume more calories than your maintenance, resulting in weight gain. The usual goal in a surplus is to make sure that weight gain is mostly muscle tissue and not fat tissue.

Metabolism - The entirety of your body's chemical processes. Typically, the two big processes involve breaking down or building up the matter inside of us. Catabolism is the breaking down of large molecules into smaller molecules, and anabolism is the building of large molecules or structures from small molecules.

Metabolic Adaptation - This is a change in metabolic rate as an adjustment to your dietary intake. For instance, if you were losing weight for a while, and you stalled, then you have witnessed metabolic adaptation. You consumed fewer calories than your maintenance, so your metabolism adapted by slowing down to prevent too much weight loss. While the individual nuances of metabolic adaptation can get drastic, that's a simple way of looking at the process for our purposes. This is the self-defense system we spoke of earlier.

So now we have some basic definitions. But what do we actually *do* with it?

How Much do I Eat to Lose Fat?

I'm sure the answer to this question will shock you, but it depends. Any diet can "work" as long as it creates a calorie deficit. However, as we'll discuss later, our goal is not just weight loss, but fat loss with maximal retention of lean mass. As we discussed earlier, energy balance will determine overall weight loss. That is, in order to lose weight, the amount of energy you expend every day will need to exceed the amount of energy—the calories—you consume.

Keep in mind that a calorie isn't a molecule or nutrient, but rather a unit of measurement for a compound's energy content. So when we say fat has nine calories per gram, we're referring to how much energy can be produced from a gram of fat. The macronutrient composition of the diet, however, can change the "calories out" component of the equation and lead to more weight loss. Just know that the increased weight loss is not due to some mystical inherent property of

the food. Rather, it's that particular food's macronutrient composition. Protein is a good example, because it has a higher thermic effect of food (aka TEF, which we will discuss below) than carbohydrate or fat. That's why diets higher in protein tend to produce better fat loss.[1] However, we want to emphasize that there is *no* energy-containing compound that is somehow energy negative. That is, eating said food actually causes you to burn (expend) more calories than the food itself contains. Many people refer to things like vegetables—and in some cases even proteins—as "free" foods because they yield greater caloric expenditure than other foods. While it's true that these foods cause a greater "calories out" response, it does *not* make them free. it just means that they increase caloric expenditure modestly. To put it in even simpler terms, they *still* have calories even though their net calorie effect might be a bit lower.

The comparable example is eating 5000 calories per day of mostly fiber and protein because they cause a greater TEF. Sure, you burned more total calories due to TEF, but you still created a caloric surplus and made it impossible to lose weight. If you have to consume 2200 calories per day to lose fat, then it makes total sense to consume foods high in protein and fiber—you're targeting that calorie intake anyway, so why not consume foods that give you a better TEF? But there are *no* free foods, period. This is a fallacy perpetuated by charlatans attempting to sell you a magic solution to all your problems.

Now that we've talked about the concept of energy balance and calories in versus calories out, we can discuss how to determine the appropriate energy intake for your metabolism. It's not as straightforward as you might think. Before we can figure out how many calories you need to eat to create a caloric deficit, we first need to determine something called your "maintenance calories."

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1 Moderate carbohydrate, moderate protein weight loss diet reduces .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18990242

Determining Your Maintenance Calories

Keeping in mind that we need to create a caloric deficit, or eat lower than our maintenance calories, to lose weight, we need to determine approximately what your maintenance calorie intake is. To find that, we need to consider what components make up your total daily energy expenditure (TDEE).

If you recall from our previous chapter:

TDEE = BMR + NEAT + Exercise + TEF

Simple, right? In order to figure out all of this, you have to calculate it, and there are several calculators out there to help you do just that. However, keep in mind that these are simply estimates. Most of them will get you in the same basic range, but they may not be 100% accurate. We tend to prefer the Müller equation since it was done mostly on a homogenous, modern population, and it uses lean body mass and body fat as its primary inputs. Any of them can work, but they will only work well for about 60% of people. The 40% who lie outside the mean, and especially the 5% of outliers, will either fall well below or well above these calorie estimates. We'll need to make some accommodations for them, and we'll discuss that later.

Some of these equations require you to determine your lean body mass and/or your fat mass. This can be accomplished if you measure your body fat percentage.

Fat Mass (FM) = Body weight × body fat percentage

Lean Body Mass (LBM) = Body weight - Fat Mass

Why Measure Body Fat?

There are a few reasons to measure body fat. The first is for our initial calculations. Many equations that determine your maintenance calorie level separate lean body mass (LBM) and fat mass (FM). LBM encompasses all non fat tissues (muscle, organs, bone, etc) while FM is just what it sounds like—all the fat tissue in your body. Why is it important to separate these two? LBM is much more metabolically active tissue than FM, and it contributes significantly more to TDEE than FM. Someone who is 100 kilograms at 30% body fat has a lot less LBM than someone who is 100 kilograms at 15% body fat—and the former is likely to have a lower BMR because of it. That's not to say that FM is metabolically inert, because it's not, but it doesn't contribute nearly as much to TDEE as LBM. With regards to LBM, we also want to emphasize that LBM isn't solely your muscle mass, which is what many people believe. Muscle mass is indeed a part of your LBM, but it also includes the weight of your organs, hair, fluids, bones, connective tissues, and anything else you can think of that isn't composed of fat. LBM is literally the weight of *all* your tissues that aren't fat. So, later, when we go over the potential losses in LBM, don't freak out and assume it's all muscle. It definitely isn't. Moreover, don't sweat the fact that this number will fluctuate like your scale weight will. It's all a part of the process.

It's important to find your LBM and FM instead of just using the scale to assess progress, because the scale doesn't tell the whole story. We've had clients who started lifting weights at the same time that they started working toward losing lose body fat. These clients hardly lost any weight at all for several months, but they lost significant body fat. For the majority of people, losing weight will go hand-in-hand with losing body fat, but for some people, it won't. That's why we suggest assessing your body fat in addition to your body weight. More data always allows you to make better, more accurate decisions.

For measuring body fat, there are a many ways to do so including:

1. Skin calipers, which measure the folds of the skin
2. BIA, which is a handheld device that sends an imperceptible electric current through your body to measure body fat (some body weight scales can do this now, as well))
3. DXA scans, which use low energy X-rays to determine body fat
4. Underwater weighing; since muscle is more dense than fat (muscle sinks, fat floats), they can use this to approximate the percentage of body fat
5. Bod Pod, which is an air displacement plethysmograph that uses whole-body densitometry to determine body fat
6. The old-school Navy body fat measurement, which is based off your age and sex, as well as your waist, hip, and neck measurement

What Method Should I Use?

Some of these methods are more accurate than others, but *none* of them are perfect. All of them use assumptions, imperfect estimations, and data calculations. They're also all subject to manipulation. The method you choose is less important than being *consistent* with it and *always using that method in the exact same way, every time*. We personally use calipers for our body fat, mainly because it's easy for us, and it's something we can reliably do on a consistent basis. But just because we use calipers doesn't mean you have to. The most important thing is make that measurement consistent. For example, if you choose to use the handheld Omron, you want to do it as soon as you wake up after you go to the bathroom, just like when you take your scale weight. To understand why it's important to measure the same way every time, let's do an experiment. If you have an Omron, use it measure your body fat. Then go drink a huge glass of water and/or eat something. Go back to the Omron and take your body fat again. **You will get a different result.** Lean body mass (LBM) is comprised of *all* non-

fat tissues. So if you drink a gallon of water and take a body fat test again, you will register as having eight more pounds of lean body mass (since a gallon of water weighs eight pounds). I've had clients get upset that they took a DXA and it registered that they've lost one pound of lean body mass over the course of a month. The reality is that they took this measurement at a different time of day, after eating different foods, after drinking a different amount of water, under different circumstances. This is why we hammer home consistency. If you can get a DXA scan every week but can't do it under the same conditions, then the DXA might not be for you.

Why do we recommend calipers? Mainly because it's convenient enough to be done at home (for most people) but still accurate enough to give decent data. If you're really overweight or obese, it may not be practical and might have a huge error margin. In that case, something like BIA might be more suitable. Are all of these measurements accurate? To an extent, they are. But none of them will be 100% accurate. The consistent inaccuracies of a particular measurement are important for noting *your* trends. That's the key word. *Your* trends. For example, if your caliper measurements predict a body fat of 15% but you're really 18%, then they aren't that accurate. If you drop from 15% to 10% using the same measurements, however, then you can be confident that the *relative* drop in body fat was accurate. Keep in mind that even week-to-week body fat measurements can fluctuate, but it's the overall trend over the course of several weeks that is most important.

How Often Should I Take Measurements?

As you keep going through your diet, you're going to notice that your body weight fluctuates *a lot*. It's completely normal for it to fluctuate at least 1% from day to day, and some people will fluctuate up to 2%. If you're a woman, your menstrual cycle can yield different weights. The amount of salt you ate in

comparison to the amount of water you drank can affect the next day's weigh in. Even the amount of sleep you get can yield a different result. or that reason, we advocate weighing in daily and taking the average for the week when tracking your progress. It gives you a reference to the bigger picture of how your body is changing. If you only weigh in once per week, you might catch yourself at a very low "valley" day, and the next week you might be at a "peak" when you weigh in—which will make it seem like the diet isn't working. In reality, your average weight might have come down for the week, but you won't know that because you only weighed in one day. Let's give you an example of a week of weights for someone who only measures once per week (the week measurement in bold) versus their actual body weights each day of that week.

Week 1: 80.2, 79.5, 80.0, 81.4, 80.6, 80.2, **79.2** = Average of 80.2 kilograms

Week 2: 79.1, 78.8, 78.5, 78.1, 78.5, 78.7, **80.0** = Average of 78.8 kilograms

If they only weighed in on the day in bold, then they would believe they *gained* 0.8 kilogram in week. But did they really? Of course not. In fact, their average was down by 1.4 kilograms. This is why it's so important to use an average, because it shows you what's *really* happening instead of just short-term fluctuations. The only caveat is if weighing in each day messes with your head too much. If it's causing you to have anxiety every day, then it's not worth it. But it is useful data, so try to detach yourself from it and simply view it as data rather than a reflection of "good" or "bad."

Every now and then, people will ask us if they have to measure body fat percentage every day and take the average of that. You certainly can. If you use an Omron, the process will be easy. However, if you use a DXA scan, or calipers, or something of that sort, you might find it a bit of a pain to do every single day, which is why we always recommend once a week. Personally, we use a three-fold caliper test, and we do each one in triplicate to ensure accuracy. Then we

take the average of those three measurements and use that as the weekly body fat percentage.

To summarize, let's look at the takeaways:

- Be consistent with your measurements
- On that note, pick one type of measurement that you can easily do and stick with it
- Be aware that your scale weight and your LBM will fluctuate
- Remember that 100% accuracy in the measurements is impossible, but spotting your trends is guaranteed if you measure consistently

Once you've measured your weight and hopefully your body fat, we can dive into the actual caloric calculations.

Revised Harris — Benedict (Roza)

This particular equation is a revised version of a calorie formula called the Harris-Benedict equation, and it's been a common equation since the early 20th century. In 1984, a study came out evaluating the original Harris-Benedict equation, and that evaluation yielded the revised formula we have here. For this equation, there is a biological sex distinction, and the revised version also relies on your height and age, as well. Why is this important? Because this equation was found to be a bit more accurate for obese populations than other equations.

So, for men, the revised equation is:

88.362 + (13.397 × body weight) + (4.799 × height) - (5.677 × age) = BMR

If we plug in an example of a man who weighs 100 kilograms, we get:
88.362 + (13.397 × 100) + (4.799 × 182) - (5.677 × 25) = 2159.555 (Round to 2160)

And the revised equation for women:
447.593 + (9.247 × body weight) + (3.098 × height) - (4.330 × age) = BMR

Which yields the following result for a 60-kilogram woman:
447.593 + (9.247 × 60) + (3.098 × 152.4) - (4.330 × 25) = 1366.29 (Round to 1366)

Finally, we have one more equation to go over.

Müller Equation

For our second calculation, we come to the Müller equation. Müller et al. noted the flaws of the World Health Organization's calorimetry, and they came up with their own calculations based on a homogenous modern population.

In this one, we have a few more variables to take into account. We have age and LBM again, but we also have to account for fat mass (FM), and biological sex, which is represented by a 0 if you're a woman, or a 1 if you're a man. This equation is our preferred one because it accounts for most of the variables that have the biggest impact on metabolic rate (LBM, FM, Sex, and Age).

So all that yields the following equation:
(13.587 × LBM) + (9.613 × FM) + (198 × Sex) – (3.351 × Age) + 674 = BMR

For our hypothetical man from the above example, let's say he also has 15% body fat. We would plug in the numbers as follows:

The man:
(13.587 × 85) + (9.613 × 15) + (198 x 1) - (3.351 × 25) + 674 = 2087.315 (Round to 2087)

And for the woman, who has 9% body fat:
(13.587 × 51) + (9.613 × 9) + (198 × 0) - (3.351 × 25) + 674 = 1369.679 (Round to 1370)

We want to point out a few things for you. First, these aren't the only caloric equations out there. In fact, there are a lot, and we've gone over more of them in our other work—but we wanted to include two common ones to keep it simple. Second, we realize that you may not be able to (or even *want* to) measure your body fat. These two, or even any of the other extant equations, will likely get you in the ballpark for your BMR, but keep in mind that they're not perfect. All of them are the results of regressions based on data averages. That means these equations will probably work quite well for about 60% of people, they will work okay for 20-30% of people, and they won't work well for about 10-20% of people.

That's why it's important to understand that these equations are only estimates. Paying attention to how you respond to manipulations in your daily calories over a long period of time is always going to be the most accurate way of assessing your maintenance calories. In fact, our preference for determining maintenance calories is to simply track what you consume every day for a long period of time and note how your body weight responds over that time period, as we'll discuss later.

Of the equations, our personal favorite is the Müller equation, since it uses lean body mass as an input—and lean body mass is the major contributor to metabolic rate. That doesn't mean the others are garbage. We recommend trying out each and seeing which feels the most accurate for you. Above all else, you need to be consistent with it.

Activity Factor

At long last, you've established your BMR. Now it's time to figure out your maintenance calories, or as we've noted, your total daily energy expenditure (TDEE). To do that, you take your BMR and add in the calories you burn when you exercise or play sports. This figure is always going to be higher than your BMR, and is based on a range starting at 1.2 all the way up to 1.9.

If you have a desk job, don't do anything on the weekends, and come home from work to sit around and watch TV, then you're going to be closer to the 1.2 range. If you time-travelled back to Soviet Russia and joined their weightlifting team (where it was your job to lift and nothing else), then you would be closer to a 1.9.

Here's a decent guide to your activity factor:

1.2 - Sedentary:

You work a desk job and don't exercise

1.375 - Light Activity:

You work a desk job but do a bit of regular exercise. Or you don't exercise but you work at a job that's pretty active (a nurse, teacher, etc.) where you're on your for feet most of the day.

1.55 - Moderate Activity:

Most of you will probably fall into this category. Maybe you work a sedentary job, but you train like a madman. Or maybe you train moderately, but you also have a job where you stand on your feet all the time. Someone who doesn't train but works a hard labor job would also fall into this category.

1.725 - Very Active:

You train hard most days of the week, and you also work a job where you're on your feet quite a bit. Overall, you're active most of the day.

1.9 - Extra Active:

You train hard and work a job that is physically intense in nature. As an example, you're a roofer who also goes to the gym five days a week.

Once you select the appropriate activity factor, multiply it by the BMR that you established above, and you'll have your estimated maintenance calories. For our 60 kilogram woman who used the Müller equation, her maintenance calories would look like this:

$$1370 \times 1.55 = 2123.5 \text{ (you can round that figure up to 2124)}$$

We can't emphasize this enough: *all* of these are estimates with varying degrees of precision. Some of these equations reflect the time periods in which they originated, like the old Harris-Benedict equation. Newer ones, like the revised Harris-Benedict and Müller calculator, are more modern, and are generally considered more accurate. Whichever calculator you use, be prepared to make adjustments, and stick with it. Often, people think of these equations as the word of God,and that if they calculate them out perfectly, they'll get the exact number they need to consume to lose the exact amount of weight that they want. Some people might even say, "I ate 500 calories below my maintenance and didn't lose weight!" Let us be *perfectly clear* on this: if you ate 500 calories below your *estimated* maintenance and didn't lose weight, then by *definition*, that calorie level was *not* your maintenance. Period. Maintenance calories are the amount of calories you consume to maintain your weight. So if you eat at a deficit below your calculated "maintenance" and you don't lose weight (in the long term, regardless of daily fluctuations) then *by definition* you were not in a deficit, and what you calculated as your maintenance was not correct for you as an individual.

The Best Method: Trial and Error

Ideally, you would spend several weeks at your maintenance calories to see if you actually do maintain. If your goal is to lose fat, then you want to tighten up that margin of variance every time you weigh in. Something like ± 1.0% body weight should be a good start to account for normal weight fluctuations due to water retention, food volume, or hormonal cycles. We recommend weighing in the morning upon waking after using the bathroom every single day, and then taking the average of those weights for the week.

Based on how much you gain or lose on a certain calorie amount, you can get a pretty good idea of what your maintenance is. For example, if you were consuming 2400 calories per day for four weeks and you lost 1 kilogram of fat in

that time period, you can use that data to calculate your approximate maintenance calories. It's not a perfect method, but it will get you close.

Determining Changes in Body Fat vs. Lean Body Mass

Now, you might think that since the example above lost pure body fat, that means they lost 100% lipid—but body fat is not 100% lipid. It's around 87% lipid. So if we take 1000 grams per kilogram (1000 g = 1 kg) × 0.87, we get 870 grams of actual lipid/fat lost. We know that 1 gram of fat/lipid equals 9 calories. So 870 × 9 = 7830 calories per kilogram of body fat lost. If that was lost over 28 days, you would divide 7830 by 28 to get 280 calorie per day. Add that back to 2400, and 2680 is approximately the caloric intake required to maintain that individual's body weight.

For the sake of completion, let's say you were gaining weight by eating 3600 calories per day, and you put on 2.5 kilograms with one-fourth of it being lean body mass (LBM) and three-fourths being body fat. Unless you've just started lifting weight and are experiencing "newbie gains," (period of time in which you first start lifting and gain LBM very quickly), then it was most likely mostly fat. To break it down even further:

2.5 kg × 0.25 = 0.625 kg lean body mass and 2.5 kg × 0.75 = 1.875 kg body fat. But lean mass is not 100% protein. In fact, it's mostly fluid. Almost 70% of lean body mass is fluid, and the other 30% (approximately) is lean tissue, most of which is made of proteins.

So, if we take 0.625 kg LBM × 0.3 = 0.1875 kg of protein. 0.1875 kg × 1000 g/kg = 187.5 g of protein × 4 calorie/gram of protein = 750 calorie from LBM. Circling back to calories from body fat, 1.875 kg body fat × 0.87 = 1.63125 kg of fat/lipid. 1.875 kg × 1000 g/1 kg of fat = 1631.25 g fat × 9 calorie/g of fat = 14681 calories from body fat.

Total approximate calories in the mass you gained = (calories from body fat + calories from LBM)

Total calorie surplus = 14681 + 750 = 15431. Divide 15431 ÷ 28 days = 551 calorie/day surplus.

Take the calorie intake minus the daily surplus to determine the approximate maintenance calories.

3600 - 551 = 3049 is the approximate maintenance calorie level.

Obviously, this method is more involved than using an equation and simply plugging in the numbers. It requires you to track your weight, body fat, lean body mass, and caloric intake, but it will be by far the most accurate way of assessing your maintenance calories. Alternatively, if you wanted to track but not go to this length, you could just assume that there are approximately 7000 calories in each kilogram of mass or 3500 calories in each pound of mass, and then make your calculations based on that.

At the end of the day, whether you use one of the equations from above, track and calculate in super fine detail yourself, or use a rough estimate, it's all just a starting point. Wherever you start, you'll likely have to make adjustments at some point. If you get your calories closer to the proper starting point, you may not have to adjust as early on, but you will still have to adjust at some point. While it's an important step, errors here are by no means fatal. Just focus on being consistent with whatever method you choose.

How Fast Should I Lose Fat?

This is a hotly debated topic in fat loss research. Many experts recommend very low calorie diets (VLCD) at or under 1200 kcal per day, especially for obese peo-

ple. The reasoning being that this will induce more rapid weight loss, which can increase motivation and improve adherence for some people. We have no doubt that this is the case, but we feel this line of thinking is a bit short-sighted. As we have discussed previously, weight regain after diets is a huge problem, and if you can't sustain what you're doing, it's unlikely you'll have success with long-term weight loss maintenance. So, what are you going to do, maintain <1200 kcal per day indefinitely? Doesn't sound like much fun. Moreover, as we discussed previously, dieting triggers metabolic adaptation to reduce your metabolic rate. If you are eating *really* low calories, it's going to cause a much greater metabolic adaptation. What happens if your metabolism adapts to 1200 kcals, and you stop losing weight on that? Are you going to eat 900 kcals? We don't think that's a good idea. Physical health aside, can you imagine how awful it would be going to family dinners, dates, weddings, or a ball game on 900 calories per day? Further, losing weight faster will increase the risk of losing LBM. Losses in LBM will increase the likelihood of weight regain and lower long-term metabolic rate. Thus, we recommend an approach that focuses on sustainability and sparing maximum LBM.

We recommend losing no more than 1% of total body weight per week. That might not sound like much, but it's an aggressive rate of loss. In fact, in Bannock et al.'s natural bodybuilding contest prep case study, they saw significant reductions in lean body mass (42.8% of weight lost from lean body mass) even at 1% of body weight lost per week. In general, we think the slower you can go, the better off you will be. This does have its realistic limits, because trying to lose weight too slowly will be demotivating and increase diet "mental fatigue." In general, we recommend losing an average of 0.4-0.8% of body weight per week.

Let's look back at our example of a man who weighs 100 kilograms. Let's decide that we're going to target a conservative weight loss goal of 0.6% body weight per week. That puts us at 0.6 kilograms body weight loss per week. If he was 20% body fat, that means he has 80 kilograms of LBM and 20 kilograms of body fat.

If he wanted to diet to 10% body fat, he'd need to lose approximately 10 kilograms of FM. This should be simple. right? 10k gram FM loss ÷ 0.6 kilograms per week = 16.7 weeks of dieting—or round up to 17 weeks of dieting. Unfortunately, it's not that simple. It would be nice to assume that all the weight we lose is from FM, but that's usually not the case. When most people diet, they lose FM and LBM. Most studies show 60-70% of the weight loss is FM, and 30-40% of the weight is LBM.[2] Increasing protein intake and exercising can shift that positively towards LBM retention and more FM lost (closer to 80-85% body fat lost and 15-20% LBM lost).[3] Adding resistance training to a high-protein diet can further improve the ratio of FM to LBM lost.[4] Interestingly, adding resistance training to a normal protein diet produces almost the same effect as increasing protein intake but not utilizing resistance training in untrained type II diabetics, but by far the best results were seen in those who dieted using a high protein diet *and* resistance training (over 80% of body weight lost was FM).[5] Why is this important? Well, for one, it's another reason why high protein diets and resistance training are awesome, and two, it means that our calculations need to account for the fact that not all the weight we lose will be from FM.

How does this affect our equations? Let's examine our guy who wishes to lose 10 kilograms of FM and 0.6% of body weight per week. If he uses a high-protein diet and resistance training, it's probably within reason to assume he might lose about 80% of his weight from FM and 20% from LBM (See Table 1 below). If his goal is to lose 10 kilograms of absolute FM, what does that equate to in terms of

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2 (n.d.). Dietary protein and exercise have additive effects on body ... - NCBI. Retrieved August 28, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16046715

3 (n.d.). Dietary protein and exercise have additive effects on body ... - NCBI. Retrieved August 28, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16046715

4 (n.d.). A high-protein diet with resistance exercise training improves weight .... Retrieved August 28, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20150293

5 (n.d.). A high-protein diet with resistance exercise training improves weight .... Retrieved August 28, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20150293

total bodyweight? If 80% of the weight loss is FM, we can take 10 kg ÷ 0.8 = 12.5 kg of total body weight to lose. If his goal is to lose 0.6 kilograms of body weight per week, that means he will need approximately 21 weeks of dieting to achieve his goal (12.5 kg ÷ 0.6 kg/week = 20.8 weeks). Easy, right? Well, kind of. It's difficult to predict and account for how much LBM will be lost versus FM when setting up a diet. Studies have shown a variance from over 50% of body weight loss being LBM to some studies demonstrating an increase in LBM during dieting with resistance training.[6] [7] Further, the more fat someone has, the greater the percentage of FM they tend to lose relative to LBM, whereas people who are already lean tend to lose more LBM as a percentage of their overall body weight loss.8 So, what should we use to estimate so that we can make accurate calculations? There is no clear-cut study, so we're going to give you what we think is a reasonable breakdown.

Population	NP + No RT (FM/LBM)	HP + No RT (FM/LBM)	NP + RT (FM/LBM)	HP + RT (FM/LBM)
Obese (>27% BF male, > 40% BF female)	80/20	90/10	90/10	>90/<10
Overweight (>22% BF male; >35% BF female)	70/30	80/20	80/20	90/10
Normal (11-22% BF male; 23-35% BF female)	60/40	70/30	70/30	80/20
Lean (<11% BF male; <23% BF female)	<50/>50	60/40	60/40	70/30

Table 1. Approximate amount of FM versus LBM lost based on different subjects and dietary/exercise conditions. Definitions of obese, overweight, normal, and lean adapted from Mayo Clinic guidelines.9 BF = body fat; NP = normal protein diet (<1.6g/kg); HP = high protein diet (>1.6g/kg); RT = resistance training (at least 2 hours per week total).

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6 (2015, May 1). A nutrition and conditioning intervention for natural bodybuilding .... Retrieved August 28, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4422265/

7 (2013, November 25). The Effects of Exercise Training in Addition to Energy Restriction on .... Retrieved August 28, 2018, from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0081692

8 (2007, September 11). What is the Required Energy Deficit per unit Weight Loss? - NCBI - NIH. Retrieved August 28, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2376744/

We don't want you to get too carried away with this table. This is a very generalized breakdown of what we believe the data would look like, but everyone is different. Please realize this is just a guide to help you, not the word of God.

For another example, let's use a woman who is 90 kilograms and 36% body fat, and she would like to be 20% body fat. She currently has 57.6 kilograms of LBM and 32.4 kilograms of FM. She needs to lose 14.4 kilograms of FM (16 ÷ 36 = 0.444 × 32.4 kg = 14.4kg) to be about 20% body fat. She plans to resistance train and use a high protein diet, so we'll assume that she's going to lose 90% of her weight from FM and 10% from LBM. This means she'll need to lose a total of approximately 10 kilograms (14.4 kg ÷ 0.9 = 16 kg) to achieve her goal. If she chose to be very aggressive and target a drop of 1% of her body weight per week, that would equate to 0.9 kilogram per week loss. At this rate, she would reach her goal with approximately 18 weeks of dieting (16 kg ÷ 0.9 kg/week = 17.8 weeks).

So, to summarize, determining approximately how long you need to diet to achieve your goal should look something like this:

1. **Determine fat mass and lean body mass**
   a) Fat mass = total body weight × body fat percentage
   b) Lean Body Mass = total body weight - fat mass (calculated above)

2. **Determine approximately how much body fat will need to be lost**
   a) Body fat percentage loss required = Current body fat percentage - target body fat percentage

3. **Determine fat mass loss required**
   a) Fat mass loss required = total body weight × body fat percentage loss required

4 **Determine approximate total body weight loss required**

   b) Total body weight loss = fat mass loss required ÷ approx percentage of weight lost from FM

5 **Choose rate of loss (we recommend 0.4-0.8% per week with a 1% maximum)**

6 **Determine weight loss per week**

   a) Weight loss per week = Total body weight × rate of loss percentage from Step 5

7 **Determine required deficit duration**

   a) Deficit duration = Total body weight loss (Step 3) ÷ Weight loss per week (Step 6)

Make Room for Life

These equations and steps are great starting points for determining how long you should diet, but they shouldn't be viewed as the holy grail. Even our best laid plans are subject to the chaos of life. Life *will* happen to you during a diet. You might have bad days at work or even lose your job, you might get divorced, you might lose a loved one, you might have a new baby, or any number of stressful life events. Trust us, life doesn't really give a damn about your diet. This is all the *more* reason to use a sustainable approach. When life is good, it's easy to focus on the little things to improve ourselves. It's when life takes a nosedive into the shitter that our will-power for things like diet goes into the tank. Our friend Dr. Kori Propst said it best: "Self control is fatiguing." Knowing this, why would you not pick an approach to dieting that requires the minimum self-control to be adherent? This will increase your likelihood of being able to remain adherent even when things are stressful, which in turn increases your long-term odds of success. It's not for us to decide

what will work best for you; that's why we're providing you the information and strategies to help put you in the best position for long-term success.

During my [Layne] last long diet, I was prepping for my first series of pro bodybuilding shows and finishing my PhD, while *also* running my full-time coaching business and moving over 1000 miles from Illinois to Florida. I knew these stressors going in, so I gave myself 24 weeks to get ready for my first show. Looking back, it went pretty smoothly, all things considered. But life does happen.

In 2006, I was prepping for pro qualifiers (I would go on to win my pro card that year), but two weeks before my first show, my grandmother passed away. Her funeral was one week out from my show, and it required a four-hour drive to get there. So I cooked up a bunch of food, packed it into a big cooler, and drove down to say my goodbyes. I'm not telling you these stories to make myself appear more dedicated than anyone else; I want you to understand that there is a high probability of something stressful happening to you, completely unrelated to the diet itself.

Over the years, we've seen clients who lost jobs, went through divorces, lost pets, were victims of violent crimes, lost friends, family, and loved ones, and other assorted tragedies. While you may never experience a very stressful event during a diet, it can't hurt to hope for the best and prepare for the worst. That's why we always emphasize giving yourself more time if you're in doubt. You can always hold steady if you hit your goal early, or even start adding more calories in, but it's way more difficult to play catch-up if you get behind.

Determining Your Caloric Deficit

Your caloric deficit refers to the amount of calories you consume *below* your maintenance calories. Before we get down into the nitty-gritty of determining your macronutrient intake, we first need to determine your daily deficit calorie

level so that we can determine your average daily calorie target. Your average daily calorie target = maintenance calories - average daily deficit calories (we say "average" because we will also discuss things like high-calorie days and diet breaks in a later chapter, where this term will make more sense). This will be based on the percentage of the total body weight that you wish to lose per week. As we stated previously, our preference is to target 0.4-0.8% per week, with an absolute maximum being 1% per week. Let's say our 100-kilogram guy from earlier is targeting 0.6% of weight loss per week (100 kg × 0.006 = 0.6 kg or 600 g per week). We can use this information to determine what his starting deficit will need to be. Based on our scientific data from the studies examining diet, we estimate he'll lose about 80% of his weight from FM and 20% from LBM. On a per-week basis that equates to approximately 480 grams of FM (600g × 0.8 = 480g) and 120 grams of LBM (600g × 0.20 = 120g). Based on our previous discussion, we can determine how many calories equate to the weight of each tissue type (FM vs. LBM).

First, we can calculate how many calories would come from the FM lost.

Calories from fat loss would equal 480 g body fat × 0.87% lipid in body fat = 417.6 g (round to 418 g) of fat. 18 g of fat × 9 calories/g of fat = 3762 calories from FM

Then to determine how many calories would come from LBM:

120 g LBM × 0.3 = 36 g of protein. 36 g protein × 4 calorie/g protein = 144 calorie from LBM.

Therefore, the approximate total amount of caloric deficit required to lose 0.6 kilograms per week for him is: 3762 + 144 = 3906 calories.

If we divide that by 7, we get our daily caloric deficit: 3906 ÷ 7 = 558 (rounded) calorie-per-day deficit.

Now, if we wanted to run the same calculation on our 90-kilogram woman with 9 kilograms of body fat to lose targeting 1% body weight loss per week, it would look like this:

Total body weight loss target per week = 1% of 90 kg = 0.9 kg × 1000 g/kg = 900 g

900 g weight loss per week × 0.9 (see Table 1) = 810 g FM loss per week.

900 g weight loss per week × 0.1 (see Table 1) = 90 g LBM loss per week.

Now we can calculate how many calories would come from the body fat lost. Calories from fat loss would equal 810 g FM × 0.87% lipid in body fat = 704.7 g of FM (round up to 705 g FM). 705 g fat × 9 calories/g fat = 6345 calories from FM

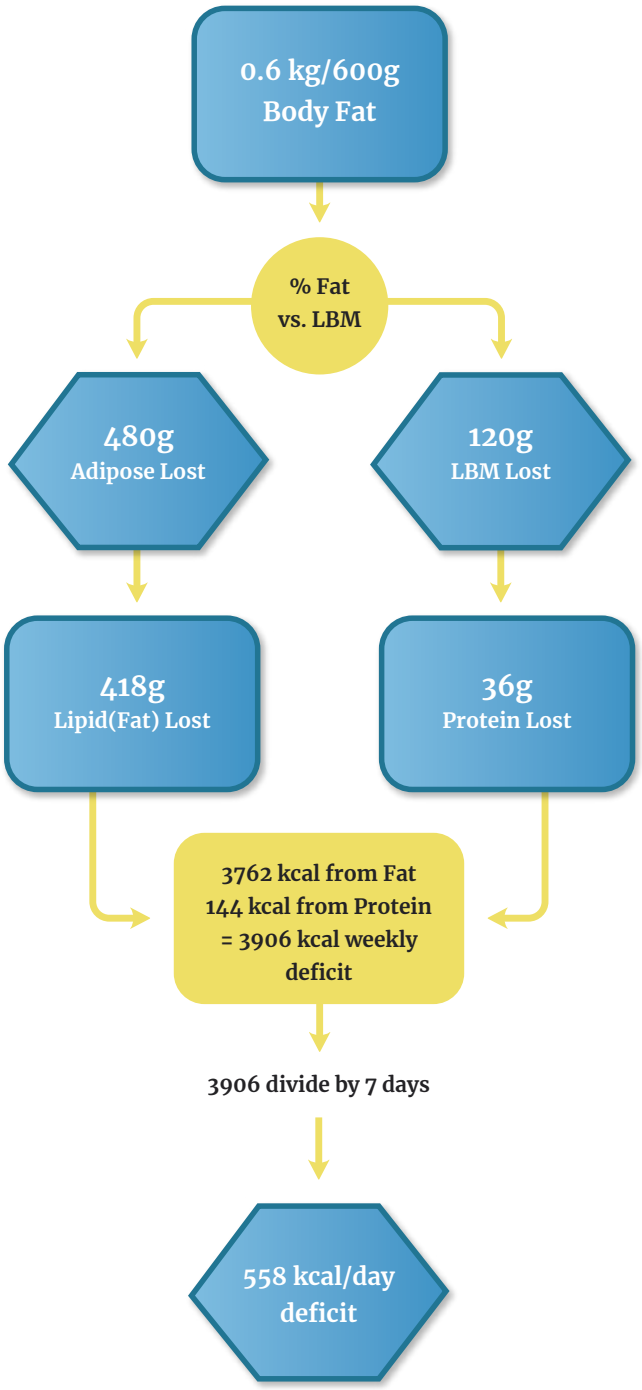

Figure 1. Flow chart of body weight lost coming from FM versus LBM in a normal-weight male utilizing a high protein diet and resistance training.

Then, to determine how many calories would come from LBM.
90 g LBM × 0.3 = 27 g of protein. 27 g protein × 4 calorie/g protein = 108 calories from LBM.

Therefore the approximate total amount of caloric deficit required to lose 0.36 kilograms per week is = 6345 + 108 = 6453 calories.

If we divide that by 7, we get our daily caloric deficit: 6453 ÷ 7 = 922 (rounded) calorie daily average deficit required

To simplify and save time for those of you who hate math, we've created a table below that provides you with a multiplication factor to determine the approximate daily caloric deficit you'll require based on the amount of weight you wish to lose per week. The chart is in kilograms and based on your body fat level, nutrition strategy, and training regiment listed in Table 1.

Population	NP + No RT (FM/LBM)	HP + No RT (FM/LBM)	NP + RT (FM/LBM)	HP + RT (FM/LBM)
Obese (>27% BF male, > 38% BF female)	930 kcal/kg	1024 kcal/kg	1024 kcal/kg	1024-1120 kcal/kg
Overweight (>20% BF male; >33% BF female)	834 kcal/kg	930 kcal/kg	930 kcal/kg	1024 kcal/kg
Normal (10-19% BF male; 21-33% BF female)	740 kcal/kg	834 kcal/kg	834 kcal/kg	930 kcal/kg
Lean (<10% BF male; <21% BF female)	<645 kcal/kg	740 kcal/kg	740 kcal/kg	834 kcal/kg

Table 2. Multiplication factors to determine daily caloric deficit required based on the amount of weight you'd like to lose per week broken down by different populations, exercise, and nutrition strategy. BF = body fat; NP = normal protein diet (<1.6g/kg); HP = high protein diet (>1.6g/kg); RT = resistance training (at least 2 hours per week total).

This table might be confusing, so let's break it down a bit. To get your calorie deficit target, you take the amount of weight you want to lose per week (in kilograms) and multiply that by the number in the column you fit into. So let's use our examples from earlier. Our 100-kilogram male who wants to lose 0.6% of his body weight per week would be targeting 0.6 kilogram of weight loss per week (100 kg × 0.006 = 0.6 kg). Now, let's take his weekly weight loss target and multiply it by the factor in his table (he has normal body fat, resistance trains, and eats a high protein diet): 0.6 kg × 930 kcal/kg = 558 kcal. So an approximate 558-calorie deficit is required per day to lose about 0.6 kilograms per week. Just like we figured out before, only a whole lot simpler. If we use our female who wants to lose 0.9 kilograms per week (90 kg × 0.01 = 0.9 kg), and we multiply that by her factor (she is overweight, resistance trains, and eats a high protein diet): 0.9 kg × 1024 kcal/kg = 921.6 kcal deficit. We round that up to a calorie deficit of approximately 922 calories per day.

We want to emphasize *again* that metabolism is not as clean cut as this math makes it out to be. We're just taking our best estimates. If we put a kilogram of body fat into a bomb calorimeter, it would likely give a different reading than 5612 calories. Likewise, if we put a kilogram of lean body mass into a bomb calorimeter, it would probably give us a different reading than 340 calories. These are just estimates to get us close; they aren't meant to be taken as 100% gospel.

Further, this assumes we're dealing with a perfectly conserved, closed system, but the human metabolism is quite messy, frankly. In fact, if you reduce your calorie intake by 40 calories per day below your maintenance, theoretically you would lose 2.46 kilograms in a year. We promise you that if you reduce your calorie intake by 40 calories per day, absolutely nothing will happen. If you do lose any weight, it will be completely short term and more likely the result of a short-term fluctuation that will simply re-fluctuate upward in time. You certainly would not lose 2.46 kilograms. So, the purpose of these equations is not to exactly predict how much weight you're going to lose down to the gram. The

purpose of these equations is simply to provide us reasonable estimates so that we can make our best guess on our starting calories and macronutrient intake. This is also why we also don't recommend starting out *too* conservatively.

As a coach [Layne], I've seen people start out diets in what was calculated to be a 100-200 kcal deficit, and usually they don't lose weight. I'll go out on a limb here and give you my hypothesis for this response: there are thresholds in metabolism. I don't believe that your maintenance calorie level is a defined "point" but rather a range of calories. I believe that there is a low-end calorie range and a high-end range where you can maintain your weight. In my experience, it's usually around a 100-300 calorie range depending on the person. For example, I know that at 97 kilograms and 10% body fat, I will maintain my weight at anywhere from 3470 to 3700 calories. If I had been eating 3700 calories (the high end of my "maintenance range") and then tried to lose weight slowly at a 200-calorie "deficit" (3500 calories), I would lose no weight because I would still be within my maintenance range. This is why we recommend a minimum of at least 0.4% target body weight loss per week. This should ensure that you have enough of a calorie deficit to break through the threshold of your maintenance calorie range and lose weight. For me, this would equate to 0.39 kilograms per week at the body weight example I gave, which would also equate to approximately a 324-calorie deficit. This deficit would put me at around 3376 calories per day (assuming I was maintaining on 3700 previously), and that puts me outside of my maintenance range threshold so weight loss can occur.

Now, I want to be clear, there is no scientific data I know of to support this hypothesis. It's simply my observation. If I had to explain it, I would say that NEAT is likely contributing to this range, and that changes within the maintenance range are regulated by increased NEAT. However, it could also be adaptive thermogenesis and the body increasing or decreasing heat dissipation within that range. Either way, we want you to go at a reasonable pace, and slower and more sustainable is better, in general. However, keep in mind that there is such a thing as "too slow."

We'll likely emphasize this point a lot, but it's important to know that the human body is more complex than a series of equations. If it behaves differently than you expect, don't be alarmed. Further, your starting calories and macros are just that—a starting point. There's a 99.9% chance you will need to change them at least once, and likely multiple times in order to achieve a stage-ready physique. So, try not to get too obsessed with where you start and making that number perfect. Rather, use this data to make your best educated guess and then make the necessary adjustments based on how you respond—but more on this later.

Determining Starting Daily Calorie Intake

The final step is to determine our daily caloric intake for starting the fat loss diet. In order to do that, we simply subtract the daily caloric deficit we calculated above from our maintenance calories, which we calculated earlier. In the case of our sample 100-kilogram man, let's say his maintenance was 2800 calories per day. To lose 0.6% of his body weight, his starting average daily calories per week would be 2800 - 558 = 2242 calories/day.

For our 60-kilogram woman, let's say her maintenance was determined to be approximately 2350 calories per day. Her starting average daily calories to lose 1% of her body weight per week would be 2350 - 922 = 1428 calories per day. To summarize our calculations for determining average daily starting calories:

1. **Determine rate of weekly loss: preferably 0.4-0.8% body weight per week with a maximum of 1% per week**

2. **Determine weight loss target (in kilograms) per week by multiplying total body weight by the percentage determined in Step 1.**

3 **Determine average daily calorie deficit required by multiplying weekly weight loss target by appropriate multiplication factor from Table 2.**

4 **Determine approximate maintenance calories by:**
   a) Using weight and food tracking by hand
   b) Using maintenance calorie calculators listem previously

5 **Determine average daily calories**
   a) Average daily calories equals maintenance calories subtracted by average daily deficit calories

SUMMARY

- **Always take life into account**
- **Don't be alarmed when your body acts like something other than a math equation**
- **Figure out your maintenance calories using one of the many equations**
- **Be consistent with your equations**
- **Figure out roughly how long your diet needs to be**
- **Figure out how aggressive you want to be**
- **Start**

7

THE MACRONUTRIENTS: WHAT YOU NEED TO KNOW

While reducing body fat and body weight depends solely on your energy intake, you can make the most of your dieting experience by separating your calories into three macronutrient groups. This helps keep your body composition optimized and limit the loss of LBM. Energy balance will drive overall weight loss, but *how* your energy is distributed into your macronutrient breakdown can affect how much weight loss occurs from body fat versus lean body mass. It can also affect the "calories out" part of the calories in versus calories out equation. That is, while weight loss is indeed a function of calories in (energy consumed) versus calories out (TDEE or total daily energy expenditure), what makes up each component of calories in and calories out is rather complex and can affect the balance of this equation.

Each macronutrient has a different calorie/energy value. Protein, carbohydrate, and fat are the big three macronutrients, and they each have a caloric energy value. The calorie content of your protein and carbohydrate is four calories per gram. The caloric value of one gram of fat is nine calories. There are other energy-containing nutrients like glycerol, alcohol, and fiber, and we'll briefly discuss some of these—but for the sake of not turning this into a thesis on every energy-containing compound in existence, we'll limit the discussion to things people might normally consume. Suffice it to say, not only do they provide you with energy, but each macronutrient has an important function within your body.

Protein

This is a big one, and happens to be what I [Layne] wrote my thesis on. Protein is made up of amino acids linked together, and proteins mediate countless important processes in the body. Protein isn't just something you eat; it's also involved in nearly every process in your body. Many hormones such as insulin, growth hormone, IGF-1, and countless others are proteins. Enzymes and kinases (cellular signaling complexes) are proteins. Transporters? Proteins. Ion channels? Proteins again. These different proteins found in the body get their different functions based on their 3D structure and how they fold—and how they fold is based on their amino acid sequence. You see, when a protein is made, it doesn't just stay as a linear chain of amino acids. It will fold into its lowest energy conformation. Basically, that means it will fold into its most energetically stable form, and this form will give the protein its biological activity.

Consuming sufficient dietary protein is essential in tissue turnover. Protein is an essential nutrient, because nine of the 20 amino acids in protein are considered "essential." Our body cannot produce them, so we must get them through diet.[1] Ingestion of sufficient dietary protein stimulates muscle protein synthesis (MPS), improves recovery, can increase lean body mass when combined with resistance training, and helps grow our strength.[2] [3] It makes sense that eating a sufficient amount of dietary protein would trigger these responses, since you wouldn't want to waste energy on attempting to turn over tissue if you didn't have sufficient building blocks from which to synthesize new tissue. This anabolic effect seems to be unique to protein compared to other macronutrients.

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1 (n.d.). Biochemical, Physiological, and Molecular Aspects of Human Nutrition .... Retrieved August 22, 2018, from https://evolve.elsevier.com/cs/product/9781455746293?role=student

2 "Higher compared with lower dietary protein during an energy deficit ...." 27 Jan. 2016, http://ajcn.nutrition.org/content/early/2016/01/26/ajcn.115.119339. Accessed 2 Jan. 2018.

3 "An isoenergetic high-protein, moderate-fat diet does not compromise ...." https://www.ncbi.nlm.nih.gov/pubmed/18618943. Accessed 2 Jan. 2018.

Carbohydrates and fats don't stimulate muscle protein synthesis by themselves in adults (though carbs may be anti-catabolic).[4] This anabolic effect of protein appears to be mediated by the branched chain amino acid leucine.[5] That is, the other 19 amino acids don't seem to increase muscle protein synthesis by themselves (though there is some debate surrounding isoleucine, but if it *does* increase MPS, it's a small effect compared to leucine).[6] Leucine stimulates a complex in muscle called mTOR (mammalian target of rapamycin), and this initiates a signaling cascade that increases MPS.[7]

Why leucine? We can't ever really know for sure, but from an evolutionary perspective, it makes sense to use an amino acid "sensor" of protein anabolism rather than having to detect all the amino acids to determine if a suitable anabolic environment exists to build tissue. The leucine content of protein sources is extremely indicative of dietary protein quality, so if you're getting enough leucine, the chances are good you're also getting enough of the other essential amino acids from a protein source.[8] Further, if you were evolution, and you were going to "pick" one of the 20 amino acids to act as the sensor for protein quality, you would want it to:

1. Be an essential amino acid
2. Not be extracted much by the gut and liver on first pass metabolism, and
3. You would want it to have concentration-dependant, passive diffusion

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4 (n.d.). Effect of carbohydrate intake on net muscle protein ... - NCBI - NIH. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/14594866

5 (n.d.). Leucine regulates translation initiation of protein synthesis in skeletal .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16424142

6 (n.d.). The role of leucine in the regulation of protein metabolism. - NCBI. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15930468

7 (n.d.). Leucine regulates translation initiation of protein synthesis in skeletal .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16424142

8 (2012, July 20). Leucine content of dietary proteins is a determinant of ... - NCBI. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22818257

across the cell membrane so that the amount of the amino acid that gets into the cell is reflective of the quantity consumed in the diet.

Leucine fits all of these requirements, and that's likely why leucine appears to be unique in its ability to stimulate muscle protein synthesis. Now, we know what you're thinking. "Too easy, let's just supplement leucine all day every day and get *jacked*!" If only it were that easy. Leucine supplementation has had mostly disappointing results. Supplementing with leucine increases MPS in the short term, but this doesn't appear to translate into long-term increases in muscle mass.[9] A possible explanation is that while leucine stimulates the increase in MPS, you need *all* of the amino acids present for MPS to be sustained. That said, it does appear that consuming leucine-rich protein sources may lead to more muscle mass compared to low-leucine protein sources.[10] The take-home message appears to be that supplementing with leucine doesn't seem to be a magic bullet, but eating high-quality sources of protein rich in leucine is probably a good idea.

Protein isn't just for getting jacked, however. High-protein diets have also been demonstrated to be superior to isocaloric (equal calories) low-protein diets with regards to fat loss. This is likely because the TEF of protein is about 30% more compared to carbohydrate at 5-10% or fat at 0-3%.[11] This elevated TEF is likely due to the way high-protein meals increase protein turnover and energy expenditure. Protein turnover is an energy-dependant process that requires ATP, and thus increases caloric expenditure.[12] Interestingly, high-protein diets may activate a

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9 (2017, September 19). The effectiveness of leucine on muscle protein synthesis, lean ... - NCBI. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25234223

10 (2016, November 30). Meal Distribution of Dietary Protein and Leucine Influences Long-Term .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27903833

11 Pathways to obesity. - NCBI. Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12174324

12 The Energy Costs of Protein Metabolism: Lean and Mean on Uncle .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/books/NBK224633/

"futile cycle" where synthesis and protein degradation both increase, leading to a greater dissipation of energy.[13] In my [Layne] own research, we observed this interesting phenomenon of energy dissipation with diets that increased protein turnover, albeit in rodents.[14] Further, high-protein diets cause a shift in weight loss favoring increased weight loss from fat versus. lean tissue compared to isocaloric lower protein diets.[15] This has a dual benefit. First, sparing more lean tissue means losing more body fat. Second, sparing lean body mass during a diet has been associated with decreased incidence of weight regain, as well as better maintenance of metabolic rate.[16] [17] This is an absolutely critical aspect of dieting that many people don't think about, and hopefully we've explained how important it is to consider how you'll handle the post-diet period, which is when many people begin a fast track to regaining everything they lost, and more.

Further, high-protein diets have also been shown to have a greater satiating effect than isocaloric lower-protein diets.[18] This appears to be due to a few different mechanisms. For one, higher protein food sources typically aren't very energy dense, and they can be quite voluminous. Ever try to choke down 600 calories worth of chicken breast in one go? Good luck; that's about 1 pound or one-half a kilogram of of chicken. So protein is typically very filling from a volume/mechanical perspective, but it also appears to trigger signaling favor-

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13 "Leucing weight with a futile cycle. - NCBI." https://www.ncbi.nlm.nih.gov/pubmed/17767901. Accessed 21 Aug. 2018.

14 (2016, November 30). Meal Distribution of Dietary Protein and Leucine Influences ... - NCBI. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27903833

15 (n.d.). Dietary protein and exercise have additive effects on body ... - NCBI. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16046715

16 (2014, November 8). Maintenance of energy expenditure on high-protein vs. high ... - NCBI. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25466951

17 (2018, April 5). How dieting makes some fatter: from a perspective of human body .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

18 Protein, weight management, and satiety. - NCBI. Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18469287

able for satiety in the brain. There is some evidence that the satiating effects of protein are at least in part related to the postprandial (time period after a meal) blood amino acid concentrations. This may explain why rapidly absorbed protein sources such as whey produce superior satiety compared to more slowly absorbed forms like casein—because whey causes such a large increase in blood amino acid levels.[19] Further, high-protein diets increase the release of anorexic (reduces food intake) hormones like GLP-1, glucagon, CCK, and PYY.[20] It's important to note that hunger is an extremely nebulous term, and there are countless factors influencing the drive to eat besides just physiological concentrations of hormones. Both sociological and psychological factors can also significantly alter food intake. Still, it *does* appear that protein is likely more filling calorie-per-calorie compared with carbohydrate or fat.

Carbohydrates

While carbohydrates aren't what you would call an essential macronutrient—meaning you don't need them to survive—that doesn't mean they have zero benefits. Carbohydrates come in many forms such as monosaccharides (single-sugar molecules like glucose, fructose, and galactose), disaccharides (two sugars linked together like sucrose, which is a glucose molecule linked to a fructose molecule), oligosaccharides (this is a broader category that encompasses short-chain saccharides and includes disaccharides), polysaccharides (aka complex carbohydrates like starches, which have large numbers of saccharides bonded together).

During digestion, they're broken down into their constitutive saccharides. Then they enter circulation as monosaccharides (unless we're talking about fiber,

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19 (n.d.). The macronutrients, appetite and energy intake - NCBI - NIH. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4960974/

20 (n.d.). The macronutrients, appetite and energy intake - NCBI - NIH. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4960974/

which is a different ballgame entirely). In this way, all carbs (other than fiber) wind up as sugar in the body after digestion. Glucose, in particular, is of crucial importance to survival. There is an obligate glucose usage by the body of around ~100 to 120 grams of glucose per day—but don't worry, your liver can make that much with absolutely zero carbohydrate intake through the process of gluconeogenesis (GNG).[21] Glucose is absolutely required by red blood cells, which cannot use fat or ketones for energy because they don't t contain any mitochondria (the organelle of the cell where oxidative respiration takes place and fats/ketones are oxidized). Under normal conditions, the brain will also almost exclusively use glucose for energy except in times of prolonged fasting, starvation, and during ketogenic diets (where carbs are very low and fats are very high). Glucose can also be stored as glycogen in the liver and muscle for use when required. Moreover, glucose is the required fuel for high-intensity anaerobic exercise (think really high intensity, like sprinting or lifting to failure with moderate loads), because ATP can't be created quickly enough from fats to sustain this exercise, and oxidative respiration cannot proceed without sufficient oxygen.

While glucose isn't an "essential" nutrient, the body has developed unbelievably comprehensive and redundant systems involving blood glucose regulation and transport to tissues. When carbohydrates (along with proteins and fats to an extent) are ingested, the pancreas releases a hormone called insulin. Insulin acts to lower blood glucose by shuttling glucose into tissues such as muscle, fat, liver, and others.[22] This lowering of blood glucose can be opposed by hormones like glucagon and cortisol, which act to increase blood glucose by liberating glucose from cells and increasing GNG. This system needs to work in a very tight and efficient manner; otherwise, problems can arise. When blood sugar levels are too high, they can be toxic to blood vessels and endothelial cells. When blood sugar is too low, it

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21 (n.d.). Biochemical, Physiological, and Molecular Aspects of Human Nutrition .... Retrieved August 22, 2018, from https://evolve.elsevier.com/cs/product/9781437709599?role=student

22 (n.d.). Biochemical, Physiological, and Molecular Aspects of Human Nutrition .... Retrieved August 22, 2018, from https://evolve.elsevier.com/cs/product/9781437709599?role=student

can cause nausea, fainting, coma, and in extreme cases, death. In healthy people, this system works quite well. If you eat carbs, your blood glucose goes up, stimulates insulin secretion, and insulin drives blood glucose back to a normal level. If your blood glucose levels begin to fall, your body secretes glucagon (cortisol is a bit more complicated) to increase blood glucose. In this way, insulin and glucagon act as opposites to maintain blood glucose in a homeostatic range. In Type I diabetics, this system is drastically disrupted because the pancreas doesn't produce insulin—which can cause blood sugar to skyrocket if it's controlled through external insulin use. Uncontrolled Type I diabetes is highly correlated with all-cause mortality, and even relatively well-controlled Type I Diabetes appears to shorten lifespan.[23] In Type II Diabetes, insulin can still be produced, but the cells become insensitive to it, and it doesn't have the effect it should. This leads to a risk in blood glucose levels. Type II Diabetes is also associated with a significant increase (almost a doubling) in the risk of all cause mortality.[24]

With the increased focus on obesity and Type II Diabetes, insulin has gotten a bad rap in recent years. Insulin is a fed-state hormone, meaning its secretion causes mass action that indicates a fed-state. It increases glucose, amino acid, and lipid uptake into tissues, particularly in peripheral tissues like muscle and adipose.[25] [26] [27] Further, insulin also inhibits lipolysis, the process by which stored triacylglycerols are broken down and released as free fatty acids into the blood-

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23 (2017, February 22). Range of Risk Factor Levels: Control, Mortality, and Cardiovascular .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28416524

24 (n.d.). All-cause mortality in adults with and without type 2 diabetes: findings .... Retrieved August 22, 2018, from https://drc.bmj.com/content/5/1/e000451

25 (n.d.). Insulin action on muscle protein kinetics and amino acid transport .... Retrieved August 22, 2018, from http://diabetes.diabetesjournals.org/content/48/5/949

26 (n.d.). Skeletal muscle glucose uptake during exercise: a focus on reactive .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19391163

27 (n.d.). Exercise and insulin increase muscle fatty acid uptake by ... - NCBI. Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12107370

stream (you might consider this the first step of fat burning process).[28] Insulin also inhibits fat oxidation (the second step of fat burning) and spares glucose for oxidation.[29] Keep in mind that glucose and fat metabolism are invariably tied to each other. So if you're eating high carbohydrate and low fat, insulin increases, inhibiting lipolysis and fat oxidation to spare dietary fat, and increasing carbohydrate oxidation. On the flipside, if you're eating low carbohydrate and high fat, insulin will remain lower and lipolysis and fat oxidation will be increased to spare glucose.[30] If you're eating a moderate-fat, moderate-carb diet, then insulin levels will be moderate, and there will be utilization of both carbohydrates and fats—though fat oxidation will likely be greater once insulin drops (2-3 hours post meal) and glucose oxidation drops.

Interestingly, while carbohydrates have been purported to be "fattening," carbs themselves contribute very little to body fat stores. The process of converting carbohydrates to fats is called denovo lipogenesis, and under normal diet conditions, it occurs in very small amounts. As we discussed in Chapter 3, of the women who were overfed calories by 50%, only 1.4% of the fat they gained was directly from carbohydrates.[31] However, under extreme conditions of very low fat and very high carbohydrate intake, DNL can begin to account for a significant portion of fat production. Under normal conditions, carbohydrates simply act to spare fat from oxidation, which means that a greater percentage of dietary fat consumed can be stored in adipose.

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28 (n.d.). Biochemical, Physiological, and Molecular Aspects of Human Nutrition .... Retrieved August 22, 2018, from https://evolve.elsevier.com/cs/product/9781437709599?role=student

29 (n.d.). Biochemical, Physiological, and Molecular Aspects of Human Nutrition .... Retrieved August 22, 2018, from https://evolve.elsevier.com/cs/product/9781437709599?role=student

30 (n.d.). Glucose and insulin-induced inhibition of fatty acid oxidation: the .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/8928782

31 (n.d.). Effect of carbohydrate overfeeding on whole body macronutrient .... Retrieved August 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15303106

Keep in mind that all of this exists on a continuum. It's not as if you release a small amount of insulin and fat burning shuts down everywhere in your body. The body is always simultaneously burning and storing body fat; it will be the relative rates of each that determine body fat loss or gain. It's tempting to see the information about glucose and insulin and believe that we should only eat fat while completely omitting carbs, because then we would just be burning a lot of fat. That's true. You would burn a lot of fat, but you'd also be consuming a lot of fat, and if you were consuming more total calories than you expended, you would end up storing body fat because your rate of fat storage would exceed your rate of fat burning. You see, your body is going to oxidize the fuels you provide for it, typically in the proportion you provide them. Let's compare various diets equal in calories but leaning heavily toward carbs or fats. If you're eating more fat and fewer carbs, you'll burn more fat and store more fat, while burning fewer carbs and storing fewer carbs. If you're eating more carbs and less fat, you'll burn more carbs and storing more carbs, while burning less fat and storing less fat. The overall net gain or loss of body fat will depend on the total energy balance.

Still, zealots on both sides of this argument will claim that low fat or low carb creates some kind of advantage for fat loss. In the 1970s and 1980s, fat was roundly demonized by the media, government, and fitness experts. Low-fat products flooded the market, and yet we continued to get fatter and have higher incidences of heart disease. Fast-forward 30 years, and now it's dietary carbohydrate under fire, particularly sugar, which has been called "toxic" and compared to addictive substances like cocaine and heroin. As discussed previously, some of the most extreme proponents of low-carbohydrate diets proposed an entire hypothesis of obesity called the carbohydrate-insulin model (CIM) of obesity. This hypothesis essentially states that it's carbohydrate intake, *not* total calories, that determines fat loss or gain. According to Dr. David Ludwig, one of the main proponents of the CIM of obesity, "recent increases in the consumption of processed, high-glycemic-load carbohydrates produce hormonal changes that promote calorie depo-

sition in adipose tissue, exacerbate hunger, and lower energy expenditure."[32] On a surface level, some of the arguments make sense, especially if you look at the plethora of effects insulin has on the metabolism. It reduces lipolysis and fat oxidation and increases lipogenesis and fat transport into adipose. The CIM of obesity asserts that high insulin from carbohydrates decreases lipolysis, "trapping" fats inside the adipose tissue. According to the model, this causes people to overfeed because the other tissues cannot get enough energy due to the trapped fats in adipose from high insulin and inhibited lipolysis.

A few major holes exist in the CIM hypothesis. First, while sugar intake did increase over the last hundred years, it has actually decreased over the past decade, particularly in Australia, while obesity rates tripled.[33] If insulin were truly the main cause of obesity, we should observe a decrease in obesity rates now that we've reduced our sugar intake. Still, proponents of the carbohydrate-insulin model will defend this data, citing that virtually all carbohydrates turn to sugar in the body. This leads us to the second problem with the CIM of obesity: if carbohydrates are truly the cause of obesity and not overconsumption of calories, then diets that are equal in calories and protein should demonstrate a clear superiority of low-carb, high-fat (LCHF) diets relative to high-carb, low-fat (HCLF) diets. There are many studies examining exactly this question, and the results are extraordinarily clear: when total calories and protein are equated, the amount of carbohydrates versus fats does not produce differences in fat loss. A recent meta-analysis examined all of the studies that fit this description (calories and protein equated, various amounts of carbohydrates versus fats) and found that LCHF diets didn't produces greater fat loss compared to HCLF diets.[34] In fact, after pooling the data,

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32 "The Carbohydrate-Insulin Model of Obesity: Beyond "Calories In …." 1 Aug. 2018, https://www.ncbi.nlm.nih.gov/pubmed/29971406. Accessed 23 Aug. 2018.

33 (2011, April 20). The Australian paradox: a substantial decline in sugars intake over the …. Retrieved August 23, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22254107

34 (2017, February 11). Obesity Energetics: Body Weight Regulation and the … - NCBI - NIH. Retrieved August 23, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5568065/

they found the exact *opposite.* Low-fat diets actually produced a slight advantage in energy expenditure (26 extra calories expended per day compared to LCHF diets) and in fat loss (16 grams more fat loss per day than LCHF diets).

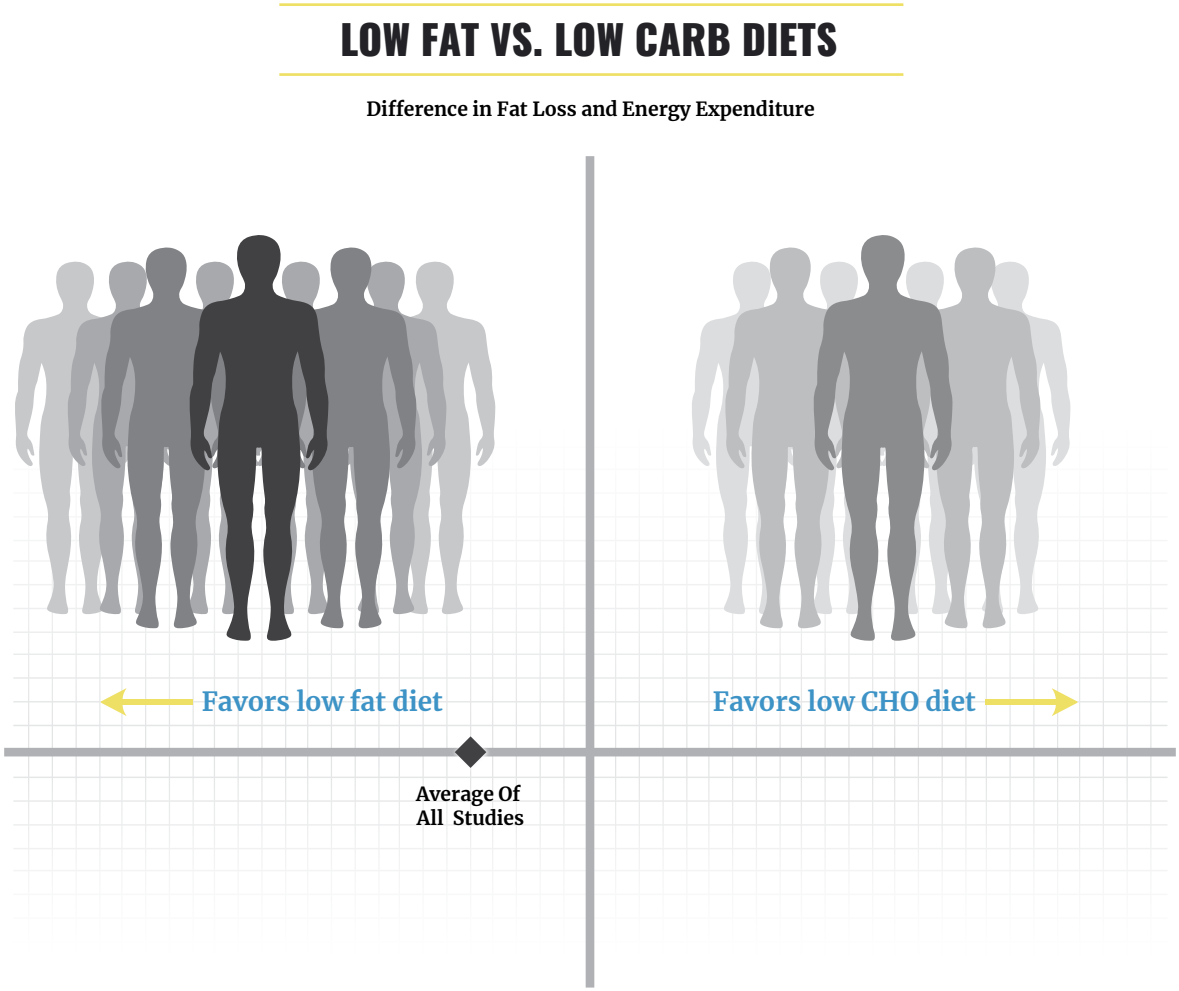

Figure 1. Summary of meta-analysis examining various studies examining different ratios of carbohydrate and fat with calories and protein equated (adapted from Hall KD 2017) on energy expenditure and fat loss. Bodies to the right denote studies favoring low carb whereas bodies to the left are those studies favoring low fat. Most individual studies show little difference in energy expenditure and fat loss, however when the data is averaged and weighted properly there is a small favoring of low fat as shown by the diamond on the x-axis.

At its most basic level, the evidence clearly opposes to CIM. The CIM claims that insulin inhibits lipolysis and "traps" fats in adipose, but obese people and people with type II Diabetes have *elevated* levels of circulating fatty acids, and

the rate of release of fatty acids from adipose is *greater* in obese people—not lower.[35] This fact alone invalidates a fundamental crux of the CIM. Further, in research experiments using drugs that inhibit lipolysis, there is no increase in fat gain or hunger, which is in stark opposition to the CIM hypothesis.[36] Another devastating fact for the CIM hypothesis: studies show that a drug called Liraglutide increases insulin significantly, and yet *reduces* body fat.[37] If insulin were in fact the main driver of obesity development and not overconsumption of calories, then this drug should cause weight gain, *not* weight loss.

Still, low-carbohydrate diet zealots insist (incorrectly) that these studies were either not controlled correctly, funded by people who had something to gain, or weren't low carbohydrate enough—and that people must be in a fully ketogenic state to observe these benefits. To this end, well-known LCHF diet promoter Gary Taubes co-founded a nonprofit called The Nutrition Science Initiative (NuSI) to fund research to "prove the carbohydrate-insulin model of obesity correct." (I may have slightly misquoted, but this was the gist of what he said in a debate at the 2015 Epic Fitness Summit). Taubes has authored numerous books on nutrition in support of the carbohydrate-insulin model of obesity (*The Diet Delusion*, *Good Calories, Bad Calories*, *Why We Get Fat*, and *The Case Against Sugar)*. These books were extremely popular and garnered Taubes a large, extremely enthusiastic following. To Taubes' credit, he decided to put his money where his mouth is, unlike many other critics of nutrition research. NuSI funded a series of studies comparing LCHF diets to HCLF diets, which didn't have the result Taubes and NuSI desired. In particular, one study had subjects eat either

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35 (2009, July 23). Relationship between body fat mass and free fatty acid kinetics in men .... Retrieved October 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19629053

36 (2015, December 21). Metabolic Effects of Long-Term Reduction in Free Fatty Acids With .... Retrieved October 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26691888

37 (2015, July 2). A Randomized, Controlled Trial of 3.0 mg of Liraglutide in Weight .... Retrieved October 16, 2018, from https://www.nejm.org/doi/full/10.1056/NEJMoa1411892

a ketogenic LCHF diet or a HCLF diet while calories and protein were equated.[38] This study was unique because it was conducted in a metabolic ward, and the subjects were provided *all* the meals during the experiment. This helped researchers be 100% sure that any differences observed in fat loss or energy expenditure were the result of the differences in carbohydrates versus fats in the diet, and not energy intake or exercise/activity.

The researchers found no difference in weight or fat loss (both groups lost equal amounts of weight and fat), despite the fact that the higher carb diet (over 300 grams of carbs per day) had significantly higher daily insulin levels. This study demonstrated that the hormonal response to diet will never supercede total energy balance for fat loss. We doubt it changed Taubes' mind, however, since he stated in the previously mentioned 2015 debate that he wouldn't reject the CIM hypothesis even if the studies didn't support it. In this way, many nutrition faction zealots have become more like political and religious zealots, completely eschewing science in favor of rhetoric, anecdote, and pseudoscience. We want to reiterate that this *doesn't* mean that all calories are equal. As stated previously, both protein and fiber may have metabolic advantages, but when it comes to carbohydrates and fats, it appears that there are no differences in fat loss when calories and protein are equated.

Even the originator of the hypothesis, David Ludwig, has conducted studies that did *not* support his hypothesis. One study examining high-GI carb intake versus low-GI carb intake over 18 months showed no differences in weight loss or fat loss between the two diets, even though the low-glycemic diet had significantly lower insulin.[39] Again, if insulin is the main driver of obesity, this should be reflected in the weight loss and fat loss data. But it isn't. Ludwig also did a study using Men-

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38 (2016, July 6). Energy expenditure and body composition changes after an isocaloric .... Retrieved August 23, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27385608

39 (n.d.). Effects of a low-glycemic load vs low-fat diet in obese young adults: a .... Retrieved October 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/17507345

delian randomization. The idea behind this technique is that specific gene variants impact some outcome that researchers want to study. In this case, they wanted to look at gene variants that impact post-meal insulin secretion, and the association of these variants with body mass index, or BMI (a measure of body fatness). If the CIM model is valid, there should be a very powerful association between gene variants that produce greater post-meal insulin secretion and BMI. The researchers found a significant association that they tried to play up, but in reality, the hard numbers were that insulin explained between 1-10% of BMI, leaving 90-99% of it unexplained by insulin.[40] So, insulin may play a role in obesity, but it's definitely not the main driver based on the research data, especially when you consider the real-world body weight and fat loss data when researchers control calories.

To further highlight the issues with the CIM, we need look no further than several meta-analyses comparing LCHF diets with non-low carb diets across a broad spectrum of carbohydrate and fat intakes. Meta-analyses are essentially studies of studies. Meta-analysis is the statistical procedure for combining data from multiple studies. When the treatments are consistent from one study to the next, a meta-analysis can be used to identify common effects. Meta-analyses are the gold standard for data in the scientific world. They combine multiple studies to increase statistical power, and they allow scientists to pick through differences in research by giving a larger consensus of the data.

A recent meta-analysis compared LCHF diets to non-low carb diets and their effects on body weight, BMI, and glycemic control as measured by glycosylated hemoglobin HbA1c (when blood sugar gets high enough, glucose can attach to hemoglobin, and assessing levels of HbA1c can reflect long-term levels of blood-glucose control). The meta-analysis examined 23 studies with a total of 2178 subjects. The researchers concluded that there was no difference in weight loss, BMI change, or adherence based on the ratio of carbohydrate and fat in

40 (n.d.). Genetic Evidence That Carbohydrate-Stimulated Insulin Secretion .... Retrieved October 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/29295838

the diets examined.[41] They did conclude, however, that the low-carb diets produced slightly better glycemic control than the non-low-carb diets. However, this meta-analysis included studies that *did not equate calories.* A previous meta-analysis examining similar outcomes (weight loss and glycemic control, but also blood lipids) found that there was no difference between low-carb and non-low-carb diets for weight loss, glycemic control, or blood lipids.[42] The difference was that this meta-analysis only included studies that equated calories. Perhaps even more interesting is that both of these meta-analyses saw no difference in adherence between low-carb and non-low-carb diets. Now, to be clear, this doesn't mean that certain people don't feel more satiated on LCHF diets than on HCLF diets. Some people do, but some people also feel more satiated on HCLF diets. What makes a diet more sustainable or easier to adhere to is individual preference, and it's part of the reason these meta-analyses likely show no difference in adherence—because it's simply a scatter plot, and it varies amongst individuals. As cliché as it sounds, there's something to be said for finding what works for you.

These meta-analyses also demonstrate something else that may not be intuitive for everyone. That is, they demonstrate that it's *weight loss from diets* that produces the overwhelming majority of beneficial health outcomes from dieting, not the compositions of the diets themselves.[43] [44] Most zealots *completely* miss this point when discussing the virtues of whatever diet religion they've chosen. Vegans, keto zealots, carnivore zealots, clean-eating zealots, and almost any

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41 (2018, August 11). Carbohydrate quantity in the dietary management of type 2 diabetes .... Retrieved September 19, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/30098129

42 (2014, July 9). Low Carbohydrate versus Isoenergetic Balanced Diets for Reducing .... Retrieved September 19, 2018, from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0100652

43 (2014, July 9). Low Carbohydrate versus Isoenergetic Balanced Diets for Reducing .... Retrieved September 19, 2018, from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0100652

44 (n.d.). Carbohydrate quantity in the dietary management of type 2 diabetes .... Retrieved September 19, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/30098129

diet zealot will expound on the reasons that their particular diet lowers the risk of heart disease, cancer, etc. But what they neglect to mention is that the people who *adhered* to these diets lost weight, and weight loss itself creates massive health benefits (as discussed earlier). Certain diets may be slightly better for certain things, but try not to major in the minors. If you're doing keto because you want to improve insulin sensitivity, but you find yourself unable to stick to it and lose weight—whereas perhaps you could stick to an approach with more carbohydrate—then you're actually *not* doing the best thing for your insulin sensitivity, because you can't lose weight if you aren't adherent. Likewise, if you're following a vegan diet to improve your blood lipids but aren't able to stick to it because you dream of steak in your sleep, and a diet with some meat and saturated fat would allow you to be adherent and lose weight, then the latter is *still* better for your heart health—because you can adhere to it. Again, the best diet is the one *you* can stick to in the long run.

Another blow to the CIM is the data concerning sugar. If insulin were truly the cause of obesity regardless of calories, then we would also expect that diets high in sugar would cause more fat gain (during an energy surplus) or impede fat gain (during an energy deficit), more so than an isocaloric diet low in sugar. As you might have guessed based on previous data, that has not been observed. There have been several studies examining isocaloric diets with varied sugar intakes, and there's no difference on fat loss when calories are equated.[45] [46] [47] [48] Perhaps the most convincing study was performed by Surwit et al., where sub-

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45 (2016, November 30). Controversies about sugars: results from systematic ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5174149/

46 (2015, October 23). No Effect of Added Sugar Consumed at Median American ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4632450/

47 (n.d.). Randomized controlled trial of changes in dietary carbohydrate ... - NCBI. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/11093293

48 (2016, November 4). Relationship between Added Sugars Consumption and ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5133084/

jects were provided every single meal during the study (six weeks) in a tightly controlled design with drastically different intakes of sugar (121 grams per day in the high-sugar group and 12 grams per day in the lower sugar group) but protein, fats, and total calories were equated.[49] The researchers found both groups lost the same amount of fat and weight (just over 7 kilograms), even with the massive difference in sugar intakes.

Furthermore, most markers of health improved (blood pressure, blood lipids, etc.) but were not different between the two groups, which adds more evidence to the argument that it's overall weight loss and improvements in body composition driving health benefits to diets, not because a particular diet is magical. The only marker that improved more on the low-sugar group compared to the high-sugar group was cholesterol. This may be due to a lower fiber intake in the high-sugar group compared to the low-sugar group. Fiber can bind to cholesterol and decrease cholesterol levels, which may explain the difference in this study. Overall, when calories are equated between diets, sugar does not appear to make a difference to fat loss. That said, sugar isn't very filling, and it may be wise to consume more filling, fiber-dense sources of food in place of sugar to increase satiety and improve adherence during a diet. However, if consuming sugary treats here and there helps improve your overall adherence, then it certainly seems that sugar intake will have minimal to no harm if you're controlling for overall caloric intake.

Finally, several protein sources are actually quite insulinogenic, but high-protein intakes don't produce obesity and actually may be favorable for reducing body weight.[50] [51] If insulin truly caused fat gain regardless of calorie intake, then

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49 (n.d.). Metabolic and behavioral effects of a high-sucrose diet during weight .... Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/9094871

50 (n.d.). Effect of protein ingestion on the glucose and insulin response ... - NCBI. Retrieved August 23, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/6389060

51 (n.d.). Effect of protein dose on serum glucose and insulin response - NCBI. Retrieved August 23, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/3307373

high-protein diets should produce nearly the same effects on fat gain as carbohydrate, considering that 50 grams of protein ingestion produced nearly the same insulin response as 50 grams of glucose.[52] That's not what we see in the data, however, and it's simply another fact that is not reconcilable with the CIM hypothesis of obesity. Based on the plethora of data presented here, we feel *extremely* confident in stating that the carbohydrate-insulin model of obesity is completely irreconcilable with the body of research examining carbohydrate and fat consumption when calories and protein are equated.

Now, before you become a "it doesn't matter what you eat as long as you hit your protein and calories" zealot, keep in mind that there are probably unique benefits to both approaches. For example, a low-fat approach may be slightly superior for fat loss on a calorie-per-calorie basis. However, a lower-carb approach may have advantages for insulin and blood-glucose control in people who are pre-Type II Diabetes compared to a low fat diet.[53] It also appears that a low-carb diet may increase LDL cholesterol and homocysteine (risk factors for cardiovascular disease) but lower triacylglycerols.[54] What's so important to understand is there is no one perfect diet. Everything involves a trade-off. If you follow a LCHF diet, you'll get certain benefits that you won't get with a HCLF diet, and vice versa. If you follow a more balanced approach of a moderate amounts of carbs and fats, you'll also likely get benefits but also drawbacks. It's important to *stop* focusing on the notion that there's one ideal diet for everyone in every situation. There isn't. Diets should depend on context. However, as we've stated repeatedly, the single most important parameter is what diet can *you* adhere to and sustain long term. Any form of caloric restriction can cause

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52 (n.d.). Effect of protein ingestion on the glucose and insulin response ... - NCBI. Retrieved August 23, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/6389060

53 (n.d.). Comparison of isocaloric very low carbohydrate/high ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1368980/

54 (n.d.). Comparison of isocaloric very low carbohydrate/high ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1368980/

weight loss, and weight loss of any kind typically leads to improvements in health. For example, even a higher carb diet leads to improvements in insulin sensitivity in people who lose weight.[55] [56] Weight loss and improvements in body composition are by *far* the main driver for improvements in health, regardless of the dietary approach you use.

Dietary zealots may try to distract you with hand-waving arguments about hormones, inflammation, autophagy, and other surrogate markers of health. Then they may try to convince you that these surrogate markers are more important than anything else and reflect overall health and weight loss. They're surrogate markers for a reason; shouldn't the most important outcome actually be the fat loss and corresponding measurable health improvements rather than surrogate markers? If hormones like insulin made a difference in long-term overall weight loss, then we would see differences in fat loss under isocaloric conditions with low-carb diets compared to low-fat diets. We resoundingly do *not* see differences, and if anything, low fat is a bit better for fat loss. Therefore, hormones don't make a meaningful difference in fat loss between LCHF diets and HCLF when calories are equated. Many zealots (usually LCHF or intermittent fasting) like to point out that surrogate markers like lowering inflammation and increasing autophagy are improved following their approach. That is 100% correct (assuming a calorie deficit), but what they don't tell you is that both of those processes are improved by a caloric deficit and losing weight in general, not just with their particular approach.[57] [58]

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55 (2009, August 31). Low-Fat Versus Low-Carbohydrate Weight Reduction Diets - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2780863/

56 (n.d.). Effect of a controlled high-fat versus low-fat diet on insulin sensitivity .... Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/9867084

57 (2013, April 29). Fasting or caloric restriction for Healthy Aging - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3919445/

58 (n.d.). Effects of a caloric restriction weight loss diet and ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3342840/

Taken together, the single most important thing you can do for your health and body composition is to choose an approach that allows you to adhere to the diet and then sustain it for long periods of time. In short, the best diet for *you* is probably the one you can stick to in the long term. There are some things you can do that will probably help you, like consuming higher protein and fiber for better lean body mass retention, thermogenesis, and satiety—but if eating high protein isn't something that you can sustain, then default to a dietary breakdown than you *can* maintain.

Fat

Fats, aka lipids, come in a diverse array of forms such as fatty acids, oils, waxes, and steroids. Unlike carbohydrates, lipids are essential nutrients, because our bodies cannot synthesize certain fats called essential fatty acids (EFAs). Fats perform a variety of important processes in the body, including forming part of the lipid bilayer of cells, regulating membrane permeability, serving as a source of fat-soluble vitamins, and as a storage reservoir for energy. Lipids are very efficient forms of energy storage because they contain 9 kcal per gram, over double what carbohydrate and protein contain, and they're stored more efficiently in adipose than carbohydrate or protein.

Lipid digestion is also unique compared to the digestion of carbohydrates and protein, because lipids are absorbed through the lymphatic system as chylomicrons. Carbohydrates and protein, on the other hand, are mostly digested in the small intestine via pancreatic enzymes and absorbed through the intestinal lumen into the liver.[59] Chylomicrons are a form of what's called lipoproteins, which are what the body uses to package lipids for transport throughout the body. You've probably heard of LDLs (low density lipoproteins), HDLs (high density lipopro-

59 (n.d.). Biochemical, Physiological, and Molecular Aspects of Human Nutrition .... Retrieved August 24, 2018, from https://evolve.elsevier.com/cs/product/9781437709599?role=student

teins), and VLDLs (very low density lipoproteins). There are also IDLs (intermediate density lipoproteins), but they don't get much press. These are all lipoproteins made by your liver for transport throughout the tissues of the body. The nomenclature generally refers to their size, where VLDLs and LDLs are large and HDLs are relatively small while IDLs are intermediate. Chylomicrons would be even *bigger* than VLDLs(75-600 nanometers versus 30-60 nanometers). For the sake of not turning this into a PhD thesis on lipids, the important thing to know is this is the major way that fats are transported in the body from the liver.

When it comes to fatty acids in particular, there are saturated fats (SFAs), which are solid at room temperature, and unsaturated fats (UFAs), which are liquids at room temperature. These terms refer to the absence (saturated) or presence (unsaturated) of a double bond in the fatty acid chain. You see, fatty acids are long chains of carbon and hydrogen (in fancy biochemist terms, an "acyl group") attached to (another fancy biochemist term incoming) a carboxyl group that is acidic. Hence the term "fatty acid."

Amongst unsaturated fats, there are monounsaturated fatty acids (aka MUFAs, which have one double bond) and polyunsaturated fatty acids (aka PUFAs, which have multiple double bonds). These double bonds create "kinks" in the fatty acid chain (normally these fatty acid chains or "tails" are relatively straight) that are important for things like membrane fluidity. However, this isn't the case for trans fats. Trans fats are unsaturated fats that contain (fancy biochemist term incoming) a "trans" bond instead of a "cis" bond. Trans double bonds don't typically occur in nature (there are small amounts in some natural food sources), and they're typically man-made as a replacement for things like butter. Why? Well, at one point we thought they might be safer since they were made from vegetable oils through a process called hydrogenation, which helped solidify them to make them more like solid SFAs. In simpler terms, to make a trans fat, you have to pump hydrogen into an unsaturated fat. The problem is that trans double bonds don't create "kinks" in the fatty acid chain like

cis double bonds do. Turns out that trans fats were *not* healthier than SFAs and are probably the *worst* sort of lipid for your health, since they increase the risk for heart disease and Type II Diabetes more than other fats.[60] We don't often tell you what to eat, but we *strongly* advise that you limit trans fat consumption for these reasons. Saturated fats are also a risk factor for heart disease, since they raise cholesterol, and while there's evidence that saturated fat isn't as bad as was once thought, it still appears that replacing saturated fat with PUFAs or MUFAs can significantly decrease the risk of heart disease.[61] Admittedly, we're not cardiac experts, so we don't want to overstep our bounds, but we've read quite a few studies and meta-analyses on fats and cardiac disease. Our best understanding of the data is that saturated fat and cholesterol probably aren't as awful as they were made out to be in the 70s and 80s—but they also aren't as innocuous as low-carb zealots claim. The best options for fats appears to be PUFAs, which offer the most cardioprotective benefits. Replacing SFAs gram for gram with PUFAs in the diet can offer the best cardioprotective bang for your buck. Replacing SFAs with MUFAs also offers a protective effect, but not at the same level as PUFAs.[62]

It's tempting to look at these data and construct a diet where fat comes from PUFAs and limits SFAs as much as possible. Please keep in mind, however, that whatever benefit PUFAs and MUFAs offer, that benefit will be smaller compared to maintaining a healthy weight or losing weight for those who are obese. So it's again important to keep in mind our hierarchy where adherence and sustainability are at the very top. If you go on a diet high in PUFAs and low in SFAs but can't stick to it, then all of this is null and void. Further, exchanging SFA for PUFAs or

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60 (2010, December 4). Trans-Fats and Coronary Heart Disease - NCBI - NIH. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3024842/

61 (2017, January 27). Saturated Fat Consumption and Risk of Coronary Heart Disease and .... Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5475232/

62 (2017, October 18). A systematic review of the effect of dietary saturated and ... - NCBI. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/29174025

MUFAs will have no impact on weight loss since they are of equal caloric value, and there's no evidence that one source of fat is more thermogenic than another. So remember to construct a diet that you can stick to for weight loss first and then worry about slightly less important variables like fat source breakdown.

Keeping your fats at an optimal level is also important for your hormonal balance. Research shows that if you lower your fat so much that it accounts for less than 20% of your daily caloric intake, your testosterone may drop, which is not beneficial for keeping lean body mass and strength—both of which are important for long-term weight loss maintenance and prevention of weight regain.[63] Don't get the wrong idea, though. Some LCHF zealots would have you believe that more fat equals more testosterone, but that's not the case. As long as you're eating a non-deficient level of fat, your testosterone levels won't decrease, but increasing fat more than that won't further increase testosterone in a linear fashion. Furthermore, it will be difficult to create a caloric deficit if your fat intake is too high, since fats are nine calories per gram, which is over double the calories of protein or carbohydrate.

Fiber

Fiber would typically fall under the category of a carbohydrate, since it contains structures and molecules that fit this bill—but it acts quite differently in the body. Fiber is the portion of carbohydrate that cannot be completely broken down by digestive enzymes. It falls into two categories of soluble fiber (aka fermentable) and insoluble fiber. Soluble fibers include fructans, pectins, polydextrose, lactulose, xylose, and others. While not completely broken down by digestive enzymes in the gastrointestinal tract, soluble fibers can be readily fermented by the colon, producing short chain fatty acids that can be absorbed, as well as gas. If you ever

63 Decrease of serum total and free testosterone during a low-fat high .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/6298507

wondered why a plate of veggies made you toot like a trumpet, now you know.[64] Soluble fiber also adds bulk to food, causes regular bowel movements and modulates gut transit time.[65] [66] Insoluble fiber adds significant bulk to food and is generally resistant to digestion. Insoluble fibers include cellulose, hemicellulose, lignins, xanthan gum, resistant starches, and a host of other compounds.

Dietary fiber has many positive health benefits. It's been demonstrated to improve blood glucose and insulin sensitivity, lower cholesterol, improve blood lipids, improve weight loss, and increase satiety—though there is significant debate about satiety.[67] [68] [69] [70]

Dietary fiber also has less metabolizable energy than normal carbohydrate, since most fibers are at least in part resistant to digestive enzymes. The estimated metabolizable energy from fiber has been proposed to be between 50% to 80% of normal carbohydrate, but this is a very hotly debated topic. It probably boils down to the individual source of fiber and the gut microbiome of the individual

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64 (n.d.). Biochemical, Physiological, and Molecular Aspects of Human Nutrition .... Retrieved August 24, 2018, from https://evolve.elsevier.com/cs/product/9781437709599?role=student

65 (2017, March 31). Ratios of soluble and insoluble dietary fibers on satiety ... - NCBI - NIH. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5389022/

66 (n.d.). An overview of the effects of dietary fiber on gastrointestinal transit.. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/7494680

67 (n.d.). The effect of fiber on satiety and food intake: a systematic review. - NCBI. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23885994

68 (1993, July 1). Effect on blood lipids of very high intakes of fiber in diets ... - NCBI - NIH. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/8389421

69 (n.d.). Soluble fiber and serum lipids: a literature review. - NCBI. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/8144811

70 (n.d.). Impact of Dietary Fiber Consumption on Insulin Resistance and ... - NCBI. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/29378044

person.[71] Since fiber is not 100% metabolizable, many people have stated that it doesn't need to be tracked. We don't think that's a good idea for a few reasons. First, even though fiber is not digested like a normal carb, soluble fibers can be fermented by the colon to short chain fatty acids, which can be absorbed and used for energy. Second, even though they're not 100% absorbed, they still do provide some energy; about 1.5 to 3 kcal per gram of fiber. For your purposes, it's best to track fiber as a carbohydrate. Don't worry about "net carbs" in relation to "total carbs." You'll go crazy trying to separate the two, and when you're trying to lose fat, the last thing you need is *another* variable to constantly monitor. So, while the energy value of dietary fiber might not necessarily be four calories per gram like other carbohydrates, for our purposes, we recommend counting it that way.

Alcohol

Ah yes, the fourth macronutrient. We would be remiss if we didn't discuss alcohol. While it's tempting to suggest eschewing alcohol completely to enhance fat loss, that would go against our principle of sustainability for many people. Like it or not, alcohol is part of our culture, and many non-alcoholics would find it extremely disruptive to their quality of life (from a social perspective) to completely abstain from alcohol.

While we won't tell you that you *must* abstain from alcohol to lose fat, alcohol is nearly as energy-dense as fat at 7 kcal/gram, so consuming large amounts of it will be difficult to do while maintaining a caloric deficit. Many people make the mistake of assuming that because hard alcohol is low carb or carb free, that alcohol is calorie free. That is definitely *not* the case, because even a small shot of hard liquor (1.5 ounces) will contain around 80 calories. Further, liquid

71 (n.d.). Determination Of Energy Values For Fibers - Dietary ... - NCBI - NIH. Retrieved August 24, 2018, from https://www.ncbi.nlm.nih.gov/books/NBK223593/

calories aren't very filling, and alcohol lowers your inhibitions, so you're more likely to make poor food and life choices, like going to IHOP at 3 a.m. and eating a big steak omelette with a stack of pancakes. If you need evidence that this isn't good idea, look up the nutrition info on that. Don't say we didn't warn you that it will be well over 1000 calories for that meal. So it's important to keep this in mind when considering how much alcohol might be okay to include in your fat loss diet. In general, small or modest amounts of alcohol are not going to have a negative impact on body composition, as long as you account for the calories in whatever alcoholic beverage you consume.[72] In fact, alcohol has a greater TEF than carbohydrate or fat, which means on a per calorie basis it may actually be slightly advantageous from a pure energetics standpoint.[73] However, consuming large amounts of alcohol has been demonstrated to inhibit protein synthesis and fat oxidation.[74] [75]

Additionally, high intakes of alcohol can suppress testosterone, but low doses of alcohol may actually increase testosterone slightly.[76] [77] Just how much is considered moderate? No negative effects of alcohol were observed up to the equivalent of three to four drinks. In fact, the increase of testosterone was seen at just three drinks. Keep in mind that this increase in testosterone is small, and it will have zero long-term effect on muscle mass. You won't get jacked by way

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72 (n.d.). The effect of moderate alcohol consumption on fat distribution and .... Retrieved January 18, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16493123

73 (2004, August 18). Diet induced thermogenesis - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC524030/

74 (2014, September 25). Alcohol impairs skeletal muscle protein synthesis and ... - NCBI - NIH. Retrieved January 18, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4233249/

75 (n.d.). Alcohol and lipid metabolism. - NCBI - NIH. Retrieved January 18, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16958674

76 (n.d.). Alcohol effects on luteinizing hormone and testosterone in male .... Retrieved January 18, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/4009484

77 (n.d.). Testosterone increases in men after a low dose of alcohol. - NCBI. Retrieved January 18, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12711931

of your drinking. The point is that it didn't inhibit your gain or maintenance of muscle mass in any way. So how much is too much? In general, if you're drinking enough to get drunk, then you're drinking enough to start having negative body composition side effects.

The other downside to alcohol is that it's not filling, but it's very calorie dense. At seven calories per gram of alcohol, it's only behind fat as the most calorie-dense nutrient we consume. The question becomes, "How do we track it?" You could make a separate category for alcohol, but that's a real pain in the ass. What happens if you consume different amounts of alcohol every day, or none at all? Or what if you drink a mixed drink? Now you're going to have to recalculate your carb and fat numbers every time you drink. Instead, we recommend tracking alcohol as either carbohydrate, fat, or both. So if you drink a Yuengling Light, which happens to be Layne's favorite, it contains 99 calories per serving, and you can track it in the following ways:

Carbohydrate:
99 calories ÷ 4 calories/g carbohydrate = 24.75 g carbohydrate, rounded to 25 g.

Fat:
99 calories ÷ 9 calories/g fat = 11 g fat

Combination:
44 calories from carbs ÷ 4 calories/g carbohydrate = 11g carbohydrate
45 remaining calories from fats ÷ 9 calories/g fat = 5 g fat

While this is a good strategy, you need to be reasonable about how much alcohol you consume during your fat loss diet. In general, we'd recommend consuming the least amount of alcohol you can while still maintaining what you feel is a reasonable lifestyle. If that means completely abstaining for you, then great. If it means a few drinks a week, great. If it means a glass of wine or beer every

night with dinner, that's okay, too. Just make sure your consumption of alcohol isn't negatively affecting your ability get enough protein, fiber, and other micronutrients.

SUMMARY

We hope this chapter provided you with a lot of context that is missing from current discussions about nutrition and dieting. Labeling nutrients as "good" and "bad" helps no one, and it only increases the nutrition misunderstandings that are rampant in society. In the last 50 years, it's been hypothesized that protein, carbs, and fats were all going to kill us at different timepoints, depending on the cultural and political climate of the time—in addition to what people thought would sell the most books. Honestly, we hate that. Don't get us wrong; we want you to buy the books we write, but not at the expense of scientific integrity. It turns out that fat loss is pretty simple in terms of just being in a caloric deficit (possibly at higher protein and fiber to help adherence). However, the *way* you create that deficit is very individual, and we need to put strategies in place that focus on adherence and sustainability so that we can end yo-yo dieting cycles. We aren't selling a magic fix. This stuff isn't easy, but it can be done with planning, persistence, and patience. What we're selling is the information to get the job done and keep it done. Now it's time to get into the meat and potatoes (or avocados if you're into that low-carb thing) of fat loss nutrition.

8

DETERMINING YOUR MACRONUTRIENT INTAKE

We previously discussed that energy balance is the dominant factor for fat loss, and that the ratio of carbohydrate to fat doesn't seem to matter much to fat loss (though Hall's study did show a fat loss advantage of 26 grams per day with low-fat diets when the data was pooled). However, this does *not* mean that the foods you choose aren't important for fat loss. As we discussed, both protein and fiber have significant advantages when it comes to satiety and fat loss versus diets low in protein and fiber. Furthermore, it's important to keep in mind our order of priority when partitioning the individual macronutrients. You *must* choose something sustainable. You might be tempted to read all the information provided in this book and go on an a super low-fat, high-protein, high-carb, and high-fiber diet because protein and fiber are thermogenic, and Hall's study showed a slight advantage to low-fat diets for fat loss. That's great, but if you hate that diet and it's not something you can sustain as part of your life, then it's not going to work for you because you won't be able to adhere to it.

For example, the downside to a low fat-diet is that it's pretty hard to eat out due to the amount of oil added to restaurant foods. However, you can typically find lower-carb, moderate-fat dishes. These are things you *must* think about when deciding how to partition your macronutrient intake. We're not telling you that you should eat LCHF or HCLF, because *you* need to make the choice based on your own food preferences. You *must* focus on sustainability *first.* Even when it comes

to something like protein, which seems great, if you hate eating a high-protein diet, then you're better off lowering your protein to an amount that is reasonable and sustainable for you, so you can be *consistent* with your nutrition. Remember, people don't fail diets because they didn't have the magic ratio of protein, carbohydrates, and fats. They fail because they can't sustain them.

With that said, we'll run through our recommendations on calculating your macronutrient intake. These numbers are based on a few different pieces of data, namely your daily calorie intake as calculated from previous chapters, and in the case of protein, your LBM. Of the three macronutrients, protein is the most important, because it improves retention of LBM, satiety, and fat loss. Due to these factors, we set the protein amount first.

Protein

Energy balance and tracking your intake might be the most important thing, but protein intake would probably be the *next* most important thing. How much protein, though? The recommended daily allowance (RDA) for protein in the USA is 0.8 grams per kilogram of body weight—but that amount is based on what's needed to prevent a deficiency (plus 2 standard deviations). Most of us aren't worried about being protein deficient, since most Americans already eat more protein than the RDA. In general, benefits have been shown in studies for fat loss or preventing fat gain by increasing from the RDA all the way up to 4.4 rams per kilogram.[1][2][3][4]

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1 (n.d.). Dietary protein and exercise have additive effects on body ... - NCBI. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16046715

2 (2009, March 13). Dietary Guidelines should reflect new understandings ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2666737/

3 (2015, October 20). A high protein diet (3.4 g/kg/d) combined with a heavy ... - NCBI. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26500462

4 (2014, May 12). The effects of consuming a high protein diet (4.4 g/kg/d) on body .... Retrieved August 26, 2018, from https://jissn.biomedcentral.com/articles/10.1186/1550-2783-11-19

Interestingly, in one study, feeding high-protein intakes (4.4 grams per kilogram of body weight) prevented fat gain even though people were consuming almost 300 kcal more per day than the control group that consumed about 140 grams per day.5 This highlights the thermic effect of protein, and how powerful it can be. That's not to say protein is a "free" macronutrient, because it isn't. But it does appear you can eat more protein and lose fat/prevent fat gain compared to carbohydrates or fats. The range of 0.8-4.4 grams per kilogram of body weight is pretty wide, so how do we figure out what protein intake is best for you? If we look at most studies that examine "high" protein diets, they come in at around 1.6-2.8 grams per kilogram of body weight. If we split the difference, that ends up being 2.2 grams per kilogram of body weight or 1 gram per pound of body weight. We think this is a good place to start. It's an easy number to remember, and most people can hit it if they make some adjustments to their diets. If you're not used to consuming this much protein and you struggle with it, that's okay. Start as high as you can while still being able to stick to it, and then go from there. In general, we recommend a minimum of 1.6 grams per kilogram of body weight if you can.

Notice that all these values are in terms of protein per kilogram or pound of body weight. While this is generally good advice, the protein number can actually wind up skewing on the higher side if you're going solely based on body mass and the person is obese. As an example, if a person weighs 136 kilograms and is obese at 30% body fat, their protein count would be nearly 300 grams of protein per day even though their lean body mass is only 95.2 kilograms (protein intake of over 3.1 grams per kilogram of lean body mass). Since fat mass has very little protein requirement or usage, basing protein intakes off total body weight can cause some issues in people who are out of the normal weight range. Recently, there have been developments toward using lean body mass to come up with more accurate protein intakes. The simple option is to take that LBM

5 (2014, May 12). The effects of consuming a high protein diet (4.4 g/kg/d) on body .... Retrieved August 26, 2018, from https://jissn.biomedcentral.com/articles/10.1186/1550-2783-11-19

you figured out earlier and base your protein number off that. So, with that in mind, you can derive a more accurate—and to be honest, a more sustainable—protein target for the day. Since it's the LBM component of your body mass that requires the majority of tissue turnover, it would make sense that protein intake should be based on your LBM rather than just total body mass, especially for people who may have more body fat than the average person. That said, there's no evidence that protein will harm you if you base your intake off body weight rather than lean body mass; the number may just come out higher.

In cases of a caloric deficit, or even advancing age, optimal protein intake should actually increase in order to preserve the LBM that you might lose due to the catabolic nature of age (sarcopenia) and a caloric deficit.[6] While it's difficult to determine hard numbers from current data, based on our best interpretations of current data, it appears that adding 1.5% protein each year after age 30 is probably a safe bet.[7] During a caloric deficit, it may be wise to also increase protein by 10-20% above surplus calorie levels of protein (assuming that protein was at the lower end of what is "optimal"). To make things easier, here's a table compiling some of these parameters.

Age	0-30	31-40	41-50	51-60	61-70
No Calorie Deficit	1.8-2.0 g/ kg LBM	2.0-2.3 g/ kg LBM	2.3g-2.6 g/ kg LBM	2.6-2.9 g/ kg LBM	2.9-3.2 g/ kg LBM
Calorie Deficit	2.2-2.4 g/ kg LBM	2.4-2.8 g/ kg LBM	2.8-3.1 g/ kg LBM	3.1-3.5 g/ kg LBM	3.5-3.8 g/ kg LBM

Table 1. Protein recommendations based on lean body mass, age, and whether an individual is in a deficit.

6 A systematic review of dietary protein during caloric restriction ... - NCBI. Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/24092765

7 A high proportion of leucine is required for optimal stimulation of the .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16507602

Now, this may seem like a small amount of protein to some and a large amount to others. or our American friends, remember you're looking at kilograms of LBM. If we use our male example from Chapter 6 where we calculated his deficit calories, his weight was 100 kilograms at 20% body fat.That is 20 kilograms of FM and 80 kilograms of LBM. If he's 30 years old in a deficit, we could target a range of 2.2-2.4 grams per kilogram of LBM. Since more protein isn't going to hurt him and provides a metabolic benefit (and assuming he enjoys it, since sustainability is a factor), let's put him at 2.4 gram per kilogram of LBM. 80 kg LBM × 2.4 g/kg LBM = 192 g of protein per day. We can round that to 190 grams. In the case of our woman from Chapter 6, she's 90 kilograms at 36% body fat. This means she has a LBM of 57.6 kilograms. If we look at our table for her age and deficit, we get a range of 2.8-3.1 grams per kilogram. Since she's in the middle of the age bracket, let's just pick a simple number of 3 grams per kilogram. 57.6 kg LBM × 3.0 g/kg LBM = 172.8 g of protein per day, and we can round that up to 175 grams of protein per day.

For muscle heads, these protein intakes might be lower than expected. For people who are just reading about the benefits of protein for the first time, this may seem like an insane amount to get into their diet. In fact, some of you protein junkies may feel that these numbers are *too* small, but keep in mind that most fitness people tend to over-consume protein, and more protein is not necessarily better. In fact, you may actually be triggering a suboptimal response called the "muscle-full effect" or "refractory response," which is something I [Layne] studied during my PhD research.[8]

Remember that *more* is *not* better; optimal is better. These ranges appear to be optimal, and if anything they're on the high side of optimal. By consuming these ranges of protein, you can be confident that you're getting more than your fair share of protein to maximize your retention of lean body mass. Could you eat up

8 (2011, September 13). Leucine or carbohydrate supplementation reduces AMPK and eEF2 .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4395871/

to 4.4 grams per kilogram of body weight with no documented negative effects? It appears so, but keep in mind that if your daily calories are a set amount, you can't jack your protein up really high without limiting room for carbohydrates and fats. If you love protein, that might be okay with you. But for some of you, that will be a completely unsustainable approach. If we aren't talking about bodybuilders, then a good guide would be a minimum of 1.6 grams per kilogram of body weight, or 2.0 grams per kilogram of lean body mass. From there, you could go all the way up to the maximum intake you can consume while being adherent and not feeling like you're being deprived of the other two macronutrients. This will likely be a different number for everyone depending on their own preferences. I personally [Layne] consume approximately 3 grams per kilogram of lean body mass (or 2.5 grams per kilogram of body weight). That's what allows me to feel satiated but also enjoy a reasonable amount of carbohydrates and fats. However, if you utterly despise protein, then we suggest eating as high of a protein diet as you can tolerate and stick to—then filling in the rest of your diet with carbohydrates and fats. It might not be theoretically optimal, but if we remember that sustainability and adherence are the *most* important factors for long-term diet success, then eating a normal-protein diet may be superior to a high-protein diet if it allows you to *better* adhere to the diet. This is where individual preference comes into play.

All of that said, if you're a hardcore bro and just don't feel right unless you're stuffing a metric ton of chicken breasts down your throat every day, there's probably nothing wrong with eating more protein.

It's unlikely to harm you, but keep in mind that:

1. Intakes over 2.8 grams per kilogram per day haven't been assessed for long term safety, although we have little reason to believe that they will be dangerous
2. By consuming more protein, you're taking calories away from other mac-

ronutrients (carbs and fats) that also have specific valuable attributes, and
3. You are creating a more extreme diet that is going to be more difficult to stick to.

Now that we've come up with a protein amount, we need to deduct that amount from our overall calories.

So, if we look back at Chapter 6, we can see that we calculated our 100-kilogram man's daily calories to lose approximately 0.6 kilograms (0.6% of his body weight) per week at 2242 calories per day. We calculated his protein at 190 grams per day. As protein is 4 calories per gram, calories from protein per day is: 190 g protein/day × 4 calories/g = 760 calories from protein per day. If we subtract this number from his daily calorie intake of 2242 calories, we get 1482 calories left to allot for carbohydrates and fats.

As for our hypothetical woman from earlier, her daily calorie intake for a deficit to lose approximately 0.9 kilograms (1.0% of her body weight) per week was determined to be 1428 calories per day. We calculated her protein at 175 grams per day. 175 g protein/day × 4 calories/g = 700 calories from protein per day. If we subtract this from her daily calorie intake of 1428, we get 728 calories left to allot for carbohydrates and fats.

Protein Safety?

Some of you may be concerned about high-protein diets from fear-mongering by the media, and from vegan zealots who want to convince people to eat low protein diets so that they eat less animals (no hate intended toward the ethics associated with veganism; only those who twist science to support their beliefs). A myriad of illnesses have been ascribed to high-protein diets including cancer, cardiovascular disease (CVD), bone loss, kidney failure, and liver damage. With-

out getting into gory detail about how much of this data has been twisted to suit agendas, we can say with no reservations that we aren't aware of *any* studies demonstrating that protein damages a healthy kidney or liver. Even in people with kidney failure, it's debatable whether reducing protein actually helps or hurts people suffering from kidney disease.[9] [10] [11]

Some have postulated that a high-protein diet increases the risk of cancer based on protein's effects on mTOR and IGF-1 (insulin like growth factor - 1). Indeed, high levels of IGF-1 are associated with cancer, and mTOR inhibitors are targets of cancer drugs. Since protein stimulates mTOR, it should be pretty straightforward that protein would increase cancer risk right? Well, not really. There's a big difference between demonstrating a physiological outcome versus showing changes in short-term markers that are associated with diseases. A key point to realize is that there's also a big difference in acute increases in hormones and signaling molecules versus chronic elevations. One is a natural flux of the body, and the other is dangerous. Think about exercise for a moment. We know that exercise is healthy for you and and decreases your risk of disease. However, if you looked at what exercise does to short-term markers of health, you'd think it was the worst thing in the world for you. In the short term, exercise elevates your heart rate, raises your blood pressure, increases the production of free radicals, and increases your levels of inflammation. Stop the presses, you better stop exercising, right? Of course not, because all these markers return to baseline within a short period of time. The same is true for protein. The stimulatory effect of protein on hormones and signaling is acute and returns to baseline.

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9 (n.d.). Dietary protein intake and renal function - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1262767/

10 (2014, November 25). Intradialytic protein supplementation reduces inflammation and ... - NCBI. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25455421

11 (2016, October 11). A High Protein Diet Has No Harmful Effects: A One-Year ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5078648/

Most studies that have attributed cancer risk to protein have done so using correlation data. Many people make the mistake of assuming a correlation is the same thing as causation, but that's often not the case. For example, I wake up and eat breakfast virtually every day (usually egg whites and bacon), and answer emails. Answering emails did not cause me to eat eggs and bacon. Likewise, eating eggs and bacon did not cause me to answer emails, but both of these things almost always happen together in a high correlation. They're highly correlated but non-causal due to many confounding factors. Correlation data is quite similar. Now, sometimes things have such strong and supported correlations that we can make reasonable assumptions about causation. Since high-protein diets are associated with higher-fat and calorie intakes due to high meat consumption as well as low vegetable and fiber consumption, it's difficult to draw the conclusion that specifically protein causes cancer; people with high protein intakes may just tend to have more unhealthy lifestyles, overall. It's also difficult to draw a conclusion that protein causes cancer, especially when you consider that higher protein intakes improved survival rates in breast cancer patients.[12]

Protein certainly doesn't appear to have a negative effect on heart disease. In fact, higher-protein diets appear to improve blood lipids and lower inflammation and blood pressure.[13] [14] [15] [16] [17] High protein diets are *correlated* with higher

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12 (2016, November 7). Protein Intake and Breast Cancer Survival in the Nurses ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5456374/

13 (2016, September 14). Effects of High Protein and Balanced Diets on Lipid ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5036282/

14 (2008, November 7). Moderate carbohydrate, moderate protein weight loss diet ... - NCBI. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18990242

15 (2009, March 13). Dietary Guidelines should reflect new understandings ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2666737/

16 (2016, October 17). Isocaloric Diets High in Animal or Plant Protein Reduce Liver ... - NCBI. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27765690

17 (2014, April 30). Advice to follow a low-carbohydrate diet has a favourable ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4025600/

incidence of CVD, but this is confounded by the fact that most people who consume a high-protein diet do so not to lose weight and control calories, but as a side effect of high meat, calorie, and fat consumption, overall. Our opinion is the high calorie and fat consumption drives the increased CVD risk seen with high-protein intakes, because when calories are controlled, higher-protein diets actually result in the same if not *better* outcomes in markers of CVD.

High-protein critics have also used bone health as also another concern. High-protein diets have been shown to increase calcium excretion, and this has led critics to determine that higher-protein diets must be causing bone loss. This doesn't appear to be the case, since numerous studies and meta-analyses have demonstrated that protein doesn't cause bone loss.[18] [19] How is this possible, when high protein increases calcium excretion? It's been hypothesized that higher protein intakes may cause increased calcium absorption while low protein diets decrease calcium absorption.[20] [21] Indeed, when calcium intakes are adequate, high-protein diets actually have a favorable effect on bone.[22] [23]

We don't want to make it sound like high-protein diets have zero downsides. There may be some downsides. There are also downsides to vegan diets, LCHF diets, and HCLF diets. The reality that some people don't want to accept is that

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18 (2017, April 12). Dietary protein and bone health: a systematic review and meta ... - NCBI. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28404575

19 (n.d.). Dietary protein and bone health. - NCBI. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15018487

20 (n.d.). Dietary protein affects intestinal calcium absorption. - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/9771863

21 (n.d.). Dietary protein, calcium metabolism, and skeletal ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12936953

22 (n.d.). Dietary protein is beneficial to bone health under ... - NCBI - NIH. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4180248/

23 (n.d.). Amount and type of protein influences bone health. - NCBI. Retrieved August 30, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18469289

there's probably not one perfect diet to prevent every disease; in fact, it would be silly to assume there is. Protecting against one disease may actually increase the risk of another and vice versa. e do know that exercising and reducing obesity have huge positive impacts on the risks of all these diseases. Therefore, whatever diet allows you to most effectively maintain a healthy overall body weight is likely to have the biggest positive effect on your overall health. So, if a high protein diet allows you to be more satiated, have better adherence to diet, and increase your fat loss and LBM retention, then it can be a helpful tool that shouldn't be feared.

Carbohydrates and Fats

When we discuss how many carbohydrates and fats to consume, we usually discuss them together rather than separately. From an organizational standpoint, it make sense to discuss them separately, but from a scientific perspective, it doesn't, since they're intrinsically tied together. Let me explain what we mean. If we know our total calories, and we know how much protein we're meant to consume per day, then the leftover calories can only be allocated to carbohydrate and fats. Thus, if you consume higher carbohydrates, you'll consume lower fat by default. If you consume higher fat, you'll consume lower carbohydrate by default. This concept is lost on about 95% of the public, but more on that later. It's like a sliding scale. As one goes up, the other goes down to match it so that your remaining calories (after protein has been deducted) are still the same.

We've already discussed the carbs versus fat data in fine detail, so we won't rehash it. Considering how clear the data is, it's amazing how confused the general public is when it comes to carbs and fats. This either means that we as scientists are doing a poor job of conveying our consensus to the public, or the media and charlatans are purposefully misrepresenting the data to create hype and sell products, diets, and news. Much of what you hear in the media is, at worst, purposefully misrepresented to drive an agenda. In the 70s and 80s, it

was the anti-fat crusade, and now it's the anti-carb and anti-sugar crusade. Meanwhile, obesity is still climbing regardless. At best, the people presenting the research are too ignorant to understand what the data is actually telling them. The vast majority of these studies are free living subjects, and the comparison diets are *not* calorie-controlled. That is, they just instruct them on a certain way of eating and let them go.

In these types of studies, it does appear that reduced-carbohydrate diets might have an advantage in fat loss, but that advantage is completely explained by the fact that people eating a reduced-carb diet simply tend to eat more protein and fewer overall calories.[24] Satiety is very individual, however, and some people seem to be more satiated by carbohydrate compared to fat.[25] In fact, an analysis of satiety research has demonstrated that per gram, fat is more satiating than carbohydrate, but *per calorie* (recall that fat has 9 kcal per gram versus 4 kcal per gram for carbohydrate), the effect of carbohydrate and fat are similar, with carbohydrate possibly having a *greater* effect on satiety due to fiber.[26] As we have repeatedly demonstrated, when overall calories and protein are controlled, the studies show very little difference in weight loss and fat loss—although HCLF may have a small advantage when carbohydrate is substituted for fat on a per-calorie basis.[27] That being said, some people find that reduced carbohydrate diets have a greater satiating effect, and that benefit should be considered. However, a recent study demonstrated that competitors who placed better at natural bodybuilding shows tended to consume higher levels of car-

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24 Ketogenic low-carbohydrate diets have no metabolic advantage over .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16685046

25 (n.d.). The effects of high-carbohydrate vs high-fat breakfasts on ... - NCBI. Retrieved September 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/10435117

26 (n.d.). Carbohydrates, fats, and satiety. - NCBI - NIH. Retrieved September 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/7900695

27 (n.d.). Calorie for Calorie, Dietary Fat Restriction Results in ... - NCBI - NIH. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26278052

bohydrates in their diet.[28] What does all this mean? It means on average, carbs and fats appear to be interchangeable on a per-calorie basis. However, if *you* as an individual feel better or more satiated with one macronutrient intake versus another, then that's a perfectly good reason to eat that way. Further, if you find a specific way of eating is more sustainable for you, whether it's low carb, low fat, intermittent fasting, etc., then that may just be the best diet *for you.* , However, it doesn't mean it's the best way for everyone to eat.

Despite this data, anti-carb zealots will claim that carbs cause insulin release, which completely blocks fat burning and induces insulin resistance. On the other end of the spectrum, anti-fat zealots will claim that fat causes insulin resistance and heart disease, and it's so calorically dense that it caused the obesity crisis. The fact is that while overeating both of these macronutrients can lead to insulin resistance, heart disease, and obesity—due to overall excessive calorie consumption—when protein and calories are controlled, your distribution of carbohydrates and fats don't seem to matter much for fat loss.

Another popular myth was that fat-containing meals and carbohydrate-containing meals should be separated. This arose in the early 2000s, with the logic being that insulin increases dietary fat disposal into adipose tissue. So as as long as you seperate your fats from your carbs, the fat can't be stored in adipose, since there's no increase in insulin. Also, because de novo lipogenesis isn't a significant contributor of fat gain, there should be very little fat storage if you're separating your carb meals and fat meals. This hypothesis omits several facts. First and most importantly, fats do *not* need insulin to be stored in adipose. Acyl carrier protein (ACP) can put fats in adipose with absolutely no increase in insulin. Second, fats remain elevated in the bloodstream *much* longer than carbohydrates; from eight to 10 hours depending on how much fat is in the meal. Therefore, unless you're having all your carbs in the morning and all your fats

28 Nutritional strategies of high level natural bodybuilders during .... Retrieved January 16, 2018, from https://jissn.biomedcentral.com/articles/10.1186/s12970-018-0209-z

at night, there will likely almost always be elevated fats in your bloodstream when insulin is elevated at some point (unless you're doing a ketogenic diet). This doesn't even touch on the lack of sustainability of this approach. Good luck trying to implement it.

So, what *should* you do with your distribution of carbohydrate and fat calories? Well, it's up to you. The research pretty clearly demonstrates that fat loss and muscle retention won't be different when calories and protein are equated, so you should use the easiest breakdown for you. But if carb and fat breakdown doesn't matter, why not just track total calories and protein? If you're tracking protein and calories, then theoretically you wouldn't sacrifice any potential fat loss by just tracking protein and calories instead of protein, carbohydrates, and fats, right? Since we've established that, for the most part, carbohydrate and fat calories are interchangeable (though low fat may have a slight pure fat loss advantage). That's certainly an option, and we use it with clients who find tracking all three macronutrients too tedious and difficult. However, we don't believe it's always the best option. Even though your breakdown of carbs and fats may not affect fat loss, we think it's important to pick a breakdown of carbs and fats and be consistent with it. The body strives to maintain homeostasis—it likes being in a "groove," so to speak. Think about when you typically have your best workouts or feel your best. It's usually when you're in a normal place in your life, on a regular schedule, and consistently eating the same things at the same times. Now, think about the worst you've felt in your life—or the worst training you've had in your life. It was probably during times of stress when your schedule was irregular and your eating was all over the place. For this reason, we think it's important to pick a carb and fat distribution and stick to it.

Your metabolism upregulates and downregulates certain areas based on your nutrient intake. If we take an extreme example like a ketogenic diet, which is a diet very low in carbohydrate and very high in fat, your body cannot produce glucose quickly enough to maintain blood glucose levels and run your body's processes.

In response, your body increases the rate of glucose production (called gluconeogenesis) and the rate of ketone production in the liver. These ketones can then be used by most tissues in the body for energy, sparing glucose for the absolutely essential processes.[29] It also drastically down-regulates areas of metabolism that deal with glucose disposal, since glucose intake is very low. So, what happens if you get used to this and then throw high carbohydrate into the mix? The research shows that you aren't able to dispose of glucose well. The ketogenic diet didn't turn you into a Type II Diabetic, but rather you just didn't use the processes associated with glucose disposal during that time. But, if you get into a good groove for a decent amount of time, and you have a day where you "trade" some carbs and fats, you'll be fine if you're within your daily caloric intake.

Think about metabolism like a military factory. Let's say it makes planes and ships. Like all factories, let's also assume this factory has a certain number of employees. If a huge contract came in for planes, the factory would shift its focus to manufacturing planes. They wouldn't use the machines specifically for ships during that time. If they got a huge contract for ships right as the plane project was winding down, the ship machinery would need some maintenance and tune ups, and the employees would have to re-familiarize themselves with it. So they'll be able to make ships again, but there will be a bit of a lag time while they re-acclimate to the process. Metabolism isn't exactly the same, but the comparison is pretty accurate.

With that said, our recommendations for carb and fat distribution are as follows:

- Pick something that you enjoy and perform well on
- Pick something that you can adhere to
- Pick something that minimizes your daily hunger
- Make sure, at bare minimum, to hit your fiber target
- Be consistent with your breakdown

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29 (2013, June 5). Ketosis proportionately spares glucose utilization in brain - NCBI - NIH. Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3734783/

We realize that leaves a lot of room for interpretation, and you may not know what you prefer or where to start. Obviously, every individual is different, but we've found that a good starting place for carbs and fats is around a 55/45 to 60/40 ratio of carbs to fats after deducting protein calories from total energy intake. For our male example, remember his calculated daily calories were 2242, and he consumes 190 grams of protein per day (190 g protein × 4 calories/g protein = 760 calories from protein). So, if we subtract his protein calories from his daily calories, we'll be left with carb/fat calories. 2242 - 760 = 1482 calories from carb/fat. If 60% gets allocated to carbs and 40% to fat, that comes to 889 calories from carbs and 593 calories from fat. Since carbohydrate is four calories per gram and fat is nine calories per gram we're left with:

Daily Carb intake = 889 kcal ÷ 4 kcal/g = 222.25 g carbs (rounded to 220 grams)

Daily Fat intake = 593 ÷ 9 kcal/g = 65.9 g fat (rounded to 65 grams)

So, his total average daily macros end up being 190 grams of protein, 220 grams of carbohydrate, and 65 grams of fat. This's a pretty reasonable and balanced intake, and it's sustainable for most people. However, this individual has a pretty fast metabolism. Let's look at our female example. Her average daily total deficit calories were 1428. We calculated a protein intake of 175 grams per day (175 g protein × 4 kcal/g protein = 700), so if we subtract her protein calories from her daily 1428 calories, we're left with 728 calories for carbs and fats. If we change it up for the sake of showing different calculations and distribute 55% of that to carbohydrate and 45% to fat, we're left with 400.4 calories from carbs (rounded to 400) and 327.6 calories from fats (rounded to 328). If we divide carbohydrate calories by four and fat calories by nine, we're left with:

Daily Carb intake = 400 kcal ÷ 4 kcal/g = 100 g carbs

Daily Fat intake = 328 ÷ 9 kcal/g = 36.4 g fat (rounded to 35 grams)

Now, you might look at this and go, "Whoa, that's a pretty low carb and fat intake," and indeed it is. This is one of the downsides to choosing an aggressive rate of fat loss; you'll have much lower macros, and it will be harder to adhere to if you don't have a very fast metabolism. That's why we generally recommend using a more moderate approach and keeping your goal within the 0.4-0.8% body weight loss per week target, with 1% being an absolute maximum. Further, the more aggressively you start your fat loss diet calories, the more severe the metabolic adaptive response will be. You'll lose more fat more quickly in the short term with, but you probably won't lose more fat in the long term.

To summarize calculating carbohydrates and fats:

1. **Determine total average daily calories as specified previously**
2. **Determine protein intake as specified previously**
3. **Subtract calories from protein from total daily average calories**
4. **Distribute remaining calories to carbs and fats as per your preference**
5. **Divide carb calories by 4 and fat calories by 9 to determine daily carb and fat gram intakes**

For those of you who hate math, we developed a quick and easy reference table (originally published in our contest prep book). This chart is based on various daily calorie intakes from carb and fat (after protein has been deducted), and how they would be distributed based on your preference.

CHO/ Fat %	10/ 90	20/ 80	30/ 70	40/ 60	50/ 50	60/ 40	70/ 30	80/ 20
2200	55/220	110/196	165/171	220/147	275/122	330/98	385/73	440/49
2100	53/210	105/187	158/163	210/140	263/117	315/93	368/70	420/47
2000	50/200	100/178	150/156	200/133	250/111	300/89	350/67	400/44
1900	48/190	95/169	143/148	190/127	238/106	285/84	333/63	380/42
1800	45/180	90/160	135/140	180/120	225/100	270/80	315/60	360/40
1700	43/170	85/151	128/132	170/113	213/94	255/76	298/57	340/38
1600	40/160	80/142	120/124	160/107	200/89	240/71	280/53	320/36
1500	38/150	75/133	113/117	150/100	188/83	225/67	263/50	300/33
1400	35/140	70/124	105/109	140/93	175/78	210/62	245/47	280/31
1300	33/130	65/116	98/101	130/87	163/72	195/58	228/43	260/29
1200	30/120	60/107	90/93	120/80	150/67	180/53	210/40	240/27
1100	28/110	55/98	83/86	110/73	138/61	165/49	193/37	220/24
1000	25/100	50/89	75/78	100/67	125/56	150/44	175/33	200/22
900	23/90	45/80	68/70	90/60	113/50	135/40	158/30	180/20
800	20/80	40/71	60/62	80/53	100/44	120/36	140/27	160/18
700	18/70	35/62	53/54	70/47	88/39	105/31	123/23	140/16

Table 2. Distribution of *remaining* calories from carbohydrate and fat after protein calories have been subtracted. The column on the far left is the calories remaining to distribute to carbohydrate and fat. Each column thereafter shows the breakdown of grams of carbohydrate and fat provided by each particular breakdown at each remaining calorie level.

We want to emphasize that the calorie amounts listed in the column furthest to the left are *not* total calorie intakes. **These are the remaining calories from carbs and fats after protein calories have been subtracted.** Further, the macro breakdowns are listed with the carb value first, and then the fat value. We omitted the 90/10 column from the original table because we don't feel it's a reasonable or healthy intake—the fat is too low. If you recall the earlier section where we mentioned the possible hormonal repercussions of not getting enough fat, it's pretty important. You could argue that the fat intakes in the 80/20 column are too low, and they're certainly borderline, especially when you get lower than 1300 calories remaining from carbs and fats. There's evidence that too few fats in a diet may impede hormone production.[30] It's debatable whether this is actually a function of low dietary fat relative to carb, or if it's just a function of low total calories overall (testosterone drops on caloric restriction regardless) but since there are essential fatty acids in fat that your body cannot make, we don't recommend going much below 30% of total calories remaining for carbs and fats.

For the most part, we recommend trying to stay away from the far-left and far-right ends of this table. The far-left column, and even the column second from left, would be largely considered ketogenic. While it may be attractive to go ketogenic due to all the current hype, if you're going to do it, we do *not* recommend using the cyclical ketogenic approach that many advocate. The benefits of a ketogenic diet are not an increase in fat loss. Remember, there's very little difference in fat loss when calories and protein are equated between diets. The benefits are that some people feel better on a ketogenic diet, are more satiated, and prefer to eat that way. These benefits are due to becoming keto adapted. If you're constantly breaking up your adaptation with high-carb days, you aren't going to get those benefits, because you never sustain adaptation.

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30 Diet and serum sex hormones in healthy men. - NCBI. Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/6538617

Even if you're keto adapted, there are downsides to a ketogenic diet. First, it's difficult for many people to stick to a ketogenic diet over a long period of time. Ketogenic warrior zealots will argue this point, but the fact is that most people cannot completely omit carbohydrate from their diet for long periods of time and adhere to it. In fact, the ketogenic diet has been shown to be an excellent treatment for epilepsy, but many epileptics cannot stick to the diet, even to literally save their lives.[31] Next, another downside is that ketones cannot be used for anaerobic energy production. That type of energy production requires glucose, and with very low carbohydrate intake, you'll likely have reduced muscle glycogen. That means you won't perform quite as well if you're doing intense weight training or repeated sprint-type exercises.[32] Third, unless you plan to eat ketogenic for the rest of your life, you're more likely to experience body fat regain post-diet as you begin eating carbohydrates again, because all the systems dealing with disposing glucose haven't been used.

However, if you personally find that you enjoy the ketogenic diet, have good energy on it, and can adhere to it, then by all means, go for it. It certainly doesn't seem to impede fat loss, but you'll likely need to use a multi-vitamin and fiber supplement, since it may be difficult to meet those requirements while on a ketogenic diet. Also, people with certain diseases and illnesses may be advised against using a ketogenic approach. We suggest consulting with your physician if you're considering a ketogenic diet—or any diet at all.

You may look at the previous calculations and say, "Why not just use percentages for protein, carbohydrate, and fat breakdown?" That's a good question, but keep in mind that while the most important thing is overall calorie intake, the next most important thing is protein intake for lean body mass retention

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31 (2016, February 9). Ketogenic diet and other dietary treatments for epilepsy. - NCBI. Retrieved August 26, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26859528

32 (2017, February 14). Low carbohydrate, high fat diet impairs exercise economy and .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5407976/

and thermogenesis/fat loss. If we use a strict percentage-based program, let's look at how that affects our protein, carbohydrate, and fat intakes. If we have a guy whose maintenance calories are 2400 calories, and he's consuming 2000 calories to lose fat, and he's following a 30/40/30 pro/carb/fat breakdown, then his intake looks like this: 150 grams of protein, 200 grams of carbohydrate, and about 67 grams of fat. If he then stalls in his fat loss and needs to lower calories to say 1800, let's look at what happens to his macros using the same 30/40/30 breakdown. His macros now look like this: 135 grams of protein, 180 grams of carbohydrate, and 60 grams of fat. His protein went down by 15 grams. But as we discussed, protein needs don't go down as calories decrease; if anything, they increase. For that reason, we don't like percentages, because they simply don't hold up as you adjust total calories. It's much more accurate to calculate your daily calories, then determine protein based on the formulas we used earlier, and then determine carbohydrate and fat distribution from the remaining calories.

Fiber

We'd be remiss if we didn't discuss fiber in this book. Fiber is one of your most helpful friends not only for losing weight, but in your life. Fiber is thermogenic to about the same degree as protein, helps add bulk to your food, aids in digestion, and improves satiety in some cases.[33] Not many people have come up with precise calculations for fiber targets, but in general, we think that targeting from 10 to 15 grams of fiber per 1000 calorie intake per day is a good starting point. If you're consuming a diet too low in fiber, it's probably not going to be satiating, and you're going to have issues with bowel movement regularity. Further, you won't be optimizing your opportunity to lose body fat, since you won't be getting the thermogenic effect of fiber. As discussed earlier in this book, the calories in fiber count even though it's thermogenic. While not digested like a

33 (n.d.). The effect of fiber on satiety and food intake: a systematic review. - NCBI. Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23885994

typical carbohydrate, much of the fiber you eat is fermented by the bacteria in your digestive tract and re-absorbed as short chain fatty acids, which still gives you a good amount of calories. Do you get the same calories from fiber as you do from straight starch or glucose? Not really. But it's so variable depending on the specific source of fiber that trying to track each individual source would be almost impossibly difficult, not to mention it can change from individual to individual based on their specific gut microflora. For this reason, we recommend tracking fiber just like you'd track any other source of carbohydrate: at four calories per gram. Better to be safe than sorry, as well as consistent, in our opinion. That said, if you want to track it as 3 calories per gram, that's probably fine as long as you're consistent with it. Personally, we don't want to worry about it for the reasons stated earlier.

Many people read about the benefits of fiber and do what they do with protein: over-consume it. Remember, more isn't better with regards to pretty much everything. Too much of a good thing is still a bad thing. In fact, too much fiber can actually cause gastrointestinal distress, constipation, and malabsorption of some vitamins and minerals. You might also feel bloated. I [Layne] had one client who didn't track his vegetable intake, and he was actually eating a *kilogram* of broccoli per day. He told me he always felt bloated and sluggish. I had him trim his broccoli intake back to around three to four servings per day instead of his usual 10 to 12, and within 48 hours, he couldn't believe how much better he felt. Keep in mind that vegetables and fiber add bulk, which is great, but fiber will also pull water into the GI tract,. This can improve feelings of fullness, but it can also make you feel very bloated if you have too much. This is one of the reasons we recommend keeping your fiber at 10 to 15 grams per 1000 calories, like we mentioned earlier.

What If I Don't Want to Track My Macros?

Many people find tracking stressful, and for some, it can be a trigger for OCD and anxiety. Let us be very clear: there is *no need* to stress about hitting each macro

down to the gram. If you're within 5% of each individual macro target, that's 100% compliance. Even if you're off by a little bit, you can compensate by reducing your calories elsewhere. For example, if you went over on carbohydrates by 20 grams, that's 80 kcals over your target (20 g carbs × 4 kcal/g carbs = 80 kcals). In that case, you could simply compensate by reducing your calories from fats. 80 kcal ÷ 9 kcal/g fat = 8.88 g of fat, rounded to 9 grams of fat. The inverse is also true: if you overeat on fats, simply figure out how many fat calories you overate and correspondingly decrease your calorie intake from carbohydrate.

All that said, if you want to lose weight and body fat, you don't *have to* track your macros. There are numerous other strategies you can use; we just feel that this is the best strategy on average because it teaches you what is actually *in* food. As you learn to track better and better, over time you'll be able to eat more intuitively because you understand what portion sizes look like.

However, if you're someone who can't or won't count macros, then there are options like eating low fat, low carb, time restricted eating (ie. intermittent fasting), high protein-high fiber, and other strategies. Let's be clear, however; any diet that allows you to lose weight and *keep it off* must involve behaviors you can sustain, and it will involve some kind of sacrifice. If you want to be able to enjoy foods you love, you'll have to sacrifice by tracking calories/macros. If you *don't* want to track your intake, then you'll have to sacrifice via some other mechanism, because nothing is free. However, we've come up with what we think is a nice, happy medium for people who don't like tracking but also don't want to give up their favorite foods: track your protein and calories only. Since your carb and fat ratio doesn't seem to matter, there's no reason you can't just track your total calories and protein. If you want to go up one more notch, you could track fiber, as well. If you're hitting your daily calorie target, getting enough protein to optimize LBM and thermogenesis, and consuming enough fiber to help with digestion and satiety, then this might allow you to still be adherent and enjoy flexible dieting while not having to track quite so rigidly. We'd still argue that

it's better to track each individual macronutrient, since it helps ensure consistency from day to day and allows your body to get in a better rhythm—but that's only if it's something you can sustain. Again, remember that adherence and sustainability are the *most* important factors for long-term fat loss. So pick the strategy that works best for *you* in the long term.

Food Choices

Some of you, particularly if you're new to us, may be thinking, "All of this is great, but where is the part where they tell us what foods to eat and which ones to get rid of?" Well, we'll save you time. That section doesn't exist. Why, you ask? Because quite simply, there are no magic foods. This may come as a shock to many of you, but the types of foods you eat affect fat loss *far less* than the amount of the foods you eat. There are no such things as "clean" foods, since "clean" has no objective definition. Certain foods may have more benefits than others because they have more protein and fiber and thus are more thermogenic and filling, but even overeating on these foods can cause you to consume too many total calories for weight loss to occur. You may be able to eat more of these foods relative to foods containing mostly fat and refined sugars, but it doesn't make them a free food, and it doesn't make foods high in carbohydrate, fat, or sugar necessarily "bad." It's just about how you choose to allocate your caloric/macronutrient "budget."

Let's take our two examples from before and examine the same food. If we have our male consuming 2242 calories per day as 190 grams of protein, 220 grams of carbohydrate, and 65 grams of fat, can he afford to consume a Snickers bar each day? A snickers bar is low in protein and fiber, high in carbohydrate and fat, and calorically dense (meaning a small amount has a lot of calories). One normal-sized Snickers bar (53 grams) contains 256 calories, 4 grams of protein, 33 grams of carbs (27 grams of sugar), 12 grams of fat, and 1 gram of fiber. Not

exactly filling and very high in calories, carbs, fats, and sugar. Compare it to a bowl of oatmeal with a tablespoon of peanut butter, which has approximately the same macros yet is much more filling, with more fiber.

But let's say he eats the Snickers bar. If we subtract it from his daily macros, he still has 1986 calories including 186 grams of protein, 187 grams of carbohydrate, and 53 grams of fat. Are those numbers achievable for him, keeping in mind that he should also consume 30 to 40 grams of fiber? It's definitely doable. But let's look at our female consuming 1428 calories per day with 175 grams of protein, 100 grams of carbohydrate, and 35 grams of fat. If she consumes a Snickers bar, she has 175 grams of protein, 67 grams of carbohydrate, and 23 grams of fat left. It's going to be much harder for her to hit her fiber target of 20 to 25 grams.

As I [Layne] alluded to earlier, your daily macronutrient intake is like a budget. If you have a big budget (macro-millionaire) then you can "afford" to have some "junk" or "treats." The same way that a $150,000 sports car is a *terrible* investment but completely doable for someone who makes $10 million per year, because they can buy that fancy sports car and still make their mortgage payment, health insurance payments, etc. That same sports car is going to absolutely obliterate someone who makes $50,000 per year. The sports car is not good or bad, it just "is." The context in which it's purchased will determine if it's a good or bad idea. In this way, things like candy, treats, and other "bad" foods are like the sports car. They're a really bad idea for people with a low budget, because consuming them makes it really hard to hit your target and be satiated. But for someone with a big macro budget, they can be totally fine as long as they take care of their other responsibilities, in this case nutritionally instead of financially. No foods are inherently "bad" or inherently "good" or imbued with special properties. Whether you should include them simply depends on your individual metabolism, goals, and macro "budget.". Trust me on this, I went to do a PhD trying to find magic foods. I *wanted desperately* to find magic nutrition hacks. Why? Because if I did, I'd be floating on a 200-foot yacht somewhere off the

coast of Ibiza popping bottles. But there are no magic foods or nutrition hacks, and I like being able to sleep at night knowing I didn't scam people a hell of a lot more than I'd like a big yacht. Besides, I may not be popping bottles on a 200-foot yacht off the coast of Ibiza, but I'll settle for twisting the top off a cold beer off the coast of St. Pete Beach in my 18.5-foot fishing boat knowing I got it with money that wasn't earned preying on the desperation of others.

Now, we know someone out there will say, "shouldn't we limit sugar!!!???" Of course, they're referring to sugar being insulinogenic. As we've demonstrated repeatedly throughout this book, insulin doesn't make a measurable impact on fat loss when calories and protein are equated. And while high glycemic carbohydrate consumption may cause a bigger spike in insulin, the insulin response will also be of shorter duration compared to a lower GI carbohydrate, which will have a lower peak insulin response but a longer duration due to the rate at which glucose appears. But honestly, who cares about all this hormonal mumbo jumbo? The question should be, does it actually affect fat loss? A study performed by Surwit et al. answered this quite convincingly in our opinion. They put subjects on a weight loss diet that consisted of less than 4% of calories from sugar (around 11 grams of sugar per day) or 43% of calories from sugar (around 118 grams of sugar per day) while keeping total caloric intake the same.[34]

They found that *both* groups lost the same amount of weight and body fat. While this book focuses on weight loss, there may be people out there who worry about overall health. As we have established previously, the majority of the health benefits from dieting come from the weight loss, and the type of diet used to achieve that weight loss is secondary to the caloric restriction. That said, the high-sugar diet showed no differences in most of the health markers (inflammation, blood glucose, etc) assessed during this study when calories were equated. The only difference was in cholesterol. Both groups lowered their blood cholesterol, but

34 Metabolic and behavioral effects of a high-sucrose diet during weight .... Retrieved January 2, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/9094871

the low-sugar group had a slightly better response—however, the difference was very small and likely accounted for by the reduced fiber intake in the high-sugar group. Fiber binds to cholesterol and increases cholesterol excretion, so it would make sense that the high-sugar group wouldn't lower cholesterol quite as much, since their fiber was also lower than the low-sugar group's intake.

We don't want to continue into a lengthy diatribe about sugar. We can save that for Facebook posts and YouTube videos. What we *will* tell you is that if you enjoy eating some sugar and "junk" food, you can do so without derailing your ability to get lean. However, you must understand that it comes at a cost. Eating a Snickers may taste great, but it's not very filling and takes up a large amount of macro budget for the amount of food volume you get. As you get lower and lower in calorie intake through the prep (discussed later), you'll likely want to select foods that are more voluminous to help keep you full. In fact, many flexible dieters with slow metabolisms end up eating pretty "clean" anyway, because it's the only way you can get a large food volume in while calories are low.

The point is that you should give yourself the flexibility to consume foods you enjoy. You'll still have to control portion size, but flexibility will improve adherence and help prevent post-diet weight relapse. Remember, the main focus is sustainability, because we want these changes to last *for life*.

SUMMARY

I know we've thrown a lot of calculations at you, but the take home is:

1. **Determine your maintenance calories either by your food intake and weight changes or by one of the equations we provided**
2. **Determine your required daily deficit to lose the required amount of weight to be stage lean for your category based on a rate of loss that you choose**
3. **Subtract the daily deficit from your maintenance calories to get your daily average deficit calories**
4. **Determine protein intake**
5. **Subtract protein calories from overall calories to get your carb and fat calories**
6. **Choose your carb and fat distribution based on your preferences**
7. **Consume 10-15 grams of fiber per 1000 calories of intake**

9

DEFENDING AGAINST THE SELF DEFENSE SYSTEM

In Defense of...Defense?

We spent the first few chapters scaring the shit out of you (educating you, really) regarding the body's elaborate self-defense system and why diets fail. It's important to understand why the vast majority of people regain weight so that we can also understand what will make you successful. We covered behaviors, dieting strategies, how to determine your calories, and your macronutrient intake, but what about methods to combat this elaborate self-defense system? Are we doomed to always tank our metabolic rate when we diet? As we've discussed, the body's metabolic rate drops significantly more than you would expect based on how much weight you lose in an overreaction to the imposed energy restriction. The sensing of this energy gap causes the body to activate the self-defense system.

So, how do we deal with all this? Is dieting hopeless? Or is there a way to dampen the body's self-defense system? While there's no way to completely eliminate the self-defense system (that would require no energy gap, meaning you also wouldn't lose fat), we do have a few tools that we can use to mitigate the effects. First, do *not* crash diet. The more slowly you lose the weight, the more lean body mass you will retain. Maximizing your retention of lean body mass will help attenuate the slowing of your metabolic rate, because you'll have more metabolically active tissue. It will also help prevent weight regain.

Second, we recommend trying to diet on as many calories as you can. The more calories you can consume and still lose weight, the less activation of the body's self-defense system. Now, you can't say, "I want to lose weight on 8000 calories per day" and make that come true. The minimum caloric deficit weight loss threshold will be different for everyone, but that's why it's so important to go slow. That said, you don't want to start out too conservatively, as we discussed in Chapter 6.

Third, *keep training hard*. As we discussed, training will lower the set point that your body defends, and it's absolutely crucial to preventing weight regain and keeping your progress going. The harder you train (when programmed correctly), the more muscle you're likely to maintain, which benefits your metabolism, as we discussed previously. All of these things are great, but there are also some specific nutritional strategies that may be helpful from a physiological/psychological standpoint to improve adherence and preserve metabolic rate.

Refeeds

The concept of a refeed began with the lore that you can engage in a controlled overfeed during periods of your diet. The goal of this is to raise your leptin and metabolic rate, which will hopefully have a "slingshot" effect on the metabolism to help attenuate some of the metabolic adaptation induced by dieting. There is plenty of data to show that short-term refeeding does increase leptin.[1] Typically, this is done mostly through increasing carbohydrate intake, since carbohydrates—specifically glucose—have a much greater impact on leptin production than fats or protein.[2] Sounds great, right? Eat more and raise your metabolic

1 Effects of short-term carbohydrate or fat overfeeding on energy ... - NCBI. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/11126336

2 Dietary intakes and leptin concentrations - NCBI - NIH. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4251481/

rate? Who doesn't like that idea? Well, it's not quite that simple. While refeeds have been shown to increase metabolic rate in the short term, there is no data showing that they actually improve fat loss during a diet.[3] [4] [5] That seems a bit counterintuitive given that we just said they increased metabolic rate and leptin, but these changes are all very transient. The rise in metabolic rate and leptin is short-lived, and it quickly returns to baseline once your calories come back down. In fact, of the studies examining diets that used higher-calorie days, thus far none have demonstrated superior fat loss compared to diets that were the same amount of daily calories. While an increase in metabolic rate is great, you have to keep in mind that you can still store body fat during a refeed.

Consider this hypothetical example: if a refeed boosted your metabolic rate by 1000 calories for the day, but you had to eat an extra 2000 calories to get that boost, then that means you actually stored 1000 calories—which means it was a net negative on your progress. Based on the research, it appears that weekly caloric deficit makes the difference, not varying the high and low calorie days.

That doesn't mean we think refeeds or high-calorie days are useless. We're just laying out the data. We still use refeeds for a few reasons. First and foremost, many people just prefer to diet that way. Some people, (Layne included), would rather eat 2000 calories five days per week so that they can have two days per week at 3750 calories and enjoy some tastier treats and bigger meals. Based on current data, you should do whatever you personally prefer. We know higher-calorie days can break up the monotony of dieting for some, and they also allow more flexibility for a meal out with friends or family, or some nice dessert.

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3 Intermittent versus daily calorie restriction .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21410865

4 The effects of intermittent or continuous energy restriction on weight .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20921964

5 Effects of intermittent compared to continuous energy restriction ... - NCBI. Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25826770

Others may prefer the same intake every day. This gives them a higher daily calorie intake every day rather than "low" and "high" days. Or you can use these strategies on an as-needed basis. For example, you typically eat 2000 calories per day, but you know that you have a dinner out with friends coming up, and you'd like more flexibility. It's okay to eat 1750 calories for four days followed by a day at 2500 to accommodate the lavish dinner. Fat loss should be the same as long as the weekly deficit is still the same.

What we *don't* recommend is starving yourself for most of the week so you can have a massive binge day. Eating 1000 calories for 6 days so that you can have an 8000 calorie binge-fest is not appropriate. In general, we don't recommend that your high-calorie days exceed your low-calorie days by more than double. If your daily average is 1800 calories, we don't recommend having a high day at more than 3600 calories, and that's still really pushing it. When we use refeeds, we normally stay closer to 40% to 60% over the "normal" calorie level.

That's all the scientific talk, but we can tell you anecdotally that, as coaches, we've observed different reactions to high-calorie days. Some people respond very poorly and soak up every calorie and retain it, and then spend all their low-calorie days trying to take off what they put on. Yet we've had others who seemed to be at a standstill with their fat loss, and then they had a high calorie day or two and a few days later they start losing again. Further, some individuals report ravenous hunger on refeed days while others feel quite satiated. We don't have any peer-reviewed studies to give you on this, but we've definitely observed it. It's also important to point out that, thus far, the vast majority of data on refeeds has looked at isolated high-calorie and non-consecutive days.

Several highly regarded coaches we trust as well as a few scientists who work in experiments with people have told us that they've had quite a bit of success with consecutive-day refeeding. That is, at least two consecutive days of increased calories. Perhaps one day is not sufficient for anything more than a

transient boost in metabolic rate, and something about multiple days of refeeding is enough to actually make a difference. At this point, we simply don't know. What we *do* know is that refeeds don't seem to offer too much magic, but they are a tool some people like to use.

A novice will erroneously equate refeeds with cheat meals, but there are some differences. Refeeds are more structured and planned. We don't like using the phrase "cheat meal" for several reasons. First, it attaches ethical judgement to food, which can lead to guilt, and that's never an appropriate response. We've seen way too many people end up binge-eating during cheat meals because they feel guilty, and they enter what we like to call "fuck-it mode." When you're at that point, you might say to yourself. "Well, I've already had one slice of pizza and blown my diet, so I might as well eat the entire thing." This line of thinking is very common in the dieting community, and it tends to be associated with ultra-restrictive diets like "clean" eating. Binging because you ate a single slice of pizza and feel like you ruined your diet is like getting a flat tire and then slashing your other three tires. Fuck it, might as well, since you won't get anywhere, right? Obviously, we don't recommend this. If your diet is sustainable, then why would you feel the need to cheat on it? If you want more calories on a certain day so that you can fit in more fun foods, then budget for it with your calories just like a financially responsible person would budget for a big purchase. Like cheat meals, refeed days will have you go over your normal daily calories, but it's going to be targeted. Typically, refeed days have an increase in carbohydrate intake and a decrease or maintenance of protein and fats. The caloric increase will raise your leptin levels and reduce ghrelin levels, both of which may help improve your satiation.

To structure a refeed, here's a brief guide:

- Reduce protein intake to non-deficit levels based on Table 1 in Chapter 8.
- Fats are usually maintained

- Typically, calories are raised to maintenance if not more
- Increase carbohydrate intake to fill in remaining calories
- If you prefer to have more fats on your refeed day, that's still okay, because at the end of the day, the most important thing is for this to be sustainable. While there *may* be certain advantages to increasing carbohydrates only, it's likely not a huge advantage compared to fats, and as of now there isn't enough research on refeeds to truly know.

So, what would this actually look like? Let's take our 100-kilogram man from earlier. His average daily deficit calories were calculated to be 2242 calories per day. This translates to 15694 calories per week. If he wanted to do two high-calorie days at his maintenance calories, that would put him at 2800 calories on those two days. That's 5600 (2800 × 2 = 5600) calories total for refeed days. We then subtract that from his weekly calorie intake: 15694 - 5600 = 10094. We then divide that by the remaining 5 days 10094 ÷ 5 = 2019 calories per day on his low days.

Then we can determine his macros by the same formulas as earlier. Briefly, his protein was calculated at 190 grams per day. 190 grams of protein is 760 calories (190 4 = 760), and if we subtract this from 2019, we're left with 1259 calories for carbs and fats. His carbs and fats are then placed in a 60/40 ratio (personal preference). 1259 × 0.6 = 755.4 calories from carbs, rounded to 755 calories. We divide that by 4 to get 188.75 grams of carbohydrate per day, rounded to 190 grams. To get the fat numbers, we take 1259 × 0.4 = 503.6 calories (rounded to 504) from fat. 504 ÷ 9 = 56 grams of fat. So with this, his low-day numbers look like 190 grams of protein, 190 grams of carbohydrate, and 55 grams of fat.

His high-day numbers can be determined the same way. First we drop his protein to 2 grams per kilogram of LBM (See Table 1 in Chapter 3) since he's no longer in a deficit on those high days, but rather at maintenance, which is 80 kg × 2 = 160 grams of protein. You don't have to drop your protein if you don't want to, but the option is there, since calories from carbs and fats are protein-sparing,

and you won't need as much on your higher-calorie days. 160 grams of protein is equal to 640 calories (160 g × 4 = 640) . 2800 - 640 = 2160. If we keep fats at 55 grams per day and only increase carbohydrate (since leptin is impacted significantly more by carbohydrate intake), that's 495 (55 × 9 = 495) calories from fats. 2160 - 495 = 1665 calories left for carbohydrate. If we then divide this number by 4, we get 416.25 grams, rounded to 415 grams of carbohydrate. So, his high day numbers end up at 160 grams of protein, 415 grams of carbohydrate, and 55 grams of fat. Alternatively, if he found it was better for adherence to increase his carbs and fats in the same proportion of 60/40, then that would be fine. He would take his leftover 2160 calories after subtracting protein and take 2160 × 0.6 = 1296 calories from carbs. 1296 ÷ 4 = 324 g carbohydrate, rounded to 325 grams. Then to determine fat: 2160 × 0.4 = 864 calories from fat. 864 ÷ 9 = 96 grams of fat. Thus, if he kept his ratios the same, his macros on his high days would be 160 grams of protein, 325 grams of carbohydrate, and 95 grams of fat.

Here's a summary if you choose to employ refeeds/high calorie days:

1. Determine weekly calorie intake
2. Choose number of high-calorie days
3. Choose how high calorie you would like your high-calorie days (the higher the calories on the high days, the lower the calories will be on the low days). Typically this number is around maintenance calorie level or greater.
4. Multiply the number of high-calorie days by the calorie amount of the high-calorie days. This will give you total calories consumed on high-calorie days
5. Subtract total calories consumed on high days from weekly calorie intake, which leaves you with the calories for your low-calorie days.
6. Divide your total low-day calories by the number of low-calorie days to get your daily low-calorie day intake
7. Determine macronutrients for each day as described previously

Diet Breaks

The research on diet breaks is relatively new, but the idea of diet breaks has been around for five or more years. Eric Helms, Leigh Peele, and several others have written about them over the years, but now we have it in a formal research setting from the University of Tasmania.[6] We would like to note, though, that the other strategies listed above are a diet break of sorts, as well. But the MATADOR study describes intermittent periods of caloric deficits and maintenance periods longer than just a day or two.

Briefly, 51 obese men were divided into two groups. One group restricted caloric intake for 16 consecutive weeks, or they alternated a caloric deficit with maintenance eating for two periods totalling 30 weeks. For the latter group, they still had 16 weeks of a caloric deficit like the former group, but they alternated it with two-week periods of maintenance eating. So, for this group, their participation looked like this: Two weeks deficit, two weeks maintenance, and so on until they reached 30 weeks total.

Prior to any caloric restriction, 47 of the participants established a baseline. From there, they ate in a deficit of 67% of their maintenance calories. At the end, the group with intermittent caloric restriction had lost more weight per weeks dieting than the group at the consistent deficit. Not only that, but when they adjusted for changes in body composition, the intermittent group was found to have maintained a higher BMR than the group who had a continual deficit. The upside to this is that the intermittent maintenance period seems to suggest the possibility of successfully dieting while staving off many of the negative metabolic adaptations.

I'm sure many people will be very excited to implement this. Only two weeks of dieting at a time and I'll lose more fat, you say? Who wouldn't want this? Well,

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6 (2017, August 17). Intermittent energy restriction improves weight loss efficiency ... - Nature. Retrieved January 3, 2018, from https://www.nature.com/articles/ijo2017206

before you go too crazy, keep in mind there are some drawbacks to this method. There are no perfect diet methodologies; everything is a tool and has trade-offs. While the diet breaks group lost more weight compared to the continuous group per 16 weeks of dieting, remember that it took the diet breaks group 30 weeks to get 16 weeks of actual dieting spent in a caloric deficit. While they lost more weight on an absolute scale, it did actually take them longer in total, because they didn't really lose weight during the 14 total weeks of diet breaks– they just maintained it. So this may be a good strategy for you if you're willing to be patient. And honestly, if you want to lose weight and keep it off, patience is something you'll need a *lot* of.

Another drawback to this approach is that eating 67% of maintenance calories during the diet period is pretty aggressive, even if it's only 14 days. If we use our guy from earlier whose maintenance was 2800 and have him eat at 67% of that intake, that's only 1876 calories. That's a steep deficit of almost 1000 calories per day. And if we look at our hypothetical woman, it's even less. For her, 67% of maintenance calories at 2350 per day would equal approximately 1575 calories. Not exactly a lot of calories. Many people may find it difficult to stick with this sort of approach, since it will be very restrictive during the calorie deficit period. Additionally, the MATADOR study also adjusted the "maintenance calories" used in the diet break period to account for any metabolic adaptation. That is, every two-week period, they recalculated the subjects' maintenance calories using the Müller equation (see Chapter 6) by entering the subjects' new data (changes in lean body mass and fat mass). So, if you're performing this sort of dieting, keep in mind that your maintenance calories will change, and you'll have to recalculate them using one of the equations we discussed earlier, or else recalculate your maintenance calories using the trial-and-error method we also went over. This is important because your metabolism is going to slow down when you diet as discussed in Chapter 3, and therefore it's important to accommodate for this slowing of metabolic rate when we attempt to calculate what your *current* maintenance is versus what it was when you started a diet.

Keep in mind there are no rules that say you *have* to eat at 67% of maintenance calories for two weeks. This is just what was done in this single experiment. We know it works, but we don't know if that's necessarily optimal. Studies are great, but they only answer a very specific question, and many times the researchers are extremely restrained due to attempting to control for as many variables as possible. Why couldn't you do a three-week diet at 78% of maintenance calories rather than 67% for two weeks? We say 78% because that's what it would be if you spread the same deficit over three weeks instead of two. Further, there's nothing that says you need to be this aggressive as long as you can lose the appropriate amount of body fat in the appropriate amount of time. In fact, if you're willing to be patient, you can be a bit more conservative during your deficit weeks.

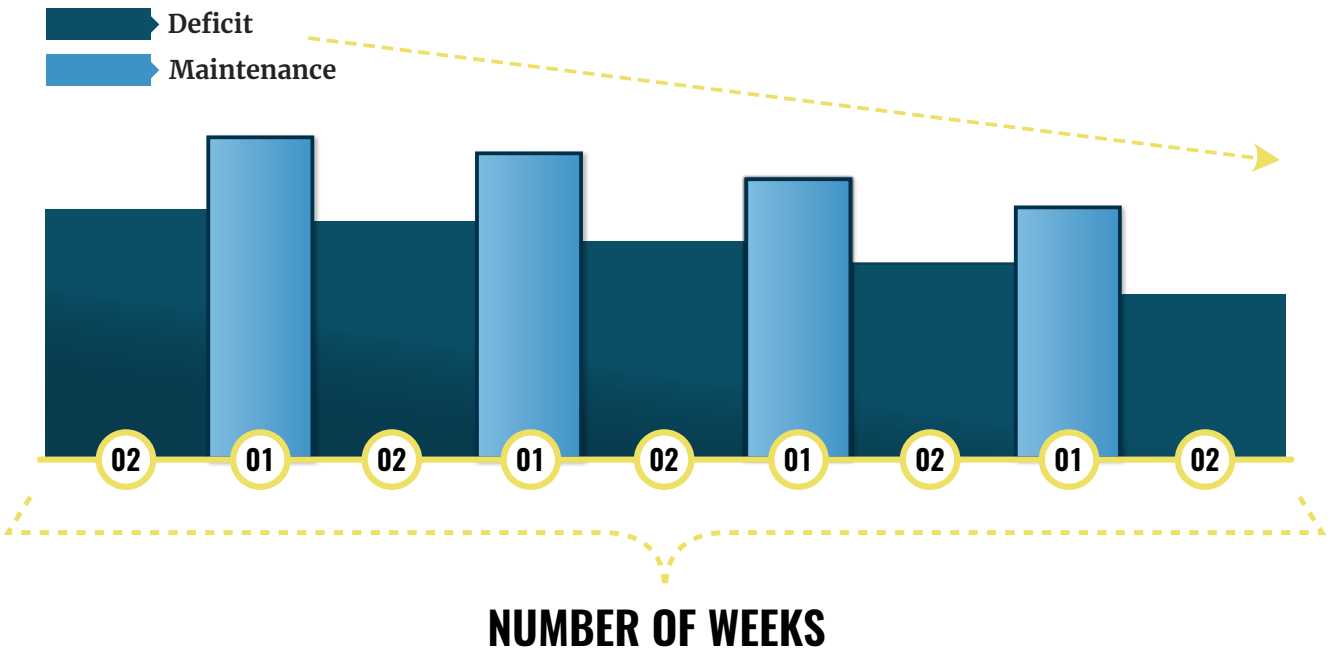

Figure 1: Figure that depicts 5 diet periods with 2 weeks spent in a deficit and 1 diet break week spent at maintenance for a total of 10 diet weeks and 4 diet break weeks.

Or you could be more conservative during your deficit weeks while not taking quite as long of a diet break. We've found great success implementing strategies that employ two- to three-week deficits followed by one- to two-week diet

breaks. In particular, I [Layne] really like a two-week deficit phase followed by a one-week diet break. I find that adherence can improve quite a bit when people realize they can push through 14 days of deficit to have a week at maintenance. It also appears to improve lean body mass retention and help keep progress going.

In the end, there probably isn't a right or wrong way to do these, but rather what's best for you and your situation. If you don't have a weight loss time-frame in mind, you could always be a bit more flexible and take your diet breaks on an as-needed basis. While this can be useful for diet veterans who know what to look for, we worry about this approach for people who struggle with mind games during dieting. Some may end up feeling like they need a diet break all the time and never actually make progress, while others may feel like they never make enough progress and don't "deserve" a diet break. For this reason, we typically plan diet breaks so fat-loss clients don't end up playing too many mind games with themselves.

Let's look at how we would program a two-week diet followed by a two-week diet break for our 100 kilogram male. His average daily deficit calories are 2242, with protein at 190 grams, carbs at 220 grams, and fats at 65 grams. Let's say we want to institute a one-week diet break intermittently after two weeks of dieting. We would plan it like the experiment, with 30 total weeks broken into 16 weeks in a deficit and 14 weeks in a diet break at maintenance. Recall that we estimated he had 12.5 kilograms to lose in total body weight to hit his goal. Previously, we discussed a traditional diet lasting about 21 weeks, which would make his rate of loss approximately 0.6 kilograms per week. If we decided to do 30 weeks total dieting with 16 of those weeks being restriction and 14 weeks being at maintenance, that means he would likely not lose weight during his maintenance periods. Thus, he would only have 16 weeks to lose the 12.5 kilograms. This would put his total rate of loss at around 0.8 kg per week of deficit. That is 0.8% body weight loss per week, which is near the upper limit of what we recommend. However, he'll be instituting diet breaks, which will help keep his metabolism from slowing down and improve lean his body mass retention.

Since we know he needs to lose 0.8 kilograms per week, we can determine what kind of daily average deficit he'll need. If we refer to Table 2 from Chapter 6, we can see that 0.9 multiplied by our factor of 930 kcal per kilogram is approximately a 744-calorie deficit per day during the diet weeks. Now we can calculate his starting macros for dieting weeks and maintenance weeks.

- Recall that his maintenance calories are 2800
- The daily deficit required during diet weeks = 2800 - 744 = 2056
- Protein intake is the same as before (calculated from Table 1 in Chapter 2) of 190 grams per
- Subtract protein calories from daily calories: 2056 - 760 = 1296 calories remaining
- Distribute the remaining calories between carbs and fats (calculate free-hand or use Table 2 in Chapter 8).

In our example, he chose a 60/40 (carb/fat) breakdown, which leaves us with 1296 × 0.6 = 778 calories from carbohydrate, and 1296 × 0.4 = 518 calories from fat. 778 ÷ 4 calories per gram of carbohydrate equals approximately 195 grams of carbohydrate. 518 ÷ 9 calories per gram of fat = 57.5 grams of fat (round to 55 grams or 60 grams if you like).

His diet break numbers *initially* would be maintenance of 2800 calories with the macro breakdown calculated as shown previously in our refeed example. What's important to note is that the "maintenance calories" should *not* be the same for each diet break period. Recall that as you diet, you lose fat mass and lean body mass, and while diet breaks will help prevent metabolism slowing from metabolic adaptation, metabolism will still slow down during dieting due to loss of overall body mass. Thus, we need to recalculate our maintenance calories during each diet break. You could recalculate your diet breaks using the Muller equation, or you could determine maintenance calories manually using the trial-and-error method described in the Chapter 2 Maintenance Calories section.

Remember that whatever method you use, you'll need to always use that method to stay consistent.

Don't get stuck on the idea that you can only do a diet break based on a two-week deficit and -two-week break. You can adapt it and customize it to your needs. For example, how would it look if we did the same thing with our 90 kilogram woman? Recall that she wanted to lose 16 kilograms total at a rate of 1% per week (18 total weeks of dieting). In the original example, we targeted a rate of 0.9 kilograms per week assuming 18 weeks of dieting with no breaks. If we use diet breaks with her but try to stick to the original 18-week mark, it would be almost impossible to do without putting her on very low-calorie deficit weeks. In this case, we might suggest for her to target 0.9 kg per week dieting but then have some diet breaks, as well. Instead of doing two weeks of dieting with a two-week break, which would make her diet a lot longer, we could try using two weeks of dieting followed by a one-week break. This would yield 18 weeks of dieting and 12 weeks of diet breaks for an overall time frame of 30 weeks. Thus, she could use her original macros that we calculated in Chapter 6 for the two-week deficit, and then follow that with one week at maintenance. Recall that her maintenance calories were 2350. Her protein was calculated at 175 grams per day (approximately 3 grams per kilogram LBM). Since her maintenance weeks aren't in a deficit, we can drop it down to 2.3 to 2.6 grams per kilogram LBM based off of Table 1 in Chapter 8. Since she's in the middle of the age range, let's put her at 2.5 grams per kilogram of LBM. Recall that her LBM is 57.6 kilograms. Multiply that by 2.5 grams per kilogram LBM, and we get 144 grams of protein. 145 g of protein × 4 kcal/g = 580 calories from protein. 2350 (maintenance calories) - 580 calories from protein = 1770 calories remaining from carbohydrates and fats. Her carb-to-fat ratio was 55/45; thus if we take 1770 × 0.55 = 973.5 calories. Divide this by 4 kcal per gram to yield 243.4, rounded to 245 grams of carbohydrates. Then take 1770 0.45 = 796.5 calories. Divide this by 9 kcal per gram to yield 88.5 grams of fat, rounded to 90 grams.

Remember that adherence is the most important thing for losing fat and keeping it off. Only utilize diet breaks if they *help* you adhere and increase sustainability

for you. In theory, they should help, because they provide flexibility and breaks from dieting as well as increased LBM retention, which should help promote weight loss and support metabolic rate. However, if trying to calculate your diet breaks, when to take them, how often you should take them, and so on gives you stress, then don't use them. Just because something may physiologically help doesn't mean you *must* use it. Far from it, because these are simply tools at your disposal. They're very useful tools, and we use them often, but *your* diet should be tailored to *you* and *your* preferences.

Another thing to consider is there is no reason you can't combine diet breaks with refeeds during your diet weeks. In the case of our hypothetical woman, suppose she knows that she likes to have one day per week to have higher calories so she has more flexibility. Her average daily deficit calories are 1428, so it's not practical for her to go up to maintenance for one day unless she wants to be *really* low on her other days. Let's say she also wants to have one day per week at maintenance during her two-week dieting phase at 1900 calories. If we subtract 700 calories from protein (175 × 4 = 700), we get 1200 calories remaining for carbs and fats. 1200 × 0.55 = 660 calories from carbohydrate. Divide that by 4 kcal per gram to get 165 grams of carbs. Now, take 1200 × 0.45 = 540 calories from fat. 540 ÷ 9 = 60 grams fat. We can now determine what her six low days would look like if we put in one high day at 1900 calories. We know her average weekly intake to lose 0.9 kilograms per week needs to be 9996 calories (1428 kcal/day × 7 days = 9996). If we subtract her high day of 1900 calories from 9996 - 1900 = 8096 calories. Divide this by 6 to get her low day calories of 1349 calories per day.

Calculating her macros from this is simple, since we've described it many times by now. Briefly, we know that her protein is 175 grams during the deficit. This equates to 700 calories, as we've shown previously. 1349 - 700 = 649. Using the 55/45 carb and fat breakdown as described earlier leaves us with approximately 90 grams of carbs and 30 grams of fat on her low days. Remember, high days don't always have to be maintenance. They can even be below maintenance if you'd rather do that. There are no hard rules with how you utilize diet breaks and refeeds.

Once again, please keep in mind that we're not saying this is the absolute best way to do things. I don't think two weeks at a deficit and one week at maintenance is magic. Neither is a two-week deficit and a two-week break. There probably is an optimal breakdown of diet weeks versus break weeks, but we don't have enough data to determine what that is, and it likely varies from person to person. There's some data suggesting that the majority of metabolic adaptation occurs within the first few weeks of dieting, so if you're going to use the diet break approach, it's probably best to do so using two- to four-week diet periods interspersed with one- to two-week diet breaks. In this case, we're using two weeks of diet followed by one week for the break. Personally, if you're going to use diet breaks, we don't recommend doing more than a 4-week deficit without at least a one-week break. Once again, this method of dieting has some great benefits, but it also has some downsides, namely that it will likely take more time overall.

Now, you may be thinking, "That's okay, because I get to spend a lot of that time eating at maintenance." Keep in mind that eating at maintenance isn't exactly pigging out for most people, and you'll still have to diligently track and measure your food, weigh yourself, take body fat measurements, and contribute to the overall "grind" of a diet. Self-control is fatiguing, and while a 40+ weeks of dieting using diet breaks may not sound bad, it would still be a hell of a grind.

Cheat Days Elaborated

We tend to draw a pretty thick and noticeable line in the sand about cheat days. To start with, notice that we referred to it as a cheat *day.* The original idea was for it to be a cheat *meal.* That's it. One meal of the most dirty, unclean, high-calorie foods you can imagine. Then, you get back to your merry way on the diet train. No big deal. Except, not really.

One of the problems with cheat meals is that, for many people, they can trigger what's called a "disinhibition reflex," which we spoke of earlier. If that happens,

cheat meals become binges that turn into a *cheat day or cheat days***.** So instead of having a controlled, reasonable amount of food at one meal, you wake up and have a thick stack of pancakes for breakfast (with some Bloody Marys if you're going to do it right), a bag or two of tortilla chips during the football game, *and* pizza at night. You might even shovel down a whole bag of trail mix and half a cheesecake because, fuck it, you've already blown your diet, right?

Next thing you know, you've derailed your progress into a binge where you suck down so much food that a black hole would be jealous. Those types of setbacks are never good. Not only that, but this type of behavior also comes from the same crowd of "hardcore" people who live by the mantra, "food is fuel, nothing more." If that were *truly* the case, they wouldn't let these binges happen. We'll use another quote from Sohee Lee: "if your diet is so great, why do you feel the need to cheat on it?"

So, let's get one thing out of the way first. Food is definitely fuel. All the math equations you've read up until this point talking about energy expenditure are indicative of that. On a broader level, food is more than that. You have various cultural, religious, and personal affiliations with food. You restrict food for Ramadan, and feast on Eid al-Fitr. You feast on Christmas, you have totem restaurants for anniversaries or special occasions, and you have the ritual of wedding cake when you get married. Food is fuel and more. To look at *any* food as "cheating" takes the joy out of your life. It also tends to create a poor relationship with food where guilt enters the picture and creates more problems. We've seen people enter the "fuck it mode" because they restricted themselves to only "clean" foods—and when they ate *anything* off plan, they felt guilty and just said "fuck it." Try to be reasonable. One slice of pizza is hardly going to derail your progress if you account for it in your macros. But a whole large pizza, breadsticks, ice cream, and donuts, washed down with a sixer of beer is going to set you back pretty damn far.

Lastly, cheat meals (or heaven forbid, cheat days) are typically not tracked. So you might go over on your net deficit for the week. You also don't want that. It

defeats the purpose of cognitive restraint and self-monitoring. So the basic philosophy is this: it's not a test, so don't cheat. There are better ways. High-calorie days are fine. Refeeds are fine. Diet breaks are fine. There is no reason to cheat on your diet, since you can have any foods you like if you account for them in your macro budget. Obviously, the lower your calories, the less you'll be able to fit in calorically dense foods. We've had many people ask, "Can I have a cheat meal?" Sure, you can. As long as you understand that by eating want you want without tracking, you increase your risk of eating well over the deficit calorie level required to lose fat. Typically, we find people are hoping to a hear a magic solution where they can eat whatever they want and some kind of magic fuckery will keep them from gaining fat. Sorry, it doesn't work that way. In general, eating like an asshole will not yield the results you're after.

SUMMARY

In summary, refeeding, calorie cycling, and diet breaks have very little hard data at this point in time. Diet breaks do seem to have some reasonably good data supporting their implementation, but this research is in its infancy. The most important thing to take away is that these methods should only be implemented if they maintain or improve adherence. Also, they need to be tailored to the needs of the individual rather than just applied in a blanket manner where everyone does the same thing. We encourage anyone looking into these methods to try out a few different ways of doing things, so you can see what you like best and what is the most sustainable for you during a diet.

10

YOU'VE STARTED... NOW WHAT?

Monitoring Your Progress

So you've started the diet, and you're humming along. You've calculated your calories and macros, and determined which strategies are best for you. Now it's just a simple matter of watching the pounds melt away and arriving at your goal, right? *Wrong*. As we discussed previously, metabolic adaptation and slowing are going to occur even if you do everything correctly. Fat loss plateaus are likely to happen to many if not most people who attempt weight loss. It's crucial we know how to plan for and make adjustments when plateaus happen. Data is king, and the more data you have, the better decisions you can make regarding your progress. In general, we don't like to rely too much on one method of monitoring progress, since each method is subject to daily fluctuations that can skew our view of the data.

Here's the thing: we can be objective with other people, but when it comes to ourselves and the people we care about? Good luck. If I [Layne] only went on how I looked, I would be all over the place. One day I might be retaining water and look a bit softer, which would cause me to panic and drop my calories low because I feel like I'm not losing fat. Two days later, I look amazing and am worried I'm losing muscle, so I raise my calories. Then a few days go by and the cycle continues. If you've tried to diet, you're likely nodding your heads as you read this. Knowing that we're not very objective about ourselves means we need

objective data in addition to subjective data. We use both to determine if we're on track and can continue our current course, or if we're getting behind in our diet and need to make adjustments with calories and/or activity.

So, what do we recommend for monitoring progress? In general, we use three pillars of progress.

Body Weight

Body weight is about as objective as it gets. Step on the scale and see where you are. Simple, right? Well, kind of. Body weight can fluctuate. A lot. Those of you who've weighed in everyday know what we mean. If we look at data from some of my own fat loss phases, I've [Layne] had a week where I weighed in at the following weights (in pounds):

216.9, 216.5, 214.1, 214.5, 217.5, 215.9, and 215.3

In the following week, it was:

215.1, 214.7, 213.1, 214.0, 213.5, 214.1 and 216.8

Now, if I weighed in on day seven of each week and on that day alone, I would think that I was in big trouble. After all, I gained 1.5 pounds in a week. However, if we look at the averages from the weeks, we get a very different story. The first week's average was 215.8 pounds, and the average for the second week was 214.5 pounds. On average, I lost 1.3 pounds, but if I only weighed in once per week, I would have registered it as a 1.5 pound gain. That's a 2.8 pound swing. This is why I prefer weighing in daily, taking the average for the week, and comparing it to the average from the previous weeks. Day-to-day fluctuations may occur, but typically the weekly average will tell the true tale. Additionally, recall that

in people who lose weight and keep it off, one of their main characteristics is self-monitoring and weighing in frequently.

Not only do we recommend taking averages, but we also want to minimize any variations in weigh-in variables from day to day. That's why we recommend taking weight the same way, on the same scale, in the same place on the floor (yes, this can make a difference), at the same time, and under the same conditions. For ease, we recommend weighing in first thing in the morning, naked, after you wake up, and after you use the bathroom. Weighing in with this method will help minimize day-to-day fluctuations, though they'll still occur.

You might be asking yourself, "Come on, guys, the scale drives me nuts. What do I do?" If you've had problems in the past with weighing yourself too frequently, then you don't have to. You can make a compromise. Perhaps you can average three weights a week, say on Monday, Wednesday, and Friday (or whatever days you choose). You can also weigh in once a week; we just don't recommend it. Luckily, we have other metrics to go by, and we want your peace of mind intact throughout this process.

Body Fat Measurement

This is something that we use a lot for contest prep clients, but we use it less often for non-prep clients who just want to lose fat. Body fat measurements can be useful, because they're measuring the variable that you actually want to change. However, body fat measurements are highly volatile, so we tend to put less emphasis on them week-to-week and look at their trends over time, instead. Body fat and lean body mass can fluctuate so much based on fluid retention that it's difficult to draw meaningful data in the short term. This is why it's critical to take these measurements the same way and under the same conditions each week. We recommend using a method of body fat assessment that

you can do at home. By doing it at home, you can take the measurement before you eat or drink, both of which can meddle with the reading.

When using calipers, you would ideally have someone else do it, but it's still possible to do it yourself. Your exact measurement may not be completely accurate, but it's likely that the relative change will be. That is, you may measure at 11% when in reality you're 13%, but if you drop to 9%, that 2% change is probably relatively accurate, even if the absolute number isn't. We'll usually measure our body fat three times and take the average of those measurements to minimize weekly variability.

If you don't want to take body fat or don't trust yourself to do it correctly, then that's fine—you can still use weight and other measurements like waist and hip circumference to track your progress. Body fat isn't necessary, but it sure can be helpful. Just be sure not to put too much emphasis on one individual measurement. We also suggest not sporadically taking your body fat. Either take it regularly, the same way, every time, or don't take it at all. People get DXA scans (considered to be the gold standard for body fat) and get upset when it shows that they lost LBM. In reality, they probably didn't lose LBM; they were simply less hydrated because fluid shows up as LBM on a DXA, which is a two-compartment model (it measures fat tissue and non-fat tissue, and it doesn't specify between non-fat tissues).

Pictures

Pictures can be useful, because at the end of the day, what most people care about is how they look. Sure, we care about getting healthy, but honestly, most of the benefits of weight loss are in the first 10% of weight lost. If that's the case, why keep going? Because we all want to look good, and we're just being honest. Pictures are likely more useful for people who are already pretty lean, since

changes occur faster when you're lean versus when you have more body fat. What do we mean? Well, if you're at 10% body fat and lose 2% of your body fat, you've lost 20% of your relative body fat. However, if you're at 40% body fat and lose 2% body fat, then you've lost 5% of your relative body fat. Thus, the leaner person will see a bigger visual difference from losing the same amount of body fat. We aren't saying it's useless to take pictures; it's not. You should take them for posterity. You may not like looking at them now, but if you follow the principles in this book, one day you'll look back and smile seeing how far you came.

Circumference Measurements

These can be subject to variation like any measurement, but if you don't want to deal with taking your body fat, then circumference measurements can be very helpful. We recommend measuring at the widest part of your hips (around your butt), and your waist around your belly button. Why those two areas? Most people tend to store much of their fat in one or the other—or both. Women especially tend to store it around the hips, whereas men store more around the waist. We also recommend those particular areas because they're relatively easy to reference. If you can find your belly button and your butt cheeks, then you can take these measurements. As with your weight and body fat, take them at the same time, under the same conditions. We'd take these once per week, and measure three times in each spot and take the average, just like you do with body fat.

How to Assess Progress

Most physique coaches do some sort of check-in with their clients to assess progress. In fact, this is probably the biggest benefit to having a coach—it helps take the "mind fuck" out of attempting to monitor your own progress. This is one area that very few diet books even address, and it's actually just as critical if

not *more* critical than setting up a diet. If you bought a diet book and the author just ranted about how a given food or nutrient is the cause of all our ailments, without actually giving you practical recommendations or addressing how to deal with *practical* diet mechanics, then we can assure you that you wasted your money. We've tried to provide you with a lot of information, but we've also made it very pragmatic so that you can be your own coach. If you're coaching yourself, you'll need to do check-ins to assess your progress just like any coach would. We suggest checking in with yourself a minimum of once per week. To be as specific as possible, we'd also suggest doing your check-ins on the same day every week.

1. **Body weight (Required):** Weigh yourself in the morning, naked, after using the bathroom, on the exact same scale, in the exact same place, and as close to the same time as you can, every morning. Average the weights for your weekly check-in and then compare this average to the previous week's average. Taking the average helps ensure that you will minimize the impact of any random fluctuations on your body weight progress

2. **Body Fat (Optional but helpful):** Once per week, take a body fat measurement the exact same way, using the exact same apparatus. If you're doing it at home, make sure to do it fasted, right after you weigh in. If you're using calipers, you can use three- or seven-site calculations; just make sure you do it the same way *every single time*. If you use calipers, we recommend taking the measurements three times and taking the average.

3. **Waist and Hip Circumference Measurements (Optional if you also take body fat; required if you don't take body fat):** Once per week, take a hip measurement at the widest point of your hips and a waist measurement across your belly button. Measure the exact same way, using the exact same tape measure. If you're doing it at home, make sure to do it fasted, right after you weigh in.

4. **Pictures:** (Optional weekly but required once per month): Take pictures once per week, in the exact same room, in the exact same spot, with the exact same lighting, using the same camera, and wearing the same clothing (preferably your posing suit or your underwear). Take the pictures after you weigh in and take body fat measurements.

5. **Subjective feedback (Required):** Answer the following questions (rank 1-10, 10 being best and 1 being terrible)
   - Did I adhere to my macronutrient targets, training, and cardio? (1-10)
   - How is my energy? (1-10)
   - How is my strength? (1-10)
   - How are my hunger levels? (1-10)
   - How is my mood? (1-10)
   - How is my stress? (1-10)
   - How am I sleeping? (1-10)
   - Am I on my period?

The data you collect will help determine if you're progressing at an appropriate rate.

Interpreting Check-in Results

The main driver of adjustments is typically body weight, only because it's a completely objective measurement and less subject to screw-ups. Body fat should be objective in theory, but the means of measuring it are so volatile that it's difficult to be super confident in the measurements. So, how do we know if we're making appropriate progress? We look at the data and make a judgement call. In terms of body weight, we have a weekly target based on how much we targeted to lose each week. Let's refer to our 100 kilogram man who wants to target 0.6 kilograms of weight loss per week. If his target is 0.6 kilograms per week, and he doesn't lose that much, then he should make changes, right?

Not necessarily. Remember that body weight can still fluctuate a lot. Even without anything weird going on (periods, binges, stress, etc.) fluctuations of 1% are normal, and even 2% isn't out of the question. This is why we highly recommend taking the average weight from the week to help smooth out some of these fluctuations. However, there can be week-to-week fluctuations. So if your target is to lose 0.6 kilograms per week,and you only hit 0.4 or 0.5 kilograms, is it time to panic and drop 500 calories? Probably not. In fact, it's probably not time to do anything yet. By the same token, if you lose 1.1 kilograms in a week, is it time to add a bunch of calories back in? Probably not. If it's your first week of dieting, it's very common for many people to drop a lot of weight, some from fat, but quite a bit from total body water, as well. Once fluid levels stabilize, then weight loss tends to continue at a steadier pace. In general, we don't recommend making hasty changes to your diet based on one week of progress.

As we discussed in depth in Chapter 3, your body is going to fight you during your diet by reducing your metabolic rate over time as part of the body's self-defense system. This happens in response to any kind of caloric deficit, and we can make adjustments to help temper the self-defense system like diet breaks, refeeds, going at a slower pace for weight loss, and more. However, metabolic adaptation will happen to a certain extent, and thus weight loss plateaus are very normal. How quickly that occurs is quite variable from individual to individual. Typically, weight loss plateaus will occur every two to 12 weeks depending on the individual, their metabolic rate, how significant their caloric deficit is, how lean they are to start, and how adaptive their metabolism is. If you're leaner to start, you're likely to plateau more often as you approach low levels of body fat. If you have a lot of body fat when you start, you're less likely to plateau early since your body isn't going to sense the energy gap as quickly. We also know that metabolic adaptation happens, but some people tend to adapt faster than others. Those who adapt faster will tend to hit more frequent weight loss plateaus than those who aren't as adaptive.

So, how can we tell the difference between a real plateau and a fluctuation? This is why we have markers other than body weight to go by. We recommend

waiting until two of your metrics fail to progress before making a change. For example, if body weight didn't drop as much as we'd like, but your body fat or circumference measurements dropped and you looked visually leaner in pictures, then we wouldn't recommend making any change. But if body weight didn't change, body fat and circumference measurements didn't change, and you can't see much difference in leanness, then it's probably time to make a change. If you think you look leaner and your body fat/circumference measurements dropped slightly but your weight stayed the same or went up slightly, then we recommend holding steady until the next update.

Remember, this is a marathon, not a sprint, and we're in this for the long haul. However, if you have two check-ins in a row where you didn't achieve at least 50% of your weekly weight loss goal (ie. your goal is 0.6 kilograms per week but for the last two check-ins you've been averaging less than 0.3 kilograms per week), then you're likely starting to plateau and it's time to make a change regardless of body fat/circumference measurements. The *only* caveat is if you have a lot of fat to lose and you start lifting weights at the beginning of or during the diet. You're going to gain lean body mass rather quickly since you're new to weight training, regardless of being in a caloric deficit or not, and thus you may expect weight to not drop as fast or at all, and possibly even to increase. If your weight isn't dropping, but your body fat/circumference measurements are dropping and you just started lifting, then we recommend not making any changes as long as the body fat/circumference measurements are still dropping regardless of what body weight is doing.

Plateaus

Everyone hates a plateau. They're frustrating and demotivating, but *everyone* will deal with them at some point, so just prepare yourself. I've [Layne] only come across *one* client who never plateaued during their 16-week diet, and I've been

doing this 14 years and have coached over 1700 people. So, there's over a 99% chance that you will plateau. A plateau is just your body's way of adapting to the stimuli it's receiving. In an effort to reach homeostasis, your metabolic adaptation occurs along with a decrease in NEAT, and you stop losing fat even though you're eating a level of calories that was allowing you to lose before. All of this is normal.

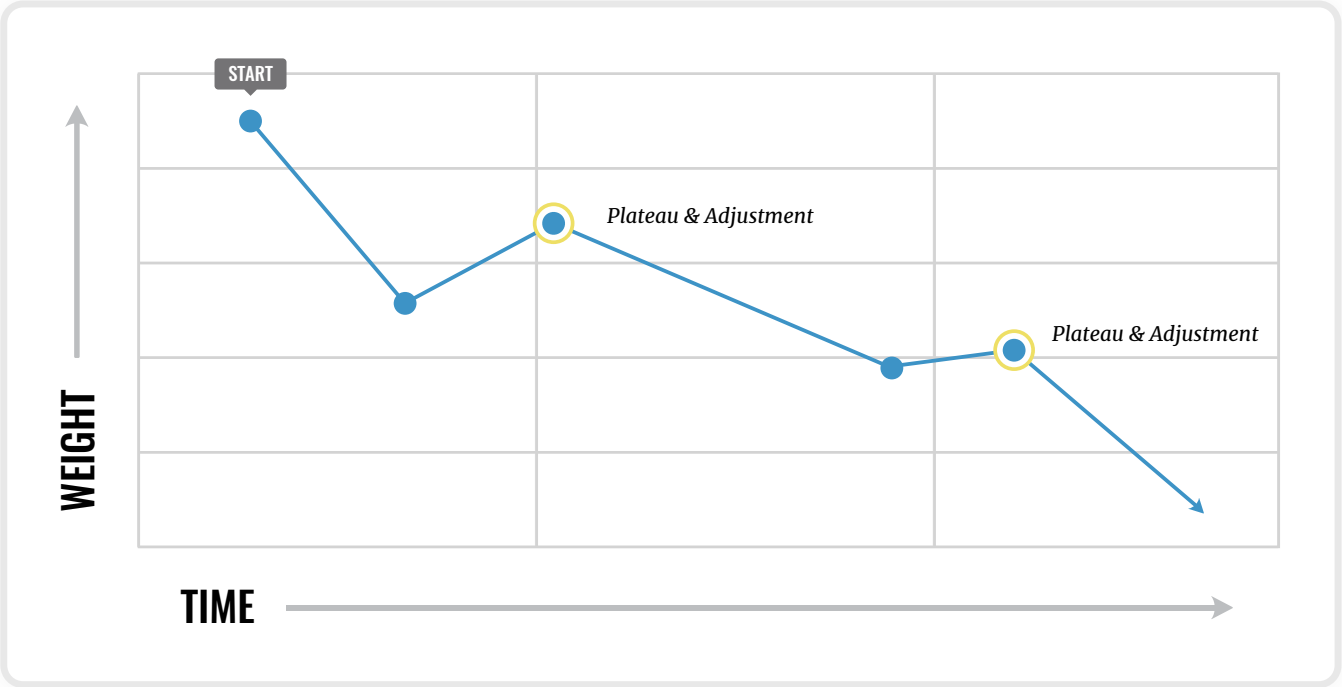

Figure 1: Example of diet progress and plateaus. Weight loss is seldom linear and often requires frequent adjustments to overcome weight loss plateaus caused by metabolic adaptation.

When a plateau occurs, you simply need to tweak the stimuli. These changes to your fat loss plan can come in various forms, some of which are easier than others; the "others" being the ones you will likely hate the most. Options for adding stimuli include:

- Decreasing calories
- Adding in more exercise/activity

Nutritional Adjustments

If you're no longer losing weight/body fat at the appropriate rate or at all, then that means your metabolic rate has lowered to the point where your current intake is either your new maintenance or getting close to it. We've had many people exclaim, "I don't understand! I'm in a caloric deficit, so why am I not losing weight?" Well, quite simply, your "maintenance calories" are a moving target. The longer you diet, the more your metabolism adapts, and the lower your TDEE/maintenance calories becomes. If you aren't losing weight or body fat, then by definition you're *not* in a deficit. In order to progress, you must re-establish the deficit. Keep in mind, however, that a few things can cause a "false positive" for a plateau:

- Menstrual cycle for women (most stop losing or gain some weight)
- Excessive stress (some people under enormous amounts of stress retain quite a bit of fluid)
- Consistent lack of sleep. Believe it or not, sleeping metabolic rate is important for fat loss, and I've seen people's progress grind to a halt with prolonged lack of sleep
- Illness creating a large immune response that increases total body inflammation and causes greater water retention and increased body weight
- Injury causing an acute increase in inflammation, which may increase water retention and body weight
- Lack of adherence. As much as this sounds like an obvious slap in the face of a bullet point, it's the *biggest* cause of lack of progress. If you're not consistently hitting your targets, your progress will be staggered or non-existent. You have to be honest with yourself about this. Most people will not be honest with themselves about their lack of progress. If you don't follow your fat loss plan consistently, it *will not work*.

If your progress stops but you're experiencing one or more of these problems, then it may be best to err on the side of caution and wait one extra check-in (if you can afford to) in order to see if progress will continue. However, if you're nailing your nutrition targets, exercising regularly, and still find your progress grinding to a halt, then it's time to make some adjustments.

Logic dictates that simple math will tell us how to progress. If our hypothetical guy consumes 2242 calories per day to lose a targeted 0.6 kilograms per week, but he stops losing weight, that *should* equate to a corresponding calorie-per-day reduction of 558 calories (930 kcal/kg per day × 0.6 = 558 kcal deficit; see Chapter 6, Table 2) to resume normal progress. That means we would need to reduce calories to 1684 in order to continue progress at 0.6 kilograms per week of body weight loss, right? Not really. Now, you won't find this information in any textbook or pubmed citation (no hate; we love pubmed) but after working with over 1700 people in my [Layne's] career, I can tell you with 100% certainty that there are thresholds in metabolism.

I've had people stuck at a weight for weeks, and simply reducing their carbohydrate intake by 10 to 15 grams per day and fat by two to three grams per day suddenly caused them to drop a kilogram within a week. It doesn't make sense from a pure mathematics perspective, but I'm sure some of you reading this book will nod your heads in agreement. This was something I discovered through sheer mass effect of working with so many people. I used to make really aggressive drops in calories, but over time, I found I really didn't need to make them. In fact, typically a 5-10% reduction in carbohydrate and fat intake will be enough to do the job and resume progress.

Occasionally, I've had people who needed to approach 15% reductions in carbohydrates and fats to keep progressing, but those were pretty rare. How much of a reduction should you use to break a plateau? That depends on each individual person. The best advice we can give is to start conservatively with a 5% reduc-

tion in carbohydrate and fat intake and document how your body responds. If that's insufficient to jumpstart progress, then try 10%. If that doesn't do the trick, then try 15%. I've met very few people who didn't respond to a 15% reduction adjustment. We typically don't advise reducing protein because protein is so crucial for lean body mass retention, satiety, and thermogenesis. Take our hypothetical woman who was consuming a daily average of 175 grams of protein, 100 grams of carbs, and 35 grams of fat. If we dropped carbs and fats by 5%, we'd be looking at dropping approximately 5 grams from carbohydrate and 2 grams of fat. If we did a 10% drop, we'd be looking at approximately 10 grams of carbohydrates and three to four grams of fat reduction.

What if someone is doing high-calorie days and low-calorie days? Typically, we'll drop from both days in proportion. So, in Chapter 9 we gave the example of our guy having five lower calorie days of 190 grams of protein, 190 grams of carbohydrate, and 55 grams of fats, and two high calorie days of 160 grams of protein, 415 grams of carbs, and 55 grams of fat. If we hit a plateau and decide to drop 7% from carbs and fats, that would mean a reduction of 13.3 grams of carbs (rounded up to 15 grams for the sake of easy numbers) and 3.85 grams of fat (rounded to 4 grams) on lower-calorie days. On his two higher-calorie days per week, this would be a reduction of 29 grams of carbs (rounded to 30 grams) and 3.85 grams of fat (rounded to 4 grams). However, this is not a set-in-stone rule. You could always keep your higher-calorie days at the same carb and fat intake and only reduce your lower calorie days. The downside is that it means you'll have a much bigger drop on your low days. If we use our previous example but decide that we aren't going to reduce the carbs and fats on his high days, we need to figure out how much lower to drop them on his low days. We calculated a reduction of 30 grams of carbs and 4 grams of fats on his high days. This equates to 156 calories. Since he has two high days, this means the total reduction that *should* come from his high days is 312 calories. Since his distribution of calories is 60/40 between carbohydrate and fats (see the Chapter 3 discussion on carb/fat distribution) that equates to 187 calories from carbo-

hydrate and 125 calories from fat. Since there are five low days remaining in the week to distribute these calories over, this equates to 37 calories per day from carbohydrate and 25 calories from fat, which corresponds to a further low-day reduction of 9.25 grams of carbohydrate (rounded to 10 grams) and 2.78 grams of fat (rounded to 3 grams) per day. Remember that we previously reduced his low-day numbers by 15 grams of carbohydrate and 4 grams of fat. If we only reduce from the low days and not the high days, we need to add an additional reduction of 10 grams of carbs and 3 grams of fat, making the total normal-day reduction in carbs and fats to 25 grams and 7 grams, respectively. This leaves us with 190 - 25 = 165 g carbohydrate and 55 - 7 g = 48 g fat. Therefore, his new low-day numbers would be 190 grams of protein, 165 grams of carbohydrate, and 48 grams of fat on low days and 160 grams of protein, 415 grams of carbs, and 55 grams of fats if he wants his higher calorie days to remain the same.

We've seen some people abuse this methodology, essentially starving themselves on low days only so they can gorge themselves on their high days. This typically doesn't work well for most people. This sort of dieting usually leaves you feeling extremely weak, tired, grouchy, and hungry on your lower calorie days, whereas on your high calorie days, you may have more energy from food but your body feels sluggish because you're bloated from eating so much. If you choose to use low-calorie and high-calorie days, our recommendation is to not let high-calorie days exceed low-calorie days by more than 2 times. So, if you're eating 2000 calories on your low days, the max I'd want to see at on your high days is 4000 calories.

Understand that some people have more adaptive metabolisms than others and will adapt faster to the caloric deficit adjustments than those who are less adaptive. I've worked with people who had to drop calories almost every week, while others needed only one or two adjustments throughout their entire diet. This is where the individuality of diet comes in, and it's crucial to understand how your body is likely to respond to these adjustments. Make sure you keep track of ev-

ery time you adjust your intake and how your body responds. This will give you a more accurate idea of how your body is likely to respond in the future, so you can adjust accordingly. That is, if you know you only require a 5% adjustment to continue progress, then there's no need to do 15%. However, if you know that 5% typically won't give you an adequate "jumpstart." then you'll want to use a higher number. If you know that 5% isn't enough but 10% definitely works, try a 7.5% drop next time and see if that does it. In this way, you can figure out the minimum adjustment required to continue progression. The first time you're making an adjustment, we'd try a 5% drop in carbs and fats and a modest increase in exercise (add 5% more exercise time per week). If you don't wish to increase exercise activity, then try a 10% drop in carbs and fats. If it works and you lose the weight you intend or more, then maybe just try a 5% reduction with no increase in exercise the next time.

On the flipside, if a 5% reduction in carbs and fats and a 10% increase in activity doesn't produce results, try a 10% drop in carbs and fat and a 10% increase in activity. If that doesn't do it, then try a 15% drop. Once you hit an adjustment that works, the next time you plateau, try a slightly lower drop by 2.5%. So, if it took a 15% drop to work, the next time drop back to a 12.5% drop and see if it still works. If you can't get results on a 15% drop in carbs and fats and a 10-20% increase in cardio activity, then that's likely a good indicator that your metabolism isn't in a good place, and you should consider taking time to reverse diet to build up your metabolic rate (discussed in the next chapter). In general, be conservative if you can, but if you're starting to lag way behind the rate you want, then it's okay to make a bigger jump as long as it's still an intake you can sustain.

Exercise Adjustments

As we've discussed previously, exercise is awesome–like, crazy awesome. So awesome that you *should* be doing it if you're truly serious about losing weight

and keeping it off. It's also something that you can adjust to influence the "calories out" side of the equation. When you reach a plateau, you can decrease calories and/or increase exercise to reestablish a caloric deficit. We recommend adjusting exercise similarly to calories. Rather than using an absolute amount, make percentage adjustments. Now, why not just get on the treadmill and go until it says you've burned an extra 500 calories? Simply, those calorie counters aren't very accurate. Hell, many of you have the experience of slaving away on a piece of cardio equipment to "burn" 1000 calories day after day only to have your weight not move. This is why we recommend making adjustments relative to your current activity. If you're only doing 90 minutes of exercise per week, try making a small adjustment to carbs and fats and adding 10% activity, up to around 100 minutes per week.

There is such a thing as overdoing it, though. Some people will find any excuse not to drop calories, and they'd rather be in the gym three hours per day. Unless you absolutely love the gym that much, we don't recommend this approach for the same reasons we don't recommend many dietary approaches: it's simply not sustainable for most people. Now. we are gym junkies. We love it. A two-hour workout is our release for the day. When I [Layne] was training for the world championships in powerlifting. I would routinely train more than 3 hours per day. Peter, on the other hand, uses the gym as a way to procrastinate under the guise of it being tangentially work-related.

That said, if you're already training more than 15 hours per week, it's probably not the most reasonable idea to add 10% more training. This is where a certain amount of prioritizing sustainability is important. We've met people who couldn't stand to train more than an hour per day because they valued their time doing other things, but they had no problem eating 1500 calories per day. On the other hand, we've known people who would happily train four to five hours every day if it meant they could eat 3000 calories per day. In short, whether or not you decrease calories, increase activity, or do both is largely up to you and what you find most sustainable for your lifestyle and what you enjoy.

Oops, I Screwed Up

So, your partner dumped you, you lost your job, your dog got sick, and you drowned your sorrow by polishing off a half gallon of ice cream and a bottle of wine. Is all hope lost? Did you completely screw up your diet? Most likely, no. Obviously, we prefer these things not happen, but you're human and quite frankly, shit happens. This whole scenario is an amalgam of typical occurrences that we all go through, lumped into one horror story. What it comes down to is that you can break your adherence by either missing your training days or overshooting (or undershooting) your calories for the day. The most important thing is to "get back on the horse," for lack of a better term.

If you're fortunate enough to know how many calories you overate on a night out, that's is a good thing. If it was the product of you simply having a good time and not a stress-induced binge, you can take those calories and deduct it from your subsequent days. For instance, if you overate 1000 calories, deduct 500 from the next two days, 250 calories for four days, or 200 calories for five days. If the calories you overate are close to your high-calorie day numbers (if you're having them), then you could count that day as your high-calorie day. The point is not to panic if you simply overate. You'll be okay. In the same way that one doesn't simply wake up obese one day, you won't completely screw over your progress unless you let it turn into multiple days.

Before we talk about emotional binging, we want to point out that neither of us is a counselor or physician. However, if you have an emotional binge, then you need to take a different course of action to avoid the cycle of binging and subsequently punishing yourself. This simply means getting back on the wagon the next day and moving on. More importantly, work on the triggers that caused you to binge-eat in the first place. Binge-eating is something a lot of people struggle with. Men included. In fact, of all the people I've [Layne] worked with over the last 14 years, I would estimate that at least 20% of them struggled with

binging at some point in their lives. If you're dealing with regular binge-eating, you need to speak with a counselor. This book is only going to help you so much if you don't get a handle on the root of your problem.

One thing to keep in mind during your diet is that consistency will always trump "perfection." For one, there is no perfect diet, but even if there was, *we* are not perfect. You're going to screw up here and there. Get used to the idea that things aren't going to go according to plan. Think about anything difficult you've done in your life. Did it ever go according to plan, with no hiccups? Of course not. The most important thing is to stay consistent, tenacious, and to persevere. The people who succeed on a diet and maintain their weight loss for 3+ years weren't able to do it because their diets were perfect. They were able to do it because they kept their eyes on the prize, and when anything difficult came up or they hit setbacks, they kept trucking right through them. Setbacks will happen. Plateaus will happen. It will be frustrating. It will be painful. At times, it will test you to your very core (this is adapted from a quote by Admiral William McRaven, just to give proper credit). Do not quit. If you really want this, then everything you do is a decision. You cannot always control what happens to you, but you are 100% in control of how you respond. Focus on responding in a positive and focused manner. As the popular saying goes, "It's a slow process, but quitting won't speed it up."

Adherence

It may seem obvious, but if you don't adhere to whatever program you choose, you won't make progress. However, not all adherence issues are all-out binges. In fact, for the majority of people, they're not actually being as adherent as they think they are. In fact, most people underreport what they eat by up to 50%.[1] This data is based off of a study where they examined obese people who claimed

1 (1992, December 31). Discrepancy between self-reported and actual caloric ... - NCBI - NIH. Retrieved November 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/1454084

to be resistant to weight loss despite eating 1200 calories or less. The researchers evaluated their reported intakes and compared them to their real intakes, while also evaluating their metabolic rate. What they found was shocking. These obese individuals underreported their intake by 47% and over-reported their physical activity by 51%. Further, their metabolic rates were found to be within 5% of the predicted metabolic rates based on their body composition measurements. So, many people who report not being able to lose weight despite low-calorie intakes are possibly lying to themselves.

The thing is, they may honestly believe they aren't eating that much. any people screw up by making errors in estimations, as well as not tracking small snacks or perceived "free" foods throughout the day. It's not uncommon for people to grab a small handful of chips, nuts, or other snack foods without tracking them; after all, it was just a handful. Add to that some bites of foods while cooking, plus a pack of sugar-free gum (notice it's not calorie free) and only tracking "net" carbs in some foods (net carbs is a sales term to make you feel like you can eat more than you really can), and you can *easily* add several hundred calories to your intake every day. And we haven't mentioned eating out at restaurants. You can find the nutritional information for many restaurant dishes online, so that means you can fit it into your diet, right? Well, maybe. Just because that nutrition info is listed online doesn't mean it's accurate. It's not like the chef is weighing the food he's putting on your plate. It would be absolutely nothing to simply throw some more oil or butter into your food; after all, doing so makes it taste better, which is all the chef cares about. This alone can *easily* add several hundred more calories to your nutritional intake per day. When you consider combining this with tracking errors and untracked snacks, you could be over-eating by as much as a *thousand calories or more.* So, before you claim you have a slow metabolism, make sure you're tracking everything you put in your mouth. If you still haven't lost weight after a few weeks, then maybe you *do* need to lower your calories, but for many people, it's simply "ignorance is bliss" with not tracking everything. This is where we give you some really though love.

SUMMARY

In sum, we have a hierarchical list of variables to manipulate in order to break through a plateau. Typically, we find it easiest for people to make small adjustments from several variables so that it doesn't seem like such a huge "hit." For example, instead of making a big 15% carb and fat drop, perhaps you can only drop 5% and increase activity by 10%, which can help you get through the plateaus.

Before you make any changes, be sure that you're tracking accurately. If you are, then whatever changes you make, be sure that you give them at least a week to work. Don't make a 10% drop in carbs and fats along with a 20% increase in cardio activity and then make another change 24 hours later because you had another bad weigh in. Try to be patient and document your responses.

After a few plateaus, you should get an idea of how much of a carb/fat drop and/or cardio activity increase is required to continue progression. Remember there is no set rule that says you have to do a 5%, 10%, or 15% drop. You can do anywhere between those. Maybe 7% is your threshold. Maybe 12%. That's why it is so important to monitor your progress and see what you respond to. Further, you have to take into account the nature of your life, as well. For instance, some people work demanding jobs, and adding more training might not be a realistic option. Adding more training *days* would be even less realistic. For that person, the only optimal course would be to add a cardio session where convenient and/or decrease food intake. The main takeaway is to have a list of all possible options, and take an inventory of your life and how you respond to various stressors. From there, make the best decision you can, keeping in mind what's most sustainable for *you*.

11

THE DIET AFTER THE DIET

Congratulations, you have made it to the end of your diet. Well, maybe. At the very least, you've hopefully lost some weight and have come close to, met, or even exceeded your goals. Some of you might have had an easy time on this path, and others may not have had it so easy. Either way, it's no small matter. You're also not done, so if there were a time to get complacent, this wouldn't be it. You're now in a situation where you can veer off on a few different paths. One path is to end up amongst the 95% of dieters who gain their weight back and then some. Another would be to take a break from the "grind" of dieting and hang out for a bit and maintain your newfound but beneficial losses. Yet another option is to repeat the process, because maybe you didn't lose all the weight you wanted to lose. Obviously, the latter two paths are the better option, as we've stated before. If you forgot, we *want* you to be amongst the five percent.

Assuming you want to be there, too, you're faced with a few different scenarios that will lead to a self-evaluation based on your answers to some self-imposed questions about your progress. So, let's get to some of these scenarios. If you've dieted for a long time and lost a decent amount of weight, there's a chance that your calories are pretty low compared to when you first started. By itself, that's not necessarily a negative. You can live well like that, but you have to ask yourself two things:

1. Am I happy with how I'm eating in the context of my lifestyle?
2. Can I keep living this way?

If your answer to both questions is "yes," there's a simple solution. Do you remember when we spoke of maintenance calories earlier in the book? You'd simply eat at that caloric level and maintain your weight. Simple as that. Hopefully, you've gained some knowledge and skill regarding your food choices, and you're generally eating better than you did before you started. If so, wonderful. However, you *must* keep something in mind: your current maintenance calories at the end of a diet *will not* be the same as your starting maintenance calories.

Remember the self-defense system we talked about? Remember how we spoke of diets changing your BMR? If you're at a point where you've made significant losses, you've activated the self-defense system and experienced metabolic adaptation. Again, it's not a death knell; it's just your body doing what it's supposed to do. Hopefully, you've utilized several of the strategies we discussed to help attenuate this adaptive response as much as possible. But if you don't take this into account, and you just go immediately back to your pre-diet maintenance calories (which will be higher than your *actual* maintenance calories at this point), then you'll gain a good amount of weight back. It's impossible to guess exactly *how much* weight you'll gain back, since your NEAT will increase as your calories increase, coupled with the fact that it depends on just how much your BMR dropped during the dieting phase.

The rule of thumb is, the more weight you lost and the longer the diet, the more your BMR will likely have declined. The good thing is if you're cool with gaining back a small portion of weight and cruising along at your pre-diet maintenance calories, then go for it. If you go that route, and you're happy, that's the most important thing. If you managed to lose a lot of the weight, then gaining back a couple of pounds won't undo the benefits of losing 30-plus pounds. Keep in mind that using your old maintenance calories can be dicey. You likely won't stabilize your weight regain until you regained all the lean body mass you lost while diet-

ing.[1] Hopefully this will be minimal, but in some cases, this may mean you could gain all of your weight back; thus we don't really recommend this approach.

If that idea doesn't appeal to you—and it often doesn't, because gaining weight after a triumphant period of losing *can* be a mind-fuck—then revisit the calculators from before and calculate your new TDEE for your current maintenance. Alternatively, you can manually calculate your maintenance based on your caloric intake and your average weight loss per week using Table 2 in Chapter 6. Briefly, you would take the amount of weight you've averaged losing over the past four weeks, multiply it by the caloric factor in the table, and that would give you the amount of calories you need to add to your current intake to reach your current maintenance calories. For example, let's say our guy from earlier got down to 85 kilograms at under 10% body fat and wanted to determine his maintenance. He could use a calculator, sure, but he knows that he's been losing approximately 0.6 kilograms per week on his current intake of 1770 calories per day. We simply multiply 0.6 × 834 kcal/d (he's under 10% body fat, lifts weights, and is on a high-protein diet) = 500.4 calories rounded to 500. He would then add 500 calories to his current deficit calories of 1770 to get 2270 for his current maintenance calories. If you're happy with your current calories and the way you look and feel, you can stay here indefinitely.

It's important that we don't get too cavalier with implying that remaining at maintenance will be easy. It won't be. Dieting imposes an energy gap that persists for long periods of time, so you'll probably feel hungry even at maintenance, since you're likely at a reduced body weight that is less than your body fat set point. This means your insulin and leptin will be lower, and your hunger hormones will be elevated.[2] This is one of the major reasons it will be so hard to maintain your weight loss. Not to say it's hopeless, because it's not. You *can*

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1 "How dieting makes some fatter: from a perspective of human ... - NCBI." 5 Apr. 2018, https://www.ncbi.nlm.nih.gov/pubmed/22475574. Accessed 30 Oct. 2018.

2 "Biology's response to dieting: the impetus for weight regain. - NCBI - NIH." https://www.ncbi.nlm.nih.gov/pubmed/21677272. Accessed 30 Oct. 2018.

be one of the 5%. Although you can't destroy fat cells or change your set point, there is data to indicate that if you maintain a reduced body weight for several years, for all intents and purposes, that can become your new set point, possibly due to increase leptin sensitivity.[3]

These aren't the only scenarios you might find yourself in, either. For instance, let's say you had a large amount of weight to lose, like 50 or more pounds. If you recall the calculations, losing at a recommended weekly rate might take upwards of a year, depending on how you approach it. And while we do advocate flexibility while you diet, dieting itself means there will be *some* sort of restriction. And if you don't want to go at it for a long time, you'll need to stop and take a break before you start again. Physiology aside, the psychological reasons alone might require it. Practicality will necessitate a break, too. Weddings, baseball games, funerals, births, and holidays are all events that we encounter and need to be taken into account. This is where the diet breaks we discussed in Chapter 9 can be helpful. But perhaps you're sick of dieting and would like to take a more extended diet break.

So, maybe you dieted for a while, and you lost a significant amount of weight, but you want to lose some more. There might be a variety of reasons for this choice, including:

- You want to look better
- You have to meet a weight requirement for military service
- You're still clinically obese
- Your health markers have gotten better but not quite where you want them to be
- To simply see if you can

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3 "The runaway weight gain train: too many accelerators, not ... - The BMJ." 23 Sep. 2004, https://www.bmj.com/content/329/7468/736. Accessed 30 Oct. 2018.

There's nothing wrong with any of those reasons. It's your body to do what you want with, after all. If you find yourself in the position of having to or wanting to lose more, you'll still face some of the previously mentioned obstacles. One of those obstacles involves hitting a point where you're maintaining your weight at a low caloric intake. Many people who are either chronic dieters or who need to drop a lot of weight end up in this position, where they're still at a higher weight/body fat than they'd like, but their calories are pretty darn low. In fact, there are case studies documenting people maintaining weight on less than 1000 calories per day.

Another obstacle may be that you're happy with your weight, physique, and health, but in order to maintain all of that, you have to be on much lower calories than you find to be sustainable for you. In both of these cases, it would be ideal to find a way to increase your caloric intake, energy expenditure, and improve your metabolic rate while minimizing body fat regain.

In my experience as a coach [Layne], I kept coming across very strange metabolic situations (mostly in women who happened to compete) where their maintenance calories were much lower than predicted. So low, in fact, that they wouldn't lose weight even on very low calories. It's possible that many of them underreported their intake, and this is definitely the case with many people. However, there were some individuals who I *knew* were tracking correctly and following their plans, and they still weren't losing weight, or they weren't losing it at nearly the rate they should be. Now, this might sound like it violates everything we spoke of. That isn't the case, though. In her work with professional athletes, Dr. Susan Kleiner noted a similar phenomenon, and having been in both the trenches of research *and* working with people, it would be ludicrous not to point out what she has to say. Dr. Kleiner states the following on page 111 of *The New Power Eating*:

> Active individuals who underfuel can often continue to participate in their sport at a high level for a period of time, and so it is difficult for them to

> understand that any of the symptoms that they are experiencing are from too few calories. However, our bodies will preferentially fuel the highest energy need first, leaving our foundational health needs only partially fueled. Exercise[4] is fueled, but the rest of the body is not. When calorie intake is chronically low, health deteriorates. Common symptoms are loss of menstrual cycle, reproductive function, and libido; thyroid dysfunction; poor immune function; fatigue; headaches; structural loss in hair, skin, and nails; poor sleep; lack of mental alertness or focus (foggy brain); and a short temper. Athletes commonly report working out harder but declining in performance and eating less but getting softer. Injuries from poor balance and poor judgment are common, as are stress fractures and bone breaks. I must emphasize that the data supporting the health consequences in men are limited, at best. We know, as stated above, what happens in women who chronically underfuel. However, I have had male clients who have suffered from a number of he consequences listed above, and so I want to make sure that men do not exclude themselves from this risk.[5]

Furthermore, I [Layne] have seen some anecdotal evidence of people who slowly increased their calories in a controlled manner at the end of a diet, and we found that they didn't gain much body fat at all. In fact, in some cases they actually lost fat. I can't remember who originally coined the term, whether it was myself or another coach (I think it may be Alberto Nunez who deserves credit), but we called it: "Reverse Dieting."

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4 Do keep in mind these are professional athletes who are exercising more than us and likely more than the majority of you reading. That is to say, they aren't lifting weights for 30 minutes and then doing cardio three times a week; if these athletes don't perform, they might not have a job.

5 Kleiner, S. M., & Greenwood-Robinson, M. (2018). *The New Power Eating*. Champaign, IL: Human Kinetics.

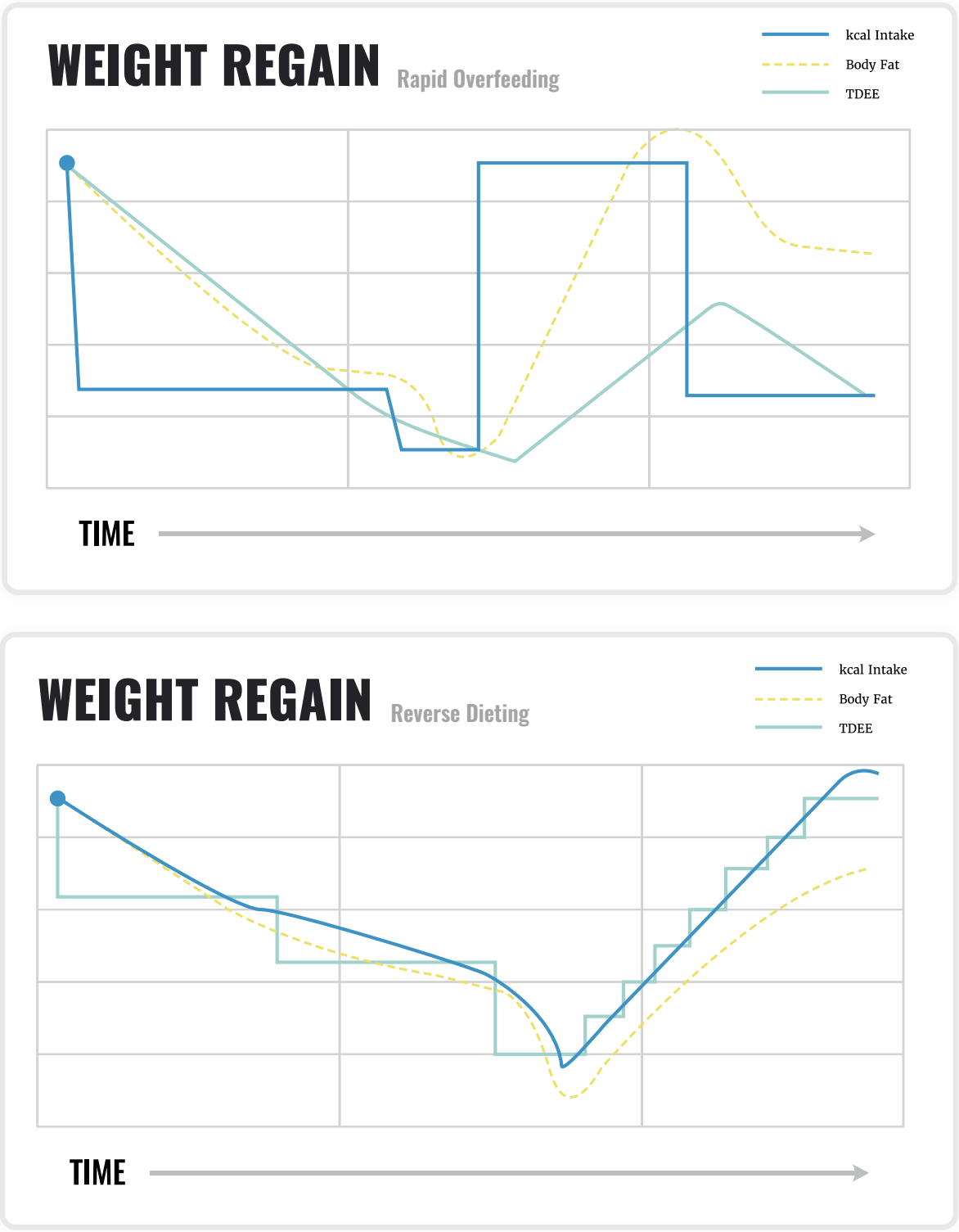

Figure 1: Comparison of weight loss and regain with typical dieting followed by rapid overfeeding post diet, vs more sustainable dieting followed by controlled reverse dieting post diet leading to recovery of metabolic rate with less fat gain.

Reverse Dieting

If we had to sum up reverse dieting in a line, it would be: "A strategy of dieting where calories are increased in a controlled manner over time to increase metabolic rate while minimizing body fat gain." We want to emphasize that the purpose of reverse dieting is *not* to lose weight. We'll say it again: the purpose of reverse dieting is *not* to lose weight. The purpose is to increase your metabolic rate so that you can either maintain your current body composition on a higher calorie intake, or lose weight more effectively in the future. Let's look at an example. Say "Jane" finishes her diet at 55 kilograms and 1100 calories per day. She's happy with her weight loss but not happy with her calorie intake. She calculates her current maintenance to be 1500, but she finds it's not sustainable for her, so perhaps she'd want to reverse diet. If over the next six months she gets her intake up to 2200 calories per day but gains 2 kilograms, she's still in a good position. Why? After all, she did gain back some weight. But with her new maintenance of 2200 calories, she should be able to drop that 2 kilograms relatively easily and still have her calories a bit higher than 1500.

Additionally, if she's been exercising, there's a good chance the weight she gained won't all be fat, but some lean body mass, as well. Now, here's where the "bro science part" starts, because there's no research data on reverse dieting–but we've seen it benefit many people at varying degrees. Some people absolutely thrive on reverse dieting. They're able to increase their calories while maintaining or even dropping weight in some cases. Others gain small amounts of weight, and others gain more weight. Generally, people who use this approach gain less weight than those who just YOLO (you're only lean once) their calories back up after dieting. Recall that in the initial post-diet phase, fat is regained relatively quickly and exclusively, whereas lean body mass takes much longer to recover. Metabolic rate also tends to return slowly and follows lean body mass. Therefore, it makes little sense to eat a ton post-diet and gain back copious amounts of body fat quickly, because metabolic rate will not return to

pre-diet levels until lean body mass is recovered.[6] This may in part explain why reverse dieting works better for minimizing fat gain compared to just jumping calories straight back up. Reverse dieting gives calories a chance to go in concert with the return of metabolic rate, whereas jumping calories up quickly will create a gap between energy expenditure and intake—which will induce a significant regain in body fat.

Now, some people have said that we're claiming reverse dieting violates the laws of thermodynamics. That is, we're somehow saying you can eat in a surplus and lose fat. That's simply not true. Energy balance will *always* dictate storage of energy versus loss of energy. If we were to attempt to explain the reverse dieting phenomenon, we'd say that somehow by adding calories slowly, the energy gap isn't "sensed" by the body, and the extra calories are favorably dissipated as heat through adaptive thermogenesis and NEAT versus being stored in adipose. Remember from earlier that NEAT, while in a deficit, goes down, and as you eat more, it goes up. Remember also that you aren't aware of it. While not found in the literature, based on our experiences with clients, we think this is likely the most plausible explanation. We aren't trying to "sell" you on reverse dieting. It's simply a tool. If you choose not to use it, then it's no skin off our backs. But if you think it's a tool that might be useful for you based on some of the scenarios we described, then we'll do our best to explain how we recommend using it.

Where to Begin – The Initial Post Diet Phase

Whatever you decide, it's always important to have an initial post-diet plan. Do *not* attempt to wing it. We also don't recommend ending your diet right before a week-long vacation. Why? Activity often goes down on vacation, while caloric and alcohol intake go way up. With your metabolism slowed from long periods of

6 (2018, April 5). How dieting makes some fatter: from a perspective of human ... - NCBI. Retrieved October 31, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

dieting, and the restore prong of the self-defense system upregulating the systems that help store fat, this is the perfect storm for piling the pounds back on and even adding *new* fat cells. If you're dieting for a vacation, wedding, or some event where there's likely to be a lot of food and less activity, we highly recommend getting to your goal weight early. Then you can spend several weeks or months at maintenance or reverse dieting so that your metabolic rate can come back, and you can enjoy yourself without piling on 10 kilograms in a week. That sounds like a lot, but we've seen it happen. We only bring up vacations and weddings because so many people diet for these types of events, and they lose weight only to put it all back on during the holiday/event/vacation. Then they immediately start trying to drop the weight again for the next event a few months away.

As we've discussed, this is extremely bad for your metabolism, we want to avoid inappropriate weight cycling as much as possible. This is why having a plan is paramount—because you *don't* want to get into a mindset of: "Okay, my diet is over! Now it's time to eat everything." If you do that, you *will* put back on all the weight. Your diet is never over; rather you're just switching gears to maintenance or metabolic building/reverse dieting. So when your caloric restriction period (aka diet) ends, you immediately go to your next planned phase. No cheat day. No binging. Business as usual, albeit with more calories.

Knowing you need to have a plan is great, but what should that plan look like? That depends on many factors, but we'll attempt to provide some guidance.

1. Initial caloric intake: we recommend starting your post-diet diet at your current maintenance calories as a minimum. If you're done losing weight, there's no reason to keep yourself perpetually in a deficit. But understand that your *current* maintenance will be much different than your *predicted* maintenance, because your metabolism has adapted.
2. If you want to avoid gaining body fat or keep potential body fat gain to a minimum, we recommend going to your current maintenance and starting there.

3. If you're okay with potentially gaining some body fat as a trade-off for having higher calories and feeling less hungry, then we suggest adding an additional 10% to 20% carbohydrate and fat to your maintenance level. We recommend adding carbs and fats and not protein, because if your protein is already sufficient, you don't need to increase it. In fact, your protein needs are actually *lower* when you add calories.
4. If protein is sufficient already (it should be if you're following the principles in this book) then you can keep it the same, or decrease it slightly based on Table 1 in Chapter 8. However, you can keep it the same if you enjoy protein and find that it helps keep you satiated
5. Remaining calories from carbohydrates and fats can be distributed based on Table 2 in Chapter 8. Remember, adherence is always the most important aspect of any diet, so put together a breakdown of carbohydrates and fats that is most sustainable for you. However, due to low rates of fat turnover in adipose cells after caloric restriction, there is some evidence that increasing carbs preferentially to fats may help reduce fat gain in the immediate post diet period. That's because carbohydrates are preferably oxidized, while lipids are preferentially stored in adipose due to significantly reduced rates of fat oxidation.[7] We want to emphasize that, while there may be a metabolic advantage to increasing carbohydrate versus fat in the immediate post diet period, this has to be tempered by the fundamental rule that whatever nutritional strategy you employ must be something you can adhere to. It's all well and good to say that you plan to only increase carbohydrate post-diet, but if that's not something you can adhere to, then you need to take a more moderate approach.

What might this look like as an example? If we take our hypothetical woman from earlier, she began her diet at 1428 calories, 175 grams of protein, 100 grams of carbs, and 35 grams of fat. Perhaps she ended at 1100 calories, 175 grams of

7 (n.d.). Weight regain after sustained weight reduction is ... - NCBI - NIH. Retrieved October 31, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18287221

protein, 55 grams of carbs, and 20 grams of fat (yikes, talk about a grind). For argument's sake, let's say we calculate her current maintenance at 1450 calories, and she'd like to start there. She wants to absolutely minimize body fat regain, so she decides on a carb to fat ratio of 60/40 to emphasize carbohydrate versus fats in the post-diet period. If she keeps protein at 175 grams, then we can subtract 700 calories of protein from her total calories, leaving us with 750 calories for carbohydrate and fat. 750 × 0.6 = 450 calories from carbohydrate. 450 ÷ 4 = 112.5 grams of carbohydrate, which we can round to 115 grams of carbohydrate. To determine fat intake, we take 750 × 0.4 = 300 calories from fat. 300 ÷ 9 = 33.3 grams of fat. We can round this to 35 grams of fat. So her starting macros would look like 175 grams of protein, 115 grams of carbohydrate, and 35 grams of fat.

High Days/Refeeds During Maintenance or Reverse Dieting

Many people ask us if they can have a high calorie or refeed day during their maintenance or reverse-diet period. Technically, it's no longer a refeed, since you're no longer in a caloric deficit. As such, a high-calorie day should only be done if you find that you prefer a few days per week with more flexibility while sacrificing calories on other days. If you'd like to have a high day in your plan, you can do this as long as you calculate it as discussed previously in Chapter 9. We find that in the initial post diet period, especially, providing people with the option to have one or one higher-calorie days at the expense of slightly lower calories on the other days of the week can work well, since many people prefer increased flexibility on the weekend—ourselves included.

Another option is to have high days on some weeks but not others. Recall that there appears to be no metabolic advantage to calorie cycling; therefore it's a matter of personal preference. As such, you can use high days as you see fit. Don't see the need for one this week, but have an event next week? Plan accordingly. Didn't plan a high day this week but randomly went out with friends and

overate a bit? No big deal; don't beat yourself up. Call it a high day and just decrease calories on your remaining days to compensate. Had an unplanned high day on Sunday, the last day of your week? No biggie, just reduce calories from the following week to offset it. The most important thing to do is always stay mindful and never let yourself enter "fuck-it mode."

Where to Begin – Exercise

As we've emphasized before, exercise is a *huge* deal for maintaining weight loss and preventing weight regain. Many people end their diet and take time off from training as a "reward" for their hard work. This is going to set you up for massive fat regain. First, we know that the benefits of exercise are acute, so you must exercise regularly to keep those benefits. If you stop exercising, you lose the benefits. We aren't saying you have to train 3 hours per day every day, but we really think 3 times per week for 30 minutes per session is an absolute minimum if you want to maintain your weight loss. We don't mean walking or just moving your legs on the elliptical, either. We're talking about exercise with purpose and intensity. If you choose to exercise at a low intensity, you'll have to increase the volume of exercise you do. Walking is fine, but you better be walking for 45 to 60 minutes every day if that's the only exercise you plan on doing. Ideally, you're weight training and doing some cardiovascular exercise as well.

When you switch from a caloric deficit to maintenance or a reverse diet, it's important to maintain your exercise activity at a high level. As discussed previously, exercise increases your sensitivity to satiety hormones and increases turnover in the fat cell. It also lowers the set point that your body defends.[8] [9]

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8 (2017, May 6). Attenuating the Biologic Drive for Weight Regain Following Weight Loss. Retrieved October 31, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28481261

9 (2009, July 8). Regular exercise attenuates the metabolic drive to regain ... - NCBI - NIH. Retrieved October 31, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19587114

There is also data showing that even with the same relative energy gap, subjects who ate more and exercised more regained significantly less weight and abolished post-diet fat cell hyperplasia versus those who ate less and exercised less, even though the relative energy gap was the same.[10] This was described as a high flux (high energy in and high energy out aka eat more, move more) energy state, and it appears to be favorable for weight maintenance compared to a low flux energy state (low energy in with low activity). This is possibly due to exercise increasing fat oxidation and shuttling fat away from storage and towards inefficient means of utilization.

It's easy to hear about the "high flux" state and get carried away with it. Eat more, move more, you say? Great, I'm going to exercise five hours per day and eat 3,500 calories and maintain my weight. While that might work in theory, most people simply cannot accommodate that sort of time towards training. If you can, great, but keep in mind that if and when you have to decrease the amount of exercise, you will need to compensate with an associated decrease in food consumption. This isn't something that works inherently correctly either. Athletes who retire often end up obese if they don't actively self-monitor and decrease their intake. To that point, athletes who repeatedly diet to make a weight class end up adding significantly more body fat post-retirement than those who did not have to make a weight class.[11] You must always remain mindful in this process. Gone are the days of magic diets, where you can do "whatever you want" and you'll magically lose weight and keep it off. If you're reading this book, then you *know* that is false. Everything you put in your mouth must be an inner conversation and decision regarding the pluses and minuses. We like to think of it in terms of opportunity cost. Opportunity cost is usually a term used in economics, wherein the focus is on the best use of a resource. Applied

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10 (2015, December 29). Increasing energy flux to decrease the biological drive toward ... - NCBI. Retrieved October 31, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28531421

11 (2018, April 5). How dieting makes some fatter: from a perspective of human ... - NCBI. Retrieved October 31, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22475574

to dieting, it might look like something like this: you can have a doughnut now, because maybe you've been craving one, as opposed to having a piece of chicken with some veggies and a small portion of a potato. Each option is roughly 400 to 500 calories, ballpark, and each has associated consequences. On the one hand, you satisfied the craving for the doughnut. But will satisfying that craving be worth the potential hunger you'll face later by not going for the more satiating option? Maybe. Only you know that. Or, if you chose to have the chicken, veggie, and potato combo, will the lack of doughnut be that big of a loss? Again, only you can answer that. Over time, as you build good habits, this will become more intuitive and less difficult, and far easier to navigate—but building those good habits requires re-wiring. Fortunately, exercise goes a long way towards re-wiring that system.

One question you may have is: "What if the amount of exercise I do is unsustainably high?" That is, you "sprinted" to the finish line to get that last bit of fat off, but you did so using an amount of exercise that you could only maintain in the short term. That's okay. Some things will not be sustainable long term, but are still useful tools in the short term. We suggest keeping that activity steady for two to four more weeks if you can, and then taper it down.

Continuing the Reverse

You've decided to reverse, and you've begun the process. Now what? How should you progress? When should you add calories? How much? When should you slow down? Can you add calories forever? All of these are very frequently asked questions, and they're important to address.

- **How should I progress?**

We recommend keeping your weekly check-ins and monitoring the same data, and using that to make your adjustments.

- **When should I add calories?**

In general, we recommend adding calories each week, unless your average weight increases by more than 0.2% to 0.5%. If you want to be more conservative, err towards the lower end of that range. If you're okay with being more aggressive, then err on the higher side. That said, understand that normal weekly fluctuations may take you outside this range; if you're a woman and your period comes up, for example, you may fluctuate up more than this range. However, during the following weeks, you should also come back down if it's a fluctuation. If you know that your weight is only up due to a short-term fluctuation from a period, water retention due to medication, or some other cause, then it's okay to add calories if you want. However, if minimizing fat regain is the priority, we typically recommend waiting until the fluctuation passess and reassessing the following week. This is largely up to your discretion. Further, if your weight fluctuates above the range, but you're still looking the same, your measurements are the same (fat and/or circumference), and/or you feel confident that it's only fluctuation, then you can make a judgement call about adding calories. If you're unsure, we suggest erring on the side of caution.

- **How much should I add?**

Assuming that your weight stays within the acceptable range, we recommend increasing your carbs and fats by 2% to 10% at each update. We realize that's a big range, so here's some guidance:

  - Conservative: 2-5%
  - Moderate: 5-8%
  - Aggressive: >8%

What you choose will be specific to your goal and your priorities. If your priority is to absolutely minimize fat gain but slowly build up your metabolic rate, then you'd

probably want to stay in the conservative zone. If you want to limit fat regain but build your caloric intake up a bit faster, then the moderate approach would be the best pick. If your priority is to get your caloric intake higher and to recover from your diet faster, you could opt for the more aggressive additions, but keep in mind that the risk for body fat gain is greater. So, who would want to use the aggressive modes? Perhaps someone who felt constantly fatigued, low libido, and hormonally imbalanced after a long diet. If this sounds like you, then you might be willing to trade off some body fat gain to feel normal or less hungry faster.

Let's look at what a conservative adjustment would be for our hypothetical woman from earlier. If she doesn't gain any weight and all her measurements are holding steady, then perhaps she decides to go on the high side of a conservative increase at 4%. Remember that her macros were 175 grams of protein, 115 grams of carbohydrate, and 35 grams of fat. A 4% increase in carbs and fats would equal approximately 5 grams of carbs and 1 to 2 grams of fat. Not exactly a smorgasbord. Some of you may even look at that and say, "What is the point? That's hardly an increase at all." A good point, but let's look at the big picture. If you made an increase of 5 grams of carbs and 1.5 grams of fat on average over the course of, say, 20 weeks, then that's a total increase of 100 grams of carbs and 30 grams of fat. Not exactly insignificant when you look at it that way.

By the same token, you don't have to always stick to the same adjustment pace. Perhaps at the beginning of your reverse, you decide that you'd like to be more aggressive. Then, once you feel more normal and less hungry, you can switch to a more conservative increase. For example, if our woman from the previous example decided to start with a more aggressive increase of 10% for her first update, then she'd be adding around 10 grams of carbs and 3 to 4 grams of fat. Perhaps after four to eight weeks, she's up to around 175 grams of protein, 170 grams of carbohydrate, and 55 grams of fat. Then she switches to more conservative adjustments after that. There's no one right or wrong way to reverse; it just depends on your situation, goals, and priorities. The most important thing to realize is that even if you add some fat, you aren't going to put yourself in

a worse place as long as you add it in a controlled manner. This is far different from yo-yo dieting, where people crash diet followed by rapidly increasing weight. As long as you aren't "eating like an asshole," you aren't going to incur the increase in fat cell number we talked about earlier in Chapter 3.

Much of these adjustments are going to be "by feel." The most important thing to realize is that there is no set-in-stone way to do this. If you're very focused on minimizing fat regain but still want to get your calories up over time, then you can always error on the conservative side, even if it means not increasing some weeks if you feel you're at the borderline.

- **When should I slow down?**

For slowing down or stopping the reverse,we typically recommend when 1) your weight goes outside the "acceptable" range for a weekly update or 2) when it hasn't gone outside the "accepted range" in any one week, but has increased consistently for at least three consecutive weeks. In this case, we'd only make very conservative increases, or take a week or two without increasing. 3) You may well get sick of eating. This third option is something you may *think* you'd like, but the reality isn't quite as delightful as it sounds. For instance, as you cruise along the reverse-diet track, you might get to a point where you're eating 200 to 300 grams of carbs per day. Moreover, you're making better food choices now. To be clear, these better food choices are great. But to give you a frame of reference, if you're going to shoot for 300 carbs a day from nutrient-dense vegetables, you could find yourself eating close to four or five *kilograms* of non-starchy vegetables *per day*. or those of you who use imperial units, that's about 8.8 pounds of vegetables a day on the low end. If you get into a higher-calorie range than you're accustomed to, it becomes impractical to get your calories this way. That means having more treats and fun foods, because they have more calories in a smaller size. Things like ice cream and Skittles, for example. The downside is that if you're a recovering "clean" eater and have general anxieties

and issues with "junk" food, you might be reluctant to incorporate these into your diet. If that's the case, you might want to hang out at your current level of eating for a while as you work to resolve those potential underlying issues.

Ending the Reverse

When to stop a reverse depends on multiple factors. If you're happy with your calorie intake and your physique, then I suggest dropping your calories by ~5% and staying there as long as you like. The reason for the 5% drop is to simply give you some cushion to make sure you don't gain weight. You don't have to do it, but if you're being conservative, that's what we recommend. If you still want to lose weight, and you're doing a reverse in the hopes of building up your metabolism, then I would recommend continuing your reverse until your metabolic rate at least matches what it "should" be based on the equations we provided in Chapter 6. I [Layne] used to recommend continuing to reverse until my clients began to linearly gain weight, but I've found that is an awful predictor of hitting your "maximum" calories. During a reverse, I often see someone's weight hold relatively steady, and then they gain a decent amount in a short period of time, like 0.5 to 1 kilograms in a week or two without even adding that many more calories. This is probably due to hitting some sort of "metabolic threshold" that we really can't explain just yet. However, after this period of time, their weight levels off, and they're able to continue adding calories for a good period of time before another weight gain. In this way, reverses are rarely a linear increase, but rather a stair step.

If your predicted metabolic rate (Müller or revised Harris-Benedict equations) plus your activity factor are matching your actual calorie intake, then that means your metabolic rate is "normal." While that should be sufficient to begin a fat loss phase if you still have more weight to lose, we recommend to keep going if you can deal with it for a bit longer. Reverse dieting is difficult for many reasons, especially for women who have been integrated and brainwashed by diet cul-

ture for many years or decades. The concept of eating more so that in the *future* you're better able to lose weight is a tough sell. Especially to those who want results *right now.* But, remember what we talked about in Chapter 4? If you're the type of person who wants right-now results, then you're *less* likely to have success. Focus on what's most important in the long term. Don't get caught up in the stupid cycle of those five pounds you just *have* to lose. But if you're someone who has a very low metabolic rate from years of improper yo-yo dieting, what are your choices? Your choices are to either diet on super low calories so that you can lose weight right now, or to reverse diet and build up your metabolic rate so that hopefully you can diet on more calories in the future. If you're one of these people, I can tell you that years of improper dieting don't get fixed in four, eight, 12, or 16 weeks. You need to start thinking about this in terms of months and years, because the level of metabolic adaptation and slowing you've incurred are likely proportionate to how you've been dieting previously. That is, if you screwed up and dieted for 12 weeks only to regain it in six weeks, that sucks. But if you start doing things properly, you'll likely turn it around very quickly. On the other hand, if you're someone who has spent *years* yo-yo dieting, it's not going to be such a quick fix. I wish I had better news for you, but people don't like to hear that it might take them a year of extremely conservative reverse dieting to put them in a position where they can lose fat on a more reasonable amount of calories—but your metabolism can only do what it can do. Complaining about it or wishing your metabolic rate was better won't solve it. Doing something about it is your only option. Either stop complaining and accept that you will need to diet on very low calories to lose fat, or reverse diet for the appropriate length of time to restore your metabolic rate to a normal level.

If we had our ideal, most people who wanted to lose more fat would keep reverse dieting past where their metabolism matches the prediction equations, until their rate is higher by 10% to 20%. So, if the Müller puts your BMR at 1800 calories per day and you're a moderately active person, then you'd multiply 1600 × 1.55 = 2480 calories per day. So, hopefully you're at least eating that much and maintaining

your weight. If you aren't, then you need to keep going. If you're 10% over, that means you're at around just over 2700, and if you're 20% over and crushing it, you're at almost 3000 calories per day maintaining your weight. Now you're in a great position to start dieting on a more reasonable amount of calories.

Beginning Another Diet: Where to Start?

So, you finished your reverse diet. You increased your calories back up to a normal level or more, and you're maintaining your current weight, but you'd still like to lose more. Where do we start to come back down? In some circles, it's become dogma that you need to stay at maintenance for at least a few months, but we don't agree with this for a few reasons. First of all, your maintenance calories aren't a set number, as we've already discussed. They can and do change, especially as you slowly add more calories and increase your metabolic rate. So, simply saying "stay at maintenance" at the end of your reverse is a bit nebulous. Second, if you're maintaining your weight on your current calories, typically you can still add small amounts and not add much weight, if any. Now, I understand why some people practice this "spend several months at maintenance" idea. If you're someone who has a long history of poor dieting habits but you've managed to get your calories pretty high and you're not comfortable adding more body fat, then it may be sensible to keep your calories steady to reduce your risk of adding more body fat. This also also gives you more time in a non-deficit state, which can be helpful. It won't increase your metabolic rate further, but it will give you more time out of a deficit, which will help dissipate some of those negative metabolic adaptations incurred by improper dieting. We should be clear here: it is okay to spend a week or even several weeks *not* increasing calories on a conservative reverse to give your metabolism a chance to "catch up" to your increased calorie level, especially if minimizing body fat gain is the priority and you've had your weight creep up a bit. However, if you plan to spend an indefinite period of time at your current maintenance, we suggest making sure that

your current metabolic rate at least matches your predicted metabolic rate. Assuming you've spent the necessary time focusing on building back your metabolic rate, and you've managed to get your calories up to at *least* your predicted maintenance calories while maintaining your weight, then it may be an appropriate time to attempt another fat loss phase. Many people mistakenly believe that since they reversed very slowly, they should move at the same slow pace to *drop* calories. But this is a big mistake, because your metabolism will simply adapt in the opposite direction. If raising them slowly causes minimal fat gain, then lowering them slowly will also cause minimal fat loss, because your metabolic rate will drop as you lower calories. You need to make enough of a drop to actually trigger a response from your body. In Chapter 6, we discussed that your maintenance calories can exist in a range of several hundred calories, and thus you need to drop enough to get out of that range. As specified in Chapter 6, we recommend targeting a drop of at *least* 0.4% body weight per week. Then you can simply use the calculations in chapters 6 and 8 to determine your starting calories and make adjustments based on the instructions in Chapter 10.

What If I Already Screwed Up?

You're probably thinking, "All of this is great, but what about me? I already screwed up because I dieted and gained back a bunch of weight by not properly reversing. My maintenance calories are currently pretty low, and I still have more body fat than I want...*What do I do*?" This isn't an easy issue to address, and honestly, we as coaches have very little success with this clientele. Not because they can't be helped, but because they're typically those dieters who have developed the worst habits. They have been attempting to lose weight pretty consistently for many years, typically through yo-yo dieting and inappropriate weight cycling. They often look for quick fixes and focusing on short-term results rather than what's best for them long term. Not a good recipe for fat loss and metabolic success. This doesn't always hold true, and there are exceptions for these situations, but in general this population (maintaining weight on low

calories and having a lot of body fat to lose) tends to have these characteristics. So, what do you do if you fit into this category? The first thing you need to realize is that you must be willing to change your mentality. Please repeat after us:

If you do what you have always done, you will get what you have always gotten.

Say it. Repeat it. Repeat it again. Now a few hundred more times. When you want to fall back into your old habits, repeat it *again*.

Now stick one more in your brain:

When the pain of staying the same becomes greater than the pain of change, that is when we change.

How high is your pain level? Is it high enough to change? Are you *truly* ready to be done with fad diets, yo-yo dieting, snake oil weight loss products, and quick fixes? Be honest with yourself. What people say means nothing. What they do means everything. If you say that you're ready to change, but then continue bad habits, you don't actually want to change. What you *truly* want is dictated by your actions. If you truly want to make a change, then you will make the change. That doesn't mean it will be easy. Quite the contrary; it will be laborious and grueling. But you'll do it.

So, where do we go from here? Essentially, you're in the position where you have to choose whether to attempt fat loss or reverse diet from your current position to improve your metabolic rate so you can lose fat more effectively in the future. We aren't going to say what the best course of action is. What we *will* say is that in our experience, if your metabolism isn't too trashed, it's okay to attempt to get some fat off first. It typically increases motivation, since getting people to reverse when they're already uncomfortable with their body fat level is very difficult. However, if you're already maintaining on less than your predicted calories by 25%, then it's not time to attempt more fat loss. That is, if you plug your metrics into the equations in Chapter 6 and get a predicted maintenance

calorie level of 25% or more over what you're *currently* maintaining on, then you shouldn't attempt fat loss. Your metabolism is simply in too shabby of a position to do so. For example, if your BMR was calculated at 1320 and you're moderately active (activity factor of 1.55), then 1320 × 1.55 = 2046 predicted maintenance calories. 2046 0.75 = 1535 calorie minimum threshold. If this person was maintaining their body weight on 1535 calories or less, dieting would be a no-go.

If all this math is giving you a headache, a quick and dirty minimum calorie level for starting a fat loss phase would be a maintenance calorie level of at least 25 calories per kilogram of lean body mass (25 kcal/kg LBM). This isn't quite as accurate as doing the calculations in Chapter 6, but it's a bit easier for those of us who are math-challenged. However, keep in mind that if you're even close to this minimum threshold, you'll need to diet on very low calories to lose weight. This also means that there won't be very much room to break plateaus. If you're maintaining your weight on 1500 calories, and you decide to start dieting at 1150 because you just "have to" lose fat right now, then what will you do when your fat loss plateaus? Go even lower? We don't think that's a good idea. However, if you're maintaining your weight on a lower level of calories than you like, but not lower than the specified thresholds, it's okay to attempt to lose some fat first before you begin a reverse diet. But you should *only* attempt this weight loss if you acknowledge that it's simply to help motivate you in the short term, and you *will* have do the work to restore your metabolism after you've lost whatever you want to lose. How much is it okay to lose? You can continue to lose fat until your fat loss plateaus to the previously discussed maintenance calories threshold.
If losing fat right now requires very low calories (maintenance calories at 25% below the predicted maintenance or less than 25 kcal/kg LBM) it's typically time to forgo fat loss and invest in a reverse diet. Not only is this going to help improve your metabolic rate so that you can diet without having to starve yourself in the future, but it also shows a commitment to changing your mindset. Recall that delayed gratification (low recency) is a strong predictor of long-term fat loss success. If you stay stuck in the mindset of "I must lose this weight right

now," then you will likely never have much long-term success. Your mindset must flip to: "What is the best course of action for me right now, to be in the best position to reach my long-term goal?" If you have more body fat than you'd like but also maintain your body weight on very low calories due to a long history of yo-yo dieting, then it's time to *break the cycle*. Remember, if you continue to do what you have always done, you will get what you've always gotten.

There is no magic solution to this situation. There are no quick fixes. Keto isn't going to fix it. Alkaline diet isn't going to fix it. Intermittent fasting isn't going to fix it. Carb backloading isn't going to fix it. Snake Diet isn't going to fix it. Proponents of each will likely try to convince you that their magic solution can fix your crap metabolism, but in reality, the only thing that will restore your metabolic rate is a sustained period of time *not* in a deficit. In my [Layne's] experience, because many of these people have developed such bad habits that they're very easily swayed by fad diets, fat loss supplements, and other forms of nutritional fuckery. Their mindset is to lose the weight now rather than fix the root of their problem. For these individuals, it's very difficult to convince them to focus on fixing their metabolism rather than losing weight, because the former could mean minimal weight regain, and they're already uncomfortable with their size.. I'll be honest. I've worked with hundreds of these people, and only a few had success in the long term. Most of them quit after things didn't happen quickly enough for them, choosing instead to fall back into bad habits of crash dieting, yo-yo dieting, fad dieting, or falling for nutritional fuckery. If you do what you've always done, you will get what you have always gotten. Yes, we are speaking to *you*.

If you've been reading this feeling like we're speaking directly to you, it's because we are. We've worked with hundreds of people just like you, and we've seen what works and what doesn't. We've also seen so many heartbreaking stories of people who let emotion and short-sightedness take over their better judgement and keep them in the chronic yo-yo dieting cycle. We also want to remind you that not everyone is going to be able to attain a low body fat and maintain it on a decent amount of calories. For some of you, it's just not reason-

able unless you're willing to have an extremely restrictive lifestyle. It just may not be in your genetic cards. That doesn't mean you can't get better and attain better health and a better physique, but you may never look like the men and women on the cover of the magazines. However, we'll let you in on a little secret about those cover models. Most of them don't look like that year round. Most of them diet to extremely low body fat levels for those magazine shoots, only to put back on a more normal amount of body fat once they're done. The models who *do* maintain those sorts of physiques year round typically live an extremely restrictive and in some cases dysfunctional lifestyle. I [Layne] have worked with some of the most famous fitness models in the industry. Those who live at low body fat levels and are able to enjoy a "normal" lifestyle are rare. Looking like that requires a superhuman commitment that is not conducive to the freedom of a super flexible lifestyle in the vast majority of cases. We'll also let you in on another secret: these people are often just as unhappy with their physiques as you are with yours. That may seem insane, but I've known fitness models who had the most amazing physiques and yet were incredibly unhappy and still viewed themselves as fat and out of shape.

A great physique isn't going to make you happy. It might make you happier, but it's not the key to happiness. I'm not sure what the key to happiness is, but I can tell you that it's not having a six pack. So, for those of you who believe you'll be happy when you lose that pesky 20 pounds or get the fat off your thighs, you'll be extremely disappointed. Losing fat can improve your health, your self image, and be part of a happy life, but it's not sufficient on its own to make an unhappy person happy. By the way, there's no reason you can't be a happy person and still have some body fat. You can. You can also lose some fat and be a happy person. You can be an obese person and be happy; that's also cool with us. It's not our job to tell you what should make you happy. What we *can* tell you is that it's only cool to complain about something if you're actively working to change it. So, if you're obese and happy, good on you. But if you complain about your body fat level, then you better do something to change it. If you're complaining about your metabolism and your inability to lose fat then you better do something to change it.

SUMMARY

- Have a plan for the diet after the diet
- Do not YOLO (you're only lean once)
- If you're happy with your current body fat level and maintenance calories, then stay at your current maintenance indefinitely and enjoy
- If you're happy with your current body fat levels but not happy with your current maintenance calories, reverse diet
- If you're unhappy with your current body fat levels and your calories, then you need to decide if dieting or reverse dieting is more appropriate based on the minimum threshold calories described in this chapter
- Reverse until your calories reach a level you're happy with, and then stay there if you're happy with your body fat levels
- Reverse until your actual maintenance calories at least match your predicted maintenance calories before attempting another big fat loss phase (preferably 10% to 20% more than predicted calories)

12

THE KETOGENIC DIET

By Kristi Storoschuk and Dr. Dominic D'Agostino, University of South Florida

We've mentioned the ketogenic diet at various points in the book, often in conjunction with fad diets. To be clear, we don't consider the ketogenic diet a form of fad dieting, although zealots do promote it in a similar manner. Rather, the ketogenic diet simply offers a different option for fat loss. The goal here is to go over both how and why someone may want to implement it, and to remove all the nonsense and "sex appeal" from it. As we discussed in chapters 2 and 7, it doesn't appear that the ketogenic diet is superior for weight fat loss when calories and protein are equated, but that doesn't mean some people don't find the ketogenic diet better for *them*. As we discussed previously, adherence is the most important factor for success, so we encourage you to explore all of your options when seeking to change and maintain body composition. There is a myriad of scientific and anecdotal evidence to suggest that the ketogenic diet shouldn't be thrown under the rug.

At first glance, keto looks like it comes with a lot of baggage. You may even be guilty of these thoughts: "I won't be able to train without carbs" or "What do I eat?" or "There is *no way* I can eat this way without losing all my muscle!" Or maybe you just don't like bacon, and you think that's all ketogenic dieters eat. The goal of this chapter is to clear up these misconceptions and provide the tools for implementation in a prescriptive manner. We aren't trying to convince you that the ketogenic diet is a magic pill or that it's for everyone; we simply want to provide a different perspective to a strategy that many could benefit

from. The way we see it, the ketogenic diet may be a practical option to create a desired calorie deficit, and it may have some other benefits for specific populations, which we will discuss in this chapter.

History

The history of the ketogenic diet is fascinating, and it's a great example of how scientists work to explore the unknown. In modern times, the ketogenic diet has been re-introduced based on the premise of what had previously been documented on fasting. Historically, fasting was a therapy used to cure disease, evidence of which dates back millennia. Fasting was likely a condition that our ancestors experienced on a relatively regular basis through the greater part of the past 70 thousand years. Certainly, they lacked foods highly enriched in carbs, except for the occasional honeycomb. et they survived, and they spread over the Earth.

Ancient religious texts from Biblical, Qur'anic, Buddhist, and Vedic sources include stories about the benefits of fasting on the health of the mind and spirit. Indigenous tribes like the Lakota always fast before their vision quests and sun gazing rituals, too. But what do we know about the history of these ketogenic strategies on the effects of body composition? For starters, about 2500 years ago, the great, ancient Greek physician Hippocrates recommended diets "rich in fat and deplete of grains" for the treatment of obese patients. Fast-forward to the mid-1800's, when Banting followed a higher-fat diet and normalized his weight (see Chapter 1). It wasn't until the 1900s that fasting ketosis was medically explored in patients suffering from the burden of epilepsy.

Fasting, however, came with obvious barriers, since it's not exactly sustainable. In the 1920s, it was proposed that a diet void of carbohydrates and replaced with fat could circumvent the limitations of fasting in epileptic patients and produce a state of therapeutic ketosis. These observations lead to the ketogenic diet. Shortly after, the diet was put to the test in the first documented clinical study

reported by the Mayo Clinic utilizing a four-to-one ketogenic diet (four parts fat to one part of protein plus carbohydrate, by weight), otherwise known as the *classical ketogenic diet.* This was proven highly effective for seizure control.[1]

Today, the ketogenic diet has been explored as a therapeutic tool against a variety of conditions ranging from rare metabolic disorders to neurodegenerative diseases, diabetes, cancer, and what has brought you here—weight loss.

What is the Ketogenic Diet?

Simply stated, the ketogenic diet is a high-fat, moderate-protein, and very low carbohydrate diet. It's unique because it's the only diet defined by the presence of a biomarker—blood, urine, or breath ketones. There's still confusion around what constitutes a ketogenic diet. Some view it simply as a low-carb diet, when in reality it extends beyond this. It's not a matter of solely reducing carbohydrates or solely increasing fats. It's the composition of all three macronutrients that dictate your success on the diet. The definitive goal of the diet is to enter the metabolic state of ketosis, where the body transitions from burning glucose as the primary fuel to burning fatty acids and ketones. Most people following a "keto diet" for weight loss seldom achieve, much less sustain, a state of ketosis. Ketosis itself is defined by an elevation of blood ketones (beta-hydroxybutyrate; BHB) above 0.5 millimoles per liter; getting to 0.5-3.0 millimoles per liter is optimal.

Variations of the Ketogenic Diet

The more people explore the diet, the more the "ketogenic diet" is becoming an umbrella term to describe variations that allow for sustained nutritional ketosis.

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1 (n.d.). Ketogenic diet for treatment of intractable epilepsy in adults: A meta .... Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/29588983

The *classical ketogenic diet* mentioned previously equates to roughly 90% of your calories coming from fat, relatively low in protein (6% to 9%), and next-to-no carbohydrates (0% to 4%). The main difference with modified versions of the ketogenic diet is that they are more liberal in protein (at least double), and these have been shown to also induce nutritional ketosis without the stringency of the classical protocol. The modified ketogenic diet is associated with improved compliance for adult epilepsy, and the added protein is beneficial for inducing and sustaining body composition alterations.

Modified versions of the ketogenic diet can range from:

- Carbohydrates: 0-10% (ideally fibrous veggies)
- Protein: 15-35% (ideally fatty meats and fish)
- Fat: 65-85%

Generally speaking, the daily macronutrient recommendations are as follows:

- Carbohydrates: no more than 50 grams *total*
- Protein: 1-1.5 g/kg LBM (1.8 g/kg may be more optimal under some conditions)
- Fat: remaining daily calories or to satiety (ideally counting macros, which shouldn't be surprising at this point)

If you can get away with consuming more protein than the recommendations above while still maintaining nutritional ketosis (less than 0.5 millimolars), and it eases your mind and creates better dietary adherence, then do it. Keep in mind that when maintaining a greater calorie deficit, it can be relatively easy to maintain ketosis with higher levels of protein.

Understanding How the Body Enters Ketosis[2]

1. Within the first one to 12 hours, you'll burn through most circulating or previously ingested glycolytic fuel. The length depends on the type and amount of foods ingested.
2. The body will next tap into its stored liver glycogen to sustain blood glucose levels for up to 12 to 24 hours, via *glycogenolysis*.
3. Upon liver glycogen depletion, *gluconeogenesis* increases to supply glucose for the brain, primarily from gluconeogenic amino acids in muscle or dietary protein. Gluconeogenesis is typically elevated for a week or more following transition into nutritional ketosis.
4. Gluconeogenesis overlaps with ketogenesis, which is typically elevated after three days (less than 0.5 millimolars). Glucose is progressively spared for the brain by the prevention of glucose utilization in tissues such as muscle and adipose. Reduced insulin and increased glucagon leads to a high glucagon-to-insulin ratio, upregulating the fat oxidation machinery required for the production of ketones in the liver, as well as the liberation of free fatty acids from adipose to the liver. Free fatty acids are then converted to acetoacetate and beta-hydroxybutyrate (*Ketogenesis*; *Figure 1*) and exported to peripheral tissues. Liver and muscle can use free fatty acids as fuel directly. The glycerol backbone liberated from triglycerides serves as a gluconeogenic substrate in the liver.
5. As you sustain ketosis, your reliance on glucose for fuel diminishes, ketones are preferentially taken up by the brain (fewer cravings for sugar), muscles will primarily use free fatty acids, and the liver will be poised towards ketone production and gluconeogenesis.

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2 (n.d.). Starvation in man. - NCBI. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/4915800

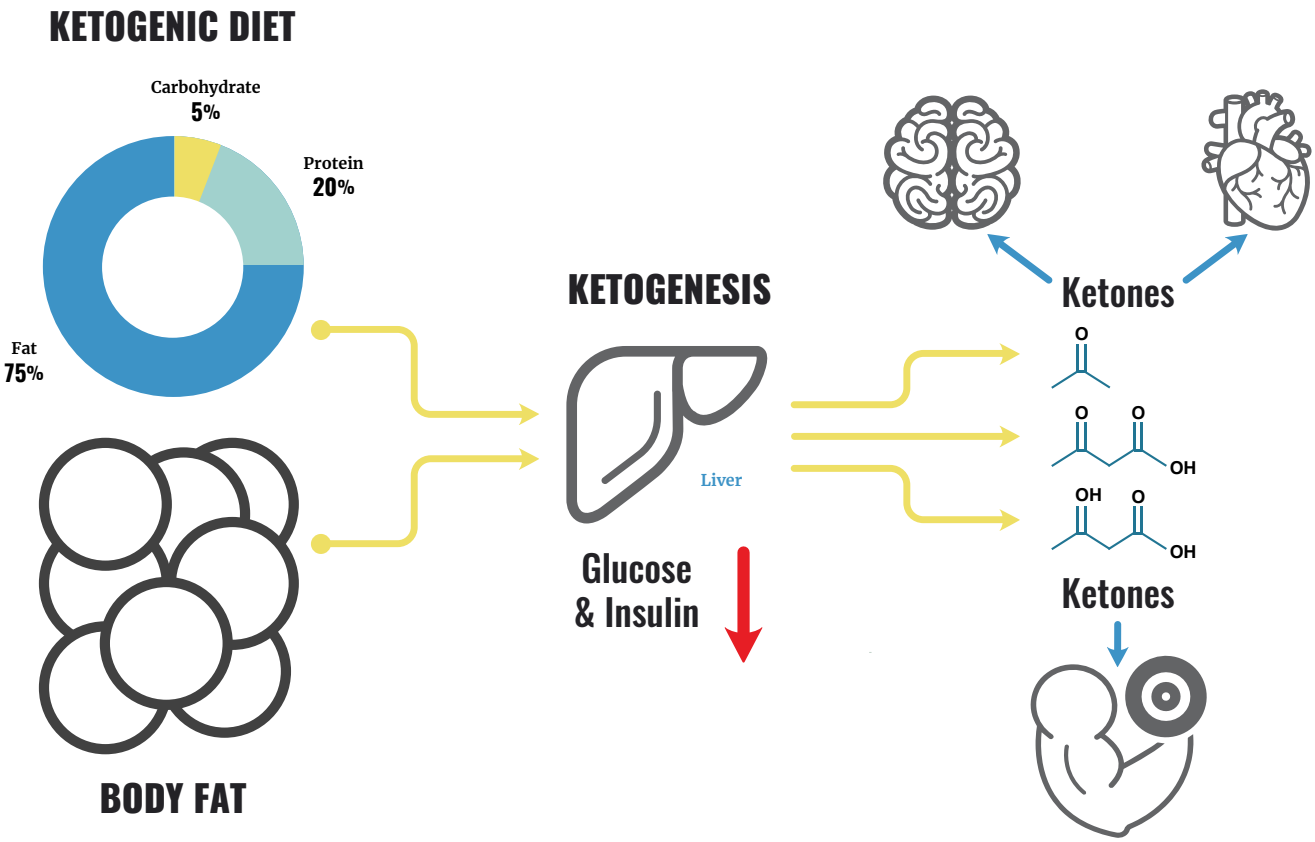

Figure 1: Production of ketone bodies from body fat and dietary fat by the liver and utilization by various tissues

Ketone Bodies

There are two primary ketone bodies produced in the liver: acetoacetate (AcAc) and beta-hydroxybutyrate (BHB). A greater abundance of BHB is favored, accounting for ~78% of total ketones. AcAc is the primary intermediate between the production and utilization of ketones for fuel; BHB is produced from AcAc and converted back to AcAc before being used for energy. Acetone is produced by the spontaneous breakdown of AcAc and is mostly excreted through our urine and breath.

Insulin

The peptide hormone insulin plays a very important role in the metabolism. This includes ketogenesis. Our pancreas releases insulin in response to a rise in blood glucose (and some amino acids), indicating that glucose is available and thereby preventing the liver from making ketones. Insulin's primary role as storage hormone is to regulate blood glucose by facilitating glucose disposal and utilization (glycolysis). The body works very differently when insulin is present versus when it's suppressed. It's a master regulator of our metabolism, and the presence—or absence—has the power to dictate whether we use glucose for fuel or fatty acid and ketones, respectively. When carbohydrates are restricted, and as a consequence insulin is suppressed, the doors now open for the transition into ketogenesis.

Insulin increases: glucose uptake, glycolysis, glycogen synthesis, adipogenesis (with total fat gain or loss dictated by overall calorie intake), and protein synthesis
Insulin decreases: gluconeogenesis, glycogenolysis, lipolysis, ketogenesis, and protein breakdown

In the presence of Insulin

When you consume a carbohydrate-based meal, your body will primarily metabolize glucose as a result of increased insulin levels, which in turn suppresses the hormone glucagon.[3] In the presence of insulin, the liver will take in some of this glucose, and either store it as liver glycogen or metabolize it into acetyl-CoA to be used in the generation of energy. DNL is generally low and contributes very little to overall fat storage as we discussed in Chapter 2, but can be higher with excess fructose consumption. These fatty acids are then used in the production of triglycerides and stored in the liver, or sent for storage in our

3 (n.d.). The Role of Dietary Protein and Fat in Glycaemic Control in Type 1 .... Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26202844

adipose tissue. Lipolysis, or the breakdown of stored triglycerides in our adipose tissue, is inhibited by insulin. Muscle will also take up glucose in the presence of insulin and use it directly as fuel, or store it as glycogen.

Fuel for the brain: glucose
Fuel for the muscle: glucose

Suppression of Insulin

When you restrict carbohydrates, insulin levels are then suppressed, and it stimulates the release of the hormone glucagon. The ratio of glucagon to insulin is an important contributor to ketogenesis. As we mentioned, a higher glucagon-to-insulin ratio is required for the production of ketones. In addition, this ratio alters liver metabolism in a way that ultimately halts glycogen synthesis, and favors the breakdown of liver glycogen and gluconeogenic substrates, which occurs with caloric restriction outside of a ketogenic diet. With that said, muscle glycogen is spared if and when ketones are elevated, based on the transitional use of fatty acids and ketones for fuel. Muscle glycogen is used (and lost) at a much faster rate following a carbohydrate-based diet, especially under conditions of calorie restriction. Thus, being in ketosis has practical implications when it comes to preserving muscle glycogen.

Fuel for the brain: ketones
Fuel for the muscle: free fatty acids

Macronutrients Metabolism and Their Respective Hormonal Response

Carbohydrates

Carbohydrates are broken down through a series of enzymatic steps until their final conversion to individual glucose molecules in the liver. These glucose mol-

ecules are either stored as liver glycogen or enter circulation, providing fuel to the rest of the body. The blood glucose response of carbohydrates depends on dose, and the source of carbohydrate consumed dictates how rapid or delayed the response (e.g. high-fiber foods such as fibrous vegetables can essentially be non-glycemic, although they contain carbohydrates).

Glucose Response: Dose-dependent and rapid
Insulin Response: Elevated (depending on fiber content)
Glucagon Response: Suppressed

Protein

Protein can stimulate the release of the hormone glucagon, which triggers the breakdown of liver glycogen to raise blood glucose. Gluconeogenic amino acids can also be converted to glucose in the liver, contributing to an elevation in blood glucose. Protein's impact on blood glucose levels is very small compared to that of carbohydrates, and the response can be delayed up to 5 hours after consumption, especially in the presence of high fat and fiber.[4]

Glucose Response: Moderate and delayed
Insulin Response: Dose-dependent
Glucagon Response: Elevated

Fat

Fats are typically consumed (and stored in adipose) in triglyceride form, which contains a glycerol backbone and three fatty acid chains. The length of the fatty acid chains matter in how they're metabolized in the body, both in general and in terms of ketogenesis. For example, when long-chain triglycerides (LCT) are

4 (n.d.). The Role of Dietary Protein and Fat in Glycaemic Control in Type 1 .... Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26202844

ingested, they're packaged into chylomicrons, which enter our lymphatic system and are delivered to adipose tissue. Whereas medium-chain triglycerides (MCT) bypass this process and are delivered directly to the liver through hepatic portal circulation. MCTs can be rapidly converted to ketone bodies in the liver (under ketogenic conditions), and can be used directly for energy (even by the brain). In terms of glucose response, once liberated from triglycerides, free fatty acids cannot be converted to glucose. The glycerol backbone, however, can be.[5] When keto-adapted, this is the body's primary source of glucose for cell types that cannot metabolize fat or ketones, but this conversion will have no noticeable effect on insulin.

Glucose Response: No response
Insulin Response: No response
Glucagon Response: Elevated (in response to low insulin)

Glucose, Insulin, and Appetite Control:

If you find that eating carbohydrate causes large fluctuations in your energy, a ketogenic approach might help control this. You could eat a 500-calorie ketogenic meal with little to no elevation of blood glucose, translating to little to no elevation of insulin and perhaps even energy and increased satiety. So, while you're supplying the body with energy (calories), the body for the most part will be in the "fed" state while the liver will remain in the "semi-fasted" state. This is important for the maintenance of blood glucose. The liver is the master regulator of metabolism, so to sustain ketosis, the liver must maintain this "fasted" state. What's more important is that *after* this ketogenic meal, you will remain satiated for two, three, four, or even five-plus hours. In addition, fat in combination with moderate protein is very satiating, and for many, a well-formulated ketogenic diet is difficult to overconsume. We'll touch on other

5 (n.d.). Biochemistry - NCBI Bookshelf. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/books/NBK21154/

appetite-suppressing effects of the ketogenic diet, which can create better adherence to the diet. Clinically, the appetite-suppressing effects of the ketogenic diet can sometimes be problematic (especially for underweight individuals), but it's often an advantage when trying to create and sustain an energy deficit. That being said, there are few reports showing differences in adherence between the ketogenic diet and non-ketogenic diets; thus it probably boils down to what the individual prefers.

Meal Frequency on the Ketogenic Diet

Figure 1 in Chapter 13 demonstrates that manipulating meal frequency will have no advantage for fat loss, because total caloric intake takes precedence. This is true. You've also read that three to five protein-containing meals throughout the day are advised for optimizing lean body mass, recommended on the assumption that you're in a glycolytic state. The ketogenic diet makes room for less frequent feedings due to delayed gastric absorption from consuming high fat. You may find your hunger feels different when you're in ketosis versus when the body is craving glucose. Instead of eating five times a day, you may find you only want/need to eat two or three times. Practicing intermittent fasting or time-restricted feeding (TRF) may become much easier when following a ketogenic diet, and some people find that TRF makes creating and sustaining a calorie deficit easier over time. When you're in ketosis, you're no longer a slave to food; one reason being that you're wearing your food. Even lean athletes can hold ~40,000 calories in stored body fat, and keto-adaptation (over months) makes it easier to access that fat for fuel.[6]

Our bodies are well-tuned machines that function off the innate survival cues that regulate our hunger and control our metabolism. Leptin and ghrelin are also differentially regulated in a state of ketosis. While the amount of leptin

6 (n.d.). Time-restricted feeding is a preventative and therapeutic ... - NCBI - NIH. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4255155/

decreases, our sensitivity typically increases, meaning only a small release of leptin will reduce hunger cravings. The suppression of ghrelin has been reported in calorie-restricted subjects who maintained BHB levels above 0.3 millimolars per liter.[7] Additionally, drinking exogenous ketones lowers plasma ghrelin levels compared with isocaloric dextrose, perceived hunger, and desire to eat.[8] Now, it's important to note that dextrose ingestion also lowered ghrelin, just not as much as exogenous ketones. Dextrose has very little satiety value in the short term, so it's unknown whether exogenous ketones would be better than isocaloric protein or lower-glycemic, carbohydrate-containing fiber. Further, it's important to note that exogenous ketones have caloric value and thus are not "free calories" but may have some beneficial effects. This effect on ghrelin may help improve satiety in a keto-adapted state.

Signalling Roles of Ketones

Ketones are not only energy metabolites used for the production of ATP; they're also powerful signalling molecules, functioning similarly to hormones. Research has found beta-hydroxybutyrate (BHB) to be anti-inflammatory, through the inhibition of the NLRP3 inflammasome.[9] The NLRP3 inflammasome controls the activation of pro-inflammatory molecules, and dampening this pathway can reduce systemic inflammation. Chronic inflammation is also a characteristic of metabolic dysfunction, which is tightly linked to insulin resistance.[10] The ketogenic diet can enhance insulin sensitivity, as well as reduce the inflamma-

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7 "Low Carbohydrate versus Isoenergetic Balanced Diets ... - NCBI - NIH." 9 Jul. 2014, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4090010/. Accessed 6 Nov. 2018.

8 (2017, November 6). A Ketone Ester Drink Lowers Human Ghrelin and Appetite - NCBI - NIH. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5813183/

9 (2015, February 16). The ketone metabolite β-hydroxybutyrate blocks NLRP3 ... - NCBI - NIH. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25686106

10 (2015, February 16). The ketone metabolite β-hydroxybutyrate blocks NLRP3 ... - NCBI - NIH. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25686106

tion that could be contributing to insulin resistance.[11] If anything, this anti-inflammatory effect may reduce inflammation-associated pain, thereby enhancing performance. What's less clear, however, is if this anti-inflammatory effect is due to unique properties of ketones, or simply the weight loss associated with caloric restriction. Several studies have demonstrated that most of the health benefits of diets can be simply ascribed to the health benefits of weight loss itself.[12] Thus, while the ketogenic diet may offer some unique benefits, remember that making sure whatever diet you choose is sustainable *for you* is the most important factor, since losing weight is the most critical piece for improving health (by way of increasing insulin sensitivity, reducing cardiovascular risk factors, and better blood markers).

Beta-hydroxybutyrate (BHB) has also been shown to act at the epigenetic level, meaning it holds the power to alter gene expression. While this may not make a huge difference in the present, long term this could have many beneficial effects on longevity. For example, BHB is a histone deacetylase (HDAC) inhibitor, and generally speaking, HDACs inhibit the gene expression. Through ketone-induced HDAC inhibition, BHB has been shown to induce the expression of genes involved in oxidative stress resistance.[13] This means BHB can enhance our own cellular and physiological protection against oxidative stressors that cause cellular damage. These ketone-induced adaptations may enhance performance resilience, especially under conditions of a calorie deficit and high endurance-training demands.

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11 (n.d.). Ketone bodies as signaling metabolites. - NCBI - NIH. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/24140022

12 "Low Carbohydrate versus Isoenergetic Balanced Diets ... - NCBI - NIH." 9 Jul. 2014, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4090010/. Accessed 6 Nov. 2018.

13 (2012, December 6). Suppression of oxidative stress by β-hydroxybutyrate, an endogenous .... Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23223453

The Ketogenic Diet and Muscle Maintenance:

Insulin is commonly considered anti-catabolic, and this is true. One effect of insulin is reduced muscle breakdown. It would be easy then to assume that a suppression of insulin means an upregulation of muscle catabolism. However, it's not quite that simple, since ketones are protein-sparing. Nitrogen excretion slows with keto-adaption, indicating a reduction in protein breakdown since fats and ketones become the primary fuel sources.[14] However, there's evidence that some LBM is lost during the initial keto-adaptation period until the body reaches keto adaptation.[15] During the transition into ketosis, the brain begins preferentially utilizing ketones for fuel, and therefore relies less on glucose. This decreased reliance on glucose for fuel significantly reduces the breakdown of gluconeogenic amino acids in skeletal muscle, explaining this muscle-sparing effect. Additionally, fatty acids are oxidized as fuel for muscles, sparing ketones for the brain while simultaneously maintaining muscle protein by a reduction in branched chain amino acid oxidation.[16] It's important to note that muscles can only use ketones for fuel under aerobic conditions, whereas anaerobic exercise will have obligate glucose usage. Thus, the ketogenic diet may not be optimal for athletes who do high-intensity exercise for muscle sparing. Recently, it was demonstrated that BHB IV infusion in humans has potent anticatabolic effects, preventing muscle-wasting under conditions of induced inflammation.[17]

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14 (n.d.). Fuel metabolism in starvation. - NCBI. Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16848698

15 "Energy expenditure and body composition changes after ... - NCBI - NIH." 6 Jul. 2016, https://www.ncbi.nlm.nih.gov/pubmed/27385608. Accessed 6 Nov. 2018.

16 (n.d.). Glucogenic substrate levels in fasting man - Science Direct. Retrieved November 6, 2018, from https://www.sciencedirect.com/science/article/pii/0065257175900230

17 (2018, October 1). Effects of 3-hydroxybutyrate and free fatty acids on muscle protein .... Retrieved November 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/30239561

What to Eat on a Ketogenic Diet

Now that we've discussed how the ketogenic diet works, let's discuss how to implement it.

Carbohydrates (0-10%):

A well-formulated ketogenic diet will favor carbohydrate sources from fibrous (non-sugar and non-starchy) vegetables, which can typically allow one to consume up to 50 grams of total carbohydrates per day. Fiber and net carbs become complicated with the addition of processed foods, specifically sugar alcohols. Dependence on "ketogenic" packaged foods can lead to a lack of fiber (especially insoluble fiber), but by following a well-formulated ketogenic diet, a lack of fiber shouldn't be of concern. From a glycemic standpoint, there is an advantage to eating raw vegetables over cooked vegetables based on how our bodies metabolize and access their carbohydrates.

Recommended examples of sources:

- All leafy greens and lettuces
- Cruciferous vegetables (broccoli, cauliflower, brussel sprouts, cabbage)
- Celery
- Cucumber
- Zucchini
- Bok choy
- Mushrooms

Protein (15-35%):

On a ketogenic diet, it's best that protein sources come from poultry, fish, eggs, and fatty cuts of meat,. Vegetarian and vegan sources are harder to come by,

and you may have to rely on low-carbohydrate, plant-based protein powder—though this isn't generally ideal. s. The caveat here is that large boluses of liquid protein, like in a protein shake, enter digestion very rapidly. Because of this, we recommend adding fats to a protein shake to try and attenuate any spike in insulin from the protein. You can get small amounts of protein from high-fat nuts and seeds, but you need to account for the carbohydrates in these foods. Depending on your carbohydrate tolerance (which you can learn by measuring ketones), fermented soy products such as tempeh may be a good choice.

Recommended examples of sources:

- Fatty cuts of red meat
- Poultry with skin on
- Fatty fish such as sardines, salmon, mackerel
- Eggs and egg yolks
- Nuts and seeds such as hemp seeds, macadamia nuts, and pecans
- Tempeh

Fat (60-90%):

Fats will make up the bulk of your daily calories. Oils are the easiest way to consume fats while avoiding carbohydrates, as well as protein to some extent. There are whole foods options, as well. Fats can delay gastric absorption of proteins and carbohydrates, slowing any blood glucose response, so it's important to include them in combination with your other macronutrients. Fats are also very satiating, especially with protein, and they'll make your food more palatable. Because of their calorie density, portion size may become smaller, and this could be a psychological barrier when just starting out with the ketogenic diet. However, you'll likely find freeing to feel satiated after eating smaller quantities of food. MCTs are an excellent source of fat when following the ketogenic diet based on their metabolic characteristics. The addition of MCT oil or powder can

induce and maintain ketosis very effectively, and may allow for less stringency on other macronutrients, primarily protein. When choosing sources of fats, it's crucial to consider the type and quality.

Types of Fats:

The majority of your fats should come from saturated and monounsaturated sources, while polyunsaturated fats should only be consumed sparingly. When consuming polyunsaturated fats, place emphasis on omega-3s while minimizing omega-6s. Both are essential fatty acids, meaning the body cannot produce them on its own and they must be received through diet. However, omega-6s are very often over-consumed and omega-3s under-consumed, leading to chronically induced inflammation. Omega-6 requirements will be easily met on the ketogenic diet without effort. Maintaining an omega-6 to omega-3 ratio between four-to-one and one-to-one would be ideal.

Quality of Fats:

Vegetable and seed oils are the primary sources of dietary omega-6s. ow-quality oils are often oxidized and may do more harm than good in your body. Put effort into sourcing oils that are cold-pressed, extra-virgin, and unrefined if possible. Saturated and monounsaturated fats are less likely to oxidize under heat, making these more suitable for cooking. However, lower heat can further protect the integrity and quality of oils.

Recommended sources:

- Oils: coconut oil, butter, ghee, MCT oil, cacao butter, extra-virgin olive oil, avocado oil, and macadamia nut oil
- Whole foods: avocados, eggs, fatty cuts of meat, poultry with skin on, coconut butter, coconut meat, olives, nuts, and some seeds

Limit consumption of or avoid completely:

- Soybean oil
- Corn oil
- Cottonseed oil
- Peanut oil
- Canola oil
- Grapeseed oil
- Safflower oil
- Sunflower oil

How to Test Ketones

Blood

The most accurate way to measure ketones is through the use of a blood ketone meter. These devices (e.g. Precision Xtra) test for beta-hydroxybutyrate (BHB), the body's primary and most abundant ketone body. While this is the most accurate method, it's also the most expensive, which may not make it feasible for everyone.

Urine

Testing ketones in urine can be very simple and useful. Ketones are filtered through the kidneys and reabsorbed based on the body's energy needs, and ketones that aren't reabsorbed are excreted in your urine. Ketone strips are easily accessible and cheap (e.g. KetoStix), and they typically test for the ketone body acetoacetate. Accuracy, however, can vary. Results are highly dependent on hydration status and keto-adaptation (e.g. less ketones excreted as waste due to better ketone utilization). When beginning with the ketogenic diet, they can be a reliable indicator to validate that you're in a state of ketosis.

Breath

Reusable breath ketone (acetone) analyzers can be a useful, noninvasive method to determine relative state of ketosis. Various meters are on the market (e.g. Ketonix), and they can be cost-effective if you desire frequent measurements. New devices are emerging on the market and are more quantitative, and they can even sync with smartphones.

Caveats of a Ketogenic Diet

A strong argument against the ketogenic diet is that ketones cannot fuel anaerobic activity. However, the ketogenic diet has a glycogen-sparing effect, and thus glycogen should not be depleted (after keto-adaptation) unless anaerobic training volume is high. Supplements like creatine may be more beneficial for those on a keto diet, especially during the first few weeks of initiation. Another issue people may experience is adherence to the diet based on personal food preferences. If you don't enjoy ketogenic foods, then this diet isn't feasible for you. Finding a diet that you can stick to is most important, and the ketogenic diet might not be the one.. For people who *do* like low carb/high fat foods, this diet may be a viable option for achieving and sustaining your weight loss goals.

SUMMARY

- **An energy deficit drives fat loss**
- **While the diet didn't start as a fad, the language surrounding it now, for the most part, is similar to that of fad diets**
- **It has clinical applications for neurodegenerative diseases and other ailments**
- **The original ketogenic diet recommends approximately 90% of your calories come from fat, but some of the modified versions we see today lessen the fat requirement (sometimes as low as 65% of total calories) to allow for more protein. You can attain and sustain nutritional ketosis with both**
- **Dietary adherence still matters, along with tracking your intake**

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SPECIAL CONSIDERATIONS

We've discussed how age is an important factor in weight loss, but so is sex. If you're a woman, the weight loss process is even less linear than it is for men. Your menstrual cycle will most likely throw you for a loop once per month. So, let's talk menstruation. If you're a woman, this won't be new to you, but if anyone else missed this part in middle school science, you're welcome.

So first, we have menstruation. This is what everyone knows and typically refers to as the period. During this portion of the menstrual cycle, the uterus sheds its lining along with blood and mucus and discharges from the vagina. Typically, this portion of the cycle lasts as little as two days and as many as eight, barring any complications. The onset of menstruation marks the beginning of one of two phases; this particular phase is called the follicular phase. The follicular phase lasts until ovulation is marked by the following:

1. Ovarian follicle development
2. Bleeding in the aforementioned time frame
3. Higher estrogen compared to progesterone

In a perfect world, the follicular phase would last 14 days, and then the next phase, the luteal phase, would begin. The luteal phase kicks off with ovulation after the follicle turns into the corpus luteum. The corpus luteum is a structure that releases progesterone, and this helps alter the uterine lining so that a fertilized egg can open up shop there and become a newborn baby at some point.

However, if the egg isn't fertilized, the corpus luteum, a temporary structure, degrades, and estrogen and progesterone levels tank, and you get your period, thus starting the cycle again. Prior to the beginning of the follicular phase, women sometimes get symptoms that are commonly referred to as premenstrual syndrome (PMS). Symptoms can include but are not limited to:

- Tender breasts
- Acne
- Bloating
- Lethargy
- Irritability

These bodily changes make sense when you look at the low hormone levels before the follicular phase. When it comes to dieting, it's important to be mindful of how you feel, especially regarding the stressors you've been putting on your body (dieting and training). It's also important to learn how to work around your bodily sensations, even if that means resting during a given phase of your cycle.

Something else to keep in mind is your hormone levels at any given point in your cycle. That said, here's an abridged version of a table that we pulled from a study (which also has an in-depth account of the nuances of the menstrual cycle if you're interested).[1]

1 (2015, May 22). The Normal Menstrual Cycle and the .... Retrieved December 21, 2017, from https://www.ncbi.nlm.nih.gov/books/NBK279054/

Sex Steroids	Early Follicular	Preovulatory	Mid-luteal
Progesterone (mg)	1	4	25
Testosterone (µg)	144	171	126
Estradiol (µg)	36	380	250

Table 1. Abridged version of normal hormone levels during various phases of the menstrual cycle.

With that in mind, it might not be a bad idea to go harder right around the time you ovulate, since your testosterone is highest at that point and recovery may be improved. During the early follicular phase, you could focus on doing more work but not going quite as hard on some exercises. Meanwhile, right before menstruation, you could potentially keep your training a bit easier. These aren't clear cut "rules," but rather suggestions if you're someone who finds your energy and strength are severely affected by the different stages of your cycle.

Though this is an abridged overview of the menstrual cycle, it's worth keeping track of in terms of how you feel and perform. With this type of knowledge, you'll know best how to proceed on your diet. For example, during PMS, many women find that they retain quite a bit of water. Fluctuations of 2% body weight are quite normal for most women, and they can even go up to 4%. Don't mistake an increase in weight or lack of weight loss during PMS for lack of progress. It's probably best if you wait until your period passes to determine whether or not progress has truly stalled or if it was simply short-term water retention.

Contraceptives

"Contraceptives" are broadly defined, because they can range from abstinence to vasectomies, tubal ligations, condoms, and sterilization. For our purposes,

however, we're going with combination contraceptives.
According to a meta-analysis by Gallo et. al., weight gain is typically *associated* with taking combination contraceptives. Further, women and clinicians often make this assumption regarding said associations between the two. According to the authors:

> Almost three-quarters of women in a random survey conducted in the United Kingdom reported believing that weight gain was related to oral contraceptive use (Turner 1994). In a Canadian survey of women filling an oral contraceptive (OC) prescription (Gaudet 2004), 68% had counseling from their physician on weight gain and the pill. Of those who had counseling, 36% said their weight would stay the same while on the pill compared to 50% of those who had no counseling. In the United States, 45% of adolescents starting OC use believed that oral contraceptive use increased the risk of weight gain (Emans 1987).[2]

If you look further, the World Health Organization (WHO) talks at length about combination contraceptives in its book, *Family Planning: A Global Handbook for Providers*. In one section, they have two columns. On the left, they list the benefits of combination contraceptives, and on the right, they list the side effects. Among the negative side effects are deep vein thrombosis and pulmonary embolism, which the WHO lists as very rare, and heart attacks and strokes, which the organization lists as extremely rare. Weight gain isn't mentioned at all.[3]

As for the benefits, the WHO lists that combination contraceptives can help protect against pregnancy, uterine cancer, ovarian cancer, and pelvic inflammatory disease. The organization goes on to discuss that combination contra-

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2 (2014, January 29). Combination contraceptives: effects on weight. - NCBI - NIH. Retrieved December 21, 2017, from https://www.ncbi.nlm.nih.gov/pubmed/24477630

3 Emergency contraceptive Pills - Family Planning: A Global Handbook .... Retrieved December 21, 2017, from https://www.fphandbook.org/sites/default/files/hb_english_2012.pdf

ceptives may help protect against ovarian cysts and anemia, and could possibly reduce symptoms of PCOS, such as irregular bleeding, excess hair, and acne. In addition to that, they can potentially reduce ovulation pain, problems with menstrual bleeding, or symptoms of endometriosis.[4] So, based on the WHO's research, along with the above mentioned meta study, it's safe to say that there appears to be no association with combination contraceptives and weight gain.

Medical Issues

Medical issues may affect your diet in unexpected ways. That said, we're going to cover a few of the ones we've run into over the years with various clients. Keep in mind, too, that some of these are exclusive to either men or women, while other issues can affect both. The purpose is to go over some common ones and talk about them as they relate to *your* diet. Finally, none of this is medical advice. This is just a relay of research with some interpretive commentary. It's not intended to diagnose or treat *anything* in any way, shape, or form. It's imperative that you talk to your doctor about any and all medical conditions that you have or think you have to get the proper diagnosis and medical treatment.

Polycystic Ovarian Syndrome (PCOS)

Roughly 10% of women who can bear children will have symptoms of PCOS. Briefly, PCOS is a hormonal condition that manifests around the age a woman can menstruate. While the exact causes are unknown, symptoms include but aren't limited to:

- Hirsutism, or excessive amounts of hair where you typically don't have hair

4 Emergency contraceptive Pills - Family Planning: A Global Handbook .... Retrieved December 21, 2017, from https://www.fphandbook.org/sites/default/files/hb_english_2012.pdf

- Potentially elevated testosterone levels
- Type 2 Diabetes (though this is only an association, which we'll speak more about soon)
- Actual cysts on your ovaries[5]

One of the other symptoms of PCOS is menstrual irregularities. For the women with PCOS, there is no uniform irregularity. So, one woman with PCOS might have her period every 14 days. Others might have a prolonged cycle that stretches beyond 28 days, up to 32, 33, 34, or even 35 days. Moreover, bleeding can be heavier than normal on top of some (or all) of the above listed symptoms, or the heavier menstrual bleeding can be the only symptom you experience.

Now, bear in mind that we don't want to seem like we're making light of this. However, if you're reading this, you likely have a handle of how to cope with your PCOS. But, a meta-analysis from Domecq et. al concluded the following:

> This systematic review and meta-analysis demonstrates that LSM [lifestyle management] programs decrease the levels of fasting glucose and insulin, suggesting that these programs will be beneficial in overweight or obese women with PCOS. Changes in BMI were associated with changes in FBG [fasting blood glucose]. Clinicians prescribing LSM interventions must consider the patient's capacity to sustain diet and exercise adherence and weight maintenance over time for the clinical benefits on PCOS to continue. Longer and larger trials at low risk of bias are needed to draw stronger conclusions about the effects of LSM on outcomes more important to women with PCOS and not only surrogates. It is likely that the current evidence is underestimating the real effects of these interventions.[6]

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5 (2013, December 1). Lifestyle Modification Programs in Polycystic Ovary Syndrome .... Retrieved December 21, 2017, from https://academic.oup.com/jcem/article/98/12/4655/2834112

6 (2013, December 1). Lifestyle Modification Programs in Polycystic Ovary Syndrome .... Retrieved December 21, 2017, from https://academic.oup.com/jcem/article/98/12/4655/2834112

So, for a woman on a diet—provided you're truly creating a deficit in your calorie intake—PCOS isn't the most disadvantageous thing that can happen to you, especially in terms of keeping LBM and your overall training. Keep in mind, it varies from woman to woman, so you might experience some or even more of the above listed symptoms, but the fact that you *do* engage in lifestyle management—controlling your diet and exercise—means that you symptoms will likely improve with weight loss. Some people claim that they can't lose weight because of PCOS, but this is untrue. Even if PCOS slows metabolic rate, it doesn't mean you *can't* lose weight; it just may be more difficult, since your calorie intake will have to be lower to cause weight loss. All in all, the lifestyle management described in the meta study suggests that it will help counteract some of the adverse effects of PCOS in addition to not being a detriment to your dieting process.

Celiac Disease and Thyroid Disease

These days, it seems like everyone *thinks* they have celiac disease based on how many people are trying to limit or eliminate gluten. However, that's usually not the case, unless you've been legitimately diagnosed with it. Before we go over Celiac proper, it's important to know what gluten *actually* is. Gluten is a Latin word that means glue. In vegan recipes, gluten is primarily a binding agent, but it also functions as a main source of protein in bread. Specifically, it's a type of storage protein that contains metal ions *and* some amino acids. It would be correctly called an incomplete protein due to low levels of the essential amino acid lysine.

Celiac disease is basically inflammation of the small intestine lining, and it leads to malabsorption of the nutrients within the food you eat. In people who suffer from celiac, wheat gluten triggers this reaction, and the only effective treatment is a legitimate gluten-free diet. While a gluten-free diet is an easy treatment for the approximately 1% of the Western population dealing with it, it isn't quite so simple (and we aren't talking about actual knowledge of gluten-containing foods or anything like that).

According to Sun et al.:

> The associations of CD [Celiac Disease] with ulcerative colitis, Crohn's disease, microscopic colitis, autoimmune liver diseases, and several other immune- and non-immune-based diseases in the digestive system are well recognized. However, many diseases outside the digestive system, such as autoimmune thyroid disease, Sjo¨gren's syndrome, type 1 diabetes mellitus, and Addison's disease, are associated with CD, in both its overt and silent forms[7 Collin P, Kaukinen K, Va¨lima¨ki M, Salmi J. Endocrinological disorders and celiac disease. Endocr Rev. 2002; 23: 464–483. doi: 10.1210/er.2001-0035 PMID: 12202461]. For example, a meta-analysis based on 26605 patients with type 1 diabetes mellitus revealed a 6.0% prevalence of biopsy-confirmed CD, which was increased compared with the prevalence among healthy controls[8 Elfstro¨m P, Sundstro¨m J, Ludvigsson JF. Systematic review with meta-analysis: associations between coeliac disease and type 1 diabetes. Aliment Pharmacol Ther. 2014; 40: 1123–1132. doi: 10.1111/apt. 12973 PMID: 25270960].[7]

Before going over the conclusion of this particular meta-analysis, some clarification is in order. Of all the thyroid complications mentioned, the authors concluded that if you have celiac disease, then you ought to get your thyroid checked. If you get regular blood work done, make sure your panel includes a test for your thyroid hormones, and that you're familiar with what they mean. We can start with an easy one. The above meta-analysis looked at euthyroidism, which is a fancy way of saying your thyroid is functioning like it should. That means your thyroid-stimulating-hormone (TSH) levels, which come from your pituitary gland, are in order, along with your T3 (thyroid hormone) and T4 (precursor to T3) levels.

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7 (2016, December 28). Increased Incidence of Thyroid Disease in Patients with Celiac ... - NCBI. Retrieved December 21, 2017, from https://www.ncbi.nlm.nih.gov/pubmed/28030626

In addition to euthyroidism, there's something called hypothyroidism, which is best described as an underactive thyroid, meaning your thyroid hormones are low. Common symptoms include fatigue, trouble concentrating, heavy bleeding in women, and others.

At the opposite end of hypothyroidism, there's hyperthyroidism. The prefix "hyper" is the direct opposite of "hypo," so hyperthyroidism is an overactive thyroid. Instead of general lethargy and slowing metabolic processes, hyperthyroidism can cause sudden weight loss, faster heartbeat, and nervousness, among other things.

Now, with both hypo- and hyperthyroidism, they can modulate your metabolic rate. Someone with hypothyroidism is going to have a more difficult time losing body fat than someone with a normal thyroid or someone who has hyperthyroidism. If you have hypothyroidism (because you went to a doctor and they diagnosed you with it) and you take your medication (possibly something like levothyroxine or another hormone replacement), then your time in the deficit won't be nearly as bad as it could be due to having a continually level amount of thyroid hormones. If you have hypothyroidism, the hormone replacement for it could *potentially* put you into a state of hyperthyroidism. All of this will be monitored by your doctor's visits, of course, because you'll let them know if you feel or see any red flags. For hyperthyroidism, some of the symptoms include, but are not limited to:

- Irregular heartbeat
- Sudden weight loss
- Increased appetite
- Anxiety
- Heat sensitivity

One potential problem is that the symptoms are similar to other medical conditions, which could lead to misdiagnosis amongst doctors. So, again, consulting

with your doctor and having the appropriate blood work done is important. If you have hyperthyroidism, that will likely increase metabolic rate and increase the rate of weight loss. So, if you have hyperthyroidism and you experience sudden weight loss *and* increased appetite, eating more will help you. And, by virtue of your faster metabolic rate, you can increase your energy intake and still be in a deficit and lose weight. While this likely sounds like a good thing, keep in mind that if you don't eat more to compensate for the increased caloric output, you could be in danger of losing more lean body mass.

Beta Blockers

These drugs slow down your adrenaline (epinephrine) in an effort to lower your blood pressure. Not only that, they can also regulate your heartbeat as well as mitigate the physical manifestations of anxiety. As such, doctors may sometimes prescribe them for off-label anxiety use. Additionally, that type of off-label use sometimes makes its way into the performance-enhancing realm, mostly for musicians and actors, so that they don't suffer from poor performance due to said physical symptoms, which we don't recommend for physique sports.

In a meta-analysis, Sharma et al. noted that the introduction of beta blockers for the treatment of hypertension yielded a 5% to 10% reduction in TDEE (which was about 100 to 200 calories, according to the authors). That 100 to 200 calories accounted for about 1 kilograms to 3.5 kilograms of weight gain in clinical studies, as well. Moreover, because of metabolic adaptation, the weight gain you observe when taking beta blockers stops after a period of six months to a year, provided you made no change to your diet.

Based on what we've written so far, and in accordance with Sharma et al., the weight gain is the result of a decrease in your energy metabolism. They note that some of the potential mechanisms for this weight gain have to do with our old

friend NEAT. Refer back to some of the symptoms beta blockers can treat, and you can note why there could be a decrease in your NEAT, which would account for the decrease of 100 to 200 calories in TDEE.[8] So, if you take beta blockers, just be mindful of your actual activity level while at the same time being mindful of your deficit.

Corticosteroids

Corticosteroids are a type of steroid hormone, but they're not like anabolic steroids other than the general chemical structure. The former are produced by your adrenal cortex, and the latter come from either the ovaries or the testes. Hormones like cortisone, cortisol, aldosterone, and their synthetic counterparts fall into the corticosteroid category. Aldosterone regulates your electrolyte balance, but the other two are involved in responses to stress. Cortisone helps to reduce inflammation. If you've ever needed a shot of cortisone as an immediate injury treatment, this was the reason why. By way of gluconeogenesis (endogenous production of glucose from various substrates, mainly amino acids), cortisol regulates your blood sugar. In its synthetic form, it's known as hydrocortisone, and it's used in asthmatic inhalers and also to treat adrenal insufficiency, among other things.

According to Liu et al., a survey of 2167 long-term corticosteroid users found weight gain to be the most common *self-reported* (emphasis mine) side effect. They also noted that in an analysis of four prospective trials of people with rheumatoid arthritis, they found a 4% to 8% increase in mean body weight with the use of five to 10 milligrams per day of prednisone (another type of synthetic corticosteroid derived from cortisone).[9] The same study noted that the patients reported an increase in appetite.

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8 Hypothesis: Beta-adrenergic receptor blockers and weight gain: A .... Retrieved December 21, 2017, from https://www.ncbi.nlm.nih.gov/pubmed/11230280

9 (2013, August 15). A practical guide to the monitoring and management of ... - NCBI - NIH. Retrieved December 21, 2017, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3765115/

The fact that the data is self-reported and that there was a noted increase in appetite shows the association of corticosteroid intake with weight gain. However, in the previously mentioned meta-analysis, it seems that the corticosteroids aren't the *direct* cause of weight gain, barring exceedingly high doses over a long period of time. Prolonged use coupled with higher doses can result in the redistribution of adipose tissue as well as cushingoid (Cushing's disease is an illness where cortisol is over-secreted) features.

But, Liu et al. note that "patients should also be advised to carry a steroid treatment card and wear a medical identification tag, and to adopt lifestyle habits that may help minimize the risk of excessive weight gain with [corticosteroid] use, such as participation in regular physical activity and following a healthy, low-calorie diet."[10] What is the practical application of this? Probably that if you need to use corticosteroids, you may experience an increase in hunger. Thus, it's a good idea to focus on eating foods that are high fiber and high volume in order to maximize satiety and avoid overeating, which would impair fat loss.

Antidepressants

These are a bit more "gray" in terms of their effect on weight loss or weight gain. If you've ever gone through a horrible break-up, a death, or any other tragedy life can throw at you, you might have succumbed to the "depression diet." Not to make light of anyone's mental health status, but essentially, you don't eat during these times, and you lose weight. So, if you get diagnosed as clinically depressed, you might also not eat enough. Then, if you start taking SSRIs or any other antidepressant, you might start eating again. If your activity level is static, then it's likely you will gain weight.

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10 (2013, August 15). A practical guide to the monitoring and management of ... - NCBI - NIH. Retrieved December 21, 2017, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3765115/

At the same time, if you're depressed and use food as a way to "self-medicate," and you start taking antidepressants to correct your chemical balance, then you actually might notice some weight loss, since you may not resort to that type of behavior anymore. If you feel like you might be depressed, seek help from a licensed counselor and/or psychiatrist and speak with your physician.

Lucky for us, Drs. Serretti and Mandelli conducted a meta-analysis that looked at various forms of antidepressants as well as their effect on weight loss, weight gain, and maintenance. They looked at both acute intervals as well long term intervals and concluded the following:

> In conclusion, the results obtained in the present meta-analysis confirm that antidepressants markedly differ in their ability to induce changes of body weight. Overall, the impact is of mild significance, except in cases of mirtazapine and amitriptyline, which were the most potent weight gain promoters. Some reduction of body weight can result from treatment with fluoxetine and bupropion, although for fluoxetine the effect may be only transient. To our knowledge, this is the first systematic and comprehensive review of the effect of antidepressants on body weight. However, further studies taking into account other important variables such as depressive severity, loss of appetite, atypical features, premorbid weight, and sex are warranted to better understand the impact of antidepressants on weight gain.[11]

So, while there is more research needed, it seems that the most you can do is to track your caloric intake diligently, and see what happens when or if you start taking antidepressants.

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11 Antidepressants and body weight: a comprehensive review ... - NCBI. Retrieved December 21, 2017, from https://www.ncbi.nlm.nih.gov/pubmed/21062615

Menopause

This is a tough one. A lot of us assume that age in and of itself is a death knell for your energy, body composition, and overall quality of life. For women, the pressure is even worse due to the general insistence that if you can't make babies, attain supple skin, or look like you're 25 eternally, then you're worthless. While the discussion on the media and its effect on women's body image is worth having, it's a bit much for our purposes, so we'll keep it simple. Aging is merely a time of change. When we all entered puberty, we experienced hormonal changes. As men age, our testosterone is continually on the decline, while women face hormonal changes when they enter menopause.

We *all* will deal with the potential for loss of LBM and a possible decrease in physical activity as we age. For women, specifically:

> During menopause the risk of developing obesity increases. Hormonal changes that occur in the menopausal period may contribute to higher accumulation of the adipose tissue, particularly within the abdominal cavity [6]. An increase in body fat results from decreased production of estradiol (E2) and body energy requirement which varies with age [7]. Visceral fat increase occurs in women as early as 3-4 years prior to menopause, manifesting a negative correlation with E2 levels and a positive correlation with folliculotropic hormone levels (FSH) at the same time. Estrogens control lipolysis by increasing lipoprotein lipase activity of the adipose tissue or by increasing lipolytic activity of adrenaline [8]. The American *Study of Women's Health Across the Nation* conducted among 3257 women has revealed a negative correlation between BMI and the levels of E2 and FSH in premenopausal women and women at the early perimenopausal stage, as well as a positive correlation in the group of women at

> later perimenopausal and postmenopausal stages [9].[12 13 14 15 16]

Further, cardiovascular disease and metabolic syndrome seem to increase in women with menopause, and it seems that dietary guidelines might actually help fight against those detriments. We know this is shocking given literally everything else we've spoken of, but hold onto your butts. We can reasonably hypothesize that with age comes a decrease in physical activity. We go from being children and running around all day to sitting in schools with little recess time, to sitting in cubicles, and letting life run its course. Nothing wrong with that; the stressors of life like work, children, and family all play into how much physical activity we can do. Despite the attitude of Instagram trainers, all of those are valid reasons to change the way you do things.

Physical activity is something you can control easily (relatively, depending on your life) as well as what you eat. We know we've made some not-so-gentle nudges in the direction of exercise with the hopes that you will, but if you are menopausal, you stand only to gain from it. As mentioned above, during menopause, your estradiol lowers and causes an increase in adipose fat. Not only that, but lower estrogen levels lead to lower bone density.[17] In fact, proper estrogen levels are vital for bone development, and when your levels are lower, exercise

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12 (n.d.). Understanding weight gain at menopause. - NCBI. Retrieved November 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22978257

13 (n.d.). Perimenopausal obesity. - NCBI. Retrieved November 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20380578

14 (2017, December 30). Management of obesity in menopause: diet, exercise ... - NCBI. Retrieved November 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20044222

15 (n.d.). Change in estradiol and follicle-stimulating hormone ... - NCBI - NIH. Retrieved November 16, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15070912

16 (2015, March 25). Guidelines for dietary management of menopausal ... - NCBI - NIH. Retrieved November 15, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4440197/

17 (n.d.). Estrogen and bone metabolism. - NCBI. Retrieved November 15, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/8865143

will only serve to help maximize your bone mineral density. Aside from that, we talked about the role of protein and its importance for all of your tissues, not just your muscles. Furthermore:

> High intake of fruits and vegetables delays the onset of menopause and prolongs the reproductive lifespan because of the presence of antioxidants in fruits and vegetables that counteracts the adverse effects of reactive oxygen species on the number and quality of ovarian follicles. Higher intake of total calories, high carbohydrate, and high protein intake are found to be associated with delayed age at menopause; however, the correlation of carbohydrate diet with ANM[Age at natural menopause] has conflicting results with some studies documenting inverse or no relationship. Dietary fiber, soy products, and red meat have inconsistent results in various studies; and hence, the need for larger studies.[18]

So, what does all this mean? Well, you *are* going to change when you hit menopause. Nobody is denying that. Nobody is even saying those changes or any of these modifications are easy. But, if you've been following along, you're learning how you can make these changes if you aren't already doing so. And you also know that energy balance is still the key to maintaining, losing, or gaining weight. Therefore, your hormonal fluctuations will affect your energy expenditure and, to an extent, age will affect your BMR. But the point remains that it's still a matter of energy balance. If your metabolic rate slows with age, then you'll need to adjust caloric intake accordingly. Furthermore, despite the above cited lack of certain data, the overarching points remain consistent no matter what stage of life you're in: eat well and exercise. The only thing we would add to that is to keep track of these effects as your years advance, so that if you do face any of them, you're not caught off-guard.

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18 (n.d.). Lifestyle and dietary factors determine age at natural ... - NCBI - NIH. Retrieved November 15, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955043/

SUMMARY

So, everything we've gone over thus far should reinforce one thing: energy balance still rules the day. Diets and even hormones don't negate that in any way. However, the medications you take and the various hormonal cycles you experience because of them (or naturally) can affect how much energy you're actually spending in your day-to-day life. Whereas a given diet that operates on time restriction means you likely won't be able to overeat (but in this day and age, anything is possible), some medications can cause your NEAT to tank and make you feel like a slug. This can in turn cause you to expend less and stall or even gain weight. In the latter case, keep tabs on that. It could mean that you need to eat *even less* than you think you do in order to see results. On the other hand, you might be taking medications that increase your TDEE, which means you should monitor how many calories you need to eat in order to avoid losing lean body mass.

Obligatory Disclaimer

None of this is is to be taken as medical advice. We are not physicians. We can't diagnose any condition or prescribe any medication. You should always seek out the care of a physician for any matter relating to your mental and/or physical health and well-being. All we wanted to do was go over a few bits of research in hopes that you better understand what's out there. This list is also not meant to be exhaustive in any way, shape, or form. There are hundreds of thousands, if not millions, of medical conditions. We tried to focus on the conditions that might most affect diet and weight loss. Again, we implore you to speak with your physician and get regular check-ups to ensure the best health possible. If you have a severe medical condition, we also recommend that it's probably best *not to* diet without first speaking to a physician.

14

DEBUNKING THE BS

Thus far, we've discussed the defining characteristics of fat loss. To sum it up, you need a negative energy balance along with a reasonable way to measure your intake to make the necessary changes. We've even discussed what calories are and why they matter. Additionally, we've covered the macronutrients and how to distribute them for optimal lean body mass retention and metabolic rate optimization, as well as what to do after the diet so you don't fall into the trap the majority of people fall in—that is, the trap of gaining weight after your diet, or in some cases, gaining *even more* weight in the subsequent years after.

Now we're going to do something a bit different. While most named diets "work," the underlying reasons why they work are almost always presented as some esoteric secret. For instance, the secret sauce for a low-carb or ketogenic diet is based on the carbohydrate-insulin model (CIM) of obesity. The idea behind this hypothesis is based on the belief that carb containing-foods secrete more insulin and ramp up fat gain. No need to rehash what we already went over, but suffice it to say that it doesn't negate energy balance. At all. Full stop.

Next, you have devout "clean eaters" who *actually* believe the calories from specific foods matter for weight loss. They believe that the calories from a doughnut are literally different than the calories from the same amount of carbs and fats from rice and olive oil. Before you go crazy, yes, there are differences in the foods themselves. But the *calories* therein are the same. Remember when we talked about the calorie being a unit of energy, and how a calorie is the amount of energy it takes to heat up one gram of water by one degree celsius? Yeah, it

doesn't matter if it comes from rice, sweet potatoes, olive oil, peanut butter, or a glazed doughnut.

Types of Food

This brings us to an important point. If calories are the same no matter where they come from, why do actual food choices matter? Great question. We like to divide up food categorically. That being said, you can break them down into the following:

- **Calorically dense foods –**These are the goodies everyone loves. Doughnuts, cheese cake, Doritos, potato chips, Big Macs, brownies, chocolate milk, and all that good stuff. Calorically dense foods are small but have a big caloric impact. For instance, a single glazed munchkin from Dunkin' Donuts has 4 grams of fat, 7 grams of carbs, and 1 gram of protein. That equates to a grand total of 68 calories for a *single munchkin*.[1] If you've ever had a munchkin or any doughnut hole, you know damn well you won't eat just one. You also know how easy it is to eat more than five. And five of these will set you back about 340 calories. So, to sum up calorically dense foods, they have high calories in a small package with a minimal impact on satiety.

- **Nutrient-dense foods -** Foods that fall into this category are quite the opposite of calorically dense foods (for the most part). This category includes foods like broccoli, spinach, cauliflower, beets, and all the green vegetables your parents told you to eat when you were a kid but you didn't listen because you're a rebel. These foods are nutrient-dense because of their micronutrient content. For example, the previously mentioned beets are a great source of folate, manganese, vitamin C, and fiber. Spinach has iron and vitamins K, A, and C, among other things. So, all the vitamins

1 (n.d.). Munchkins® | Dunkin' Donuts. Retrieved September 16, 2018, from https://www.dunkindonuts.com/en/food-drinks/donuts/munchkins

and minerals you hear about are contained in fruits and vegetables. As a contrast to our calorically dense foods, think about the last time you decided to cook a bag of spinach. A 10-ounce bag of spinach has about 70 total calories.[2] The serving size is 85 grams (approximately 3 ounces). That 85 gram serving yields you 20 calories. There are 3.5 servings in a whole bag. Let that marinate for a minute. In order to get the same calories as five munchkins, you'd need to eat more than *five bags* of spinach. Suffice it to say, few people are going to binge on spinach, because it's extremely difficult to overeat.

- **Caloric and nutrient-dense foods -** Yes, there is overlap on our proverbial venn diagram. You know both types of foods now, so let's talk about a few examples that are both at once. Things like nuts, nut butters, and oils fall into this particular magical category. If you've ever seen a serving size of peanut butter, that little golf ball size of greatness has about 190 calories in it. It's also easy to eat it right of the jar while you binge watch *Supernatural*.

Understand that these categories are meant to do just that: categorize. These categories are not a value judgment on the foods themselves. They are neither good nor bad. They all have calories, some provide more micronutrients than others, and others have micronutrients while being calorically dense. Therefore, none of them are *universally* bad.

Things do tend to get murky, though. Let's say you have a low BMR, and your daily caloric intake is around 1500 calories. If you eat five Dunkin' Donut munchkins in a day, that leaves you with 1160 calories for the rest of the day. Not a lot to work with there, and you're missing out on nutrients you could get elsewhere. Further, you've already "wasted" almost 25% of your calories on something that is not very satiating at all. So, in this case, erring on the side of nutrient-dense

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2 (n.d.). Marketside Fresh Spinach, 10 oz - Walmart.com. Retrieved September 16, 2018, from https://www.walmart.com/ip/Marketside-Fresh-Spinach-10-oz/13893738

foods is likely more beneficial. With nutrient-dense foods, you can actually eat more volume of food or even eat more often without taking a huge caloric toll. On the other hand, if you have a high BMR and you can eat 3500 calories a day, those five doughnut holes won't be too detrimental, since you can still get your essential micronutrients in as needed. At that caloric intake, you may even have the opposite problem of feeling *too full* if all you're eating is nutrient-dense foods.

Now we come to foods that fit both criteria. The nutrient *and* calorically dense foods. Consider this: someone says to you, "You need to eat clean to lose weight." And let's say you give it a shot. You take a spoon of coconut oil, sauté your spinach, and eat a sweet potato with two tablespoons of peanut butter (although every group has a different definition of what "clean" means). Yet, you still can't lose weight. Despite the supposed cleanliness of the foods, they're *still* packing a huge caloric punch. If you add a serving of chicken or beef to the previous foods, you can wind up eating a thousand calories in a given meal. Do that multiple times a day, and you're overeating by default, despite "eating clean." With that in mind, does that make coconut oil a bad food? What about peanut butter? Or spinach? No. Well, unless you have a specific allergy to any of those foods, and then yes, those would be bad (for you), but otherwise, not at all. You can get fat from overeating *anything*; it's just that some foods are more difficult to overeat than others.

The Good

It might seem like we're unnecessarily shitting on every fad diet out there. While there are certainly many components of these diets to critique, we don't want to give the impression that they're *entirely* useless. After all, food isn't clean or dirty. It simply is. A lot of these diets—save for any super low-calorie crash diet—have a lot of good aspects about them. And we shouldn't gloss over those for the sake of being right, or appearing to to be the purveyors of all things dietary. In fact, many of these diets have your best interests in mind. At least, in theory. Even Banting and Kellogg had your best interests in mind.

Fast forward to later, and we can look at Nathan Pritikin's diet. Aptly named "The Pritikin Diet," here's a list of foods that you can eat on this particular low-fat, low-cholesterol, and high-fiber diet:

- Fruits
- Vegetables
- Whole Grains like whole-wheat bread, brown rice, whole-wheat pasta, and oatmeal
- Starchy vegetables like potatoes, corn, and yams
- Legumes such as beans (like black beans, pinto beans, and garbanzo beans), peas, and lentils
- Lean, calcium-rich foods such as nonfat dairy milk, nonfat yogurt, and fortified soymilk
- Fish (a rich source of omega-3 fatty acids)
- Lean sources of protein (very low in saturated fat) such as skinless white poultry; lean red meat like bison and venison; and plant sources of protein, such as legumes and soy-based foods like tofu and edamame (soybeans)[3]

The website further states, "The Pritikin Diet focuses on a wide variety of whole (unprocessed) or minimally processed foods." By now you know that processed foods aren't intrinsically bad, right? Good. Hopefully you can also make the following assumption: most minimally processed foods happen to be nutrient-dense foods, and are usually on the lower end as far as calorie content is concerned. And over all, the foods aren't bad, or bland, if they're in the hands of a competent cook.

For contrast, let's look at the Paleo Diet. Dr. Loren Cordain popularized this particular way of eating in his book of the same title. The premise of the diet is that you eat like someone might have eaten in the paleolithic era. Having said that, it puts restrictions on what you can eat. Their list of "bad foods" are as follows:

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3 (n.d.). Pritikin Diet and Eating Plan - Pritikin Longevity Center + Spa. Retrieved September 17, 2018, from https://www.pritikin.com/healthiest-diet/pritikin-eating-plan

- Grains - bread, cereal, oatmeal
- Legumes - beans and peanuts
- Dairy - milk, cheese, yogurt
- Refined sugar - soda, doughnuts
- Potatoes - you know what a potato is, right?
- Processed foods - frozen foods, packaged foods, energy drinks
- Refined vegetable oils - shortening, canola oil
- Salt - sodium chloride[4]

Now, at first glance, it might seem that Pritikin's diet and what Cordain is presenting as the Paleo diet might be diametrically opposite.[5] But if we take in the big picture, there are a plethora of similarities.

1. Fish and lean meat are still suitable for both diets
2. Fruits
3. Vegetables
4. Minimally or non-processed items
5. Sweet potatoes (Cordain and his team believe that sweet potatoes don't have the same "harmful" ingredients as white potatoes)[6]

Further, let's look at Pritikin's "Caution" and "Stop" foods:

- Oils
- Refined sweeteners such as sugar, corn syrup, and honey
- Salt

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4 (2016, October 12). What Is The Paleo Diet | What To Eat On Paleo Diet | What Is Paleo .... Retrieved September 17, 2018, from https://thepaleodiet.com/what-to-eat-on-the-paleo-diet-paul-vandyken/

5 There are many different authors of a myriad of books on the Paleo Diet. The premises are often the same in many of the main points, but some of the finer details are different throughout.

6 (2010, February 10). Sweet Potatoes - The Paleo Diet. Retrieved September 19, 2018, from https://thepaleodiet.com/sweet-potatoes-paleo/

- Refined grains such as white bread, white pasta, and white rice
- Saturated-fat-rich foods such as butter; tropical oils like coconut oil; fatty meats; and dairy foods like cheese, cream, and whole/low-fat milk
- Organ meats
- Processed meats such as hot dogs, bacon, and bologna
- Partially hydrogenated vegetable oils
- Cholesterol-rich foods like egg yolks

Clearly, there are differences. But if we made a Venn diagram, there would be a hefty middle portion of similarities. Focusing on what we said earlier regarding differences between various food types, what do *both* the Paleo Diet and Pritikin focus on? Nutrient-dense and calorically sparse food choices.

Probably not a bad idea in the long run, especially when it comes to your overall health. Unfortunately, this nuance and context is lost on diet zealots who instead decide what diet religion they wish to support and then search for any scientific data to confirm their bias. That's why paleo zealots will say you can't have dairy because "our ancestors didn't have dairy." Who gives a damn what our ancestors did or didn't eat? The question should be, "Does that particular food have any positives or negatives?" In the case of dairy, people who eat dairy are healthier, with better bone density, more lean body mass, and less body fat.[7] [8] [9] So why should we specifically exclude it? There's no good reason to unless you're lactose intolerant or have a food allergy to dairy.

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7 (2012, October 15). Impact of milk consumption and resistance training on body ... - NCBI. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23075559

8 (2012, January 18). Effect of protein, dairy components and energy balance in ... - NCBI. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22301838

9 (n.d.). The role of milk-and soy-based protein in support of muscle protein .... Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20368372

The Zone and Whole 30

Now, let's turn to something a bit less old school (the paleolithic era is as old school as it gets, am I right?) and look at some modern day fad diets we've seen skyrocket in popularity over the years. When CrossFit accelerated in popularity during the first decade of the 21st century, a lot of CrossFit boxes either touted Paleo or The Zone diet. In fact, you can still see websites dedicated to either diet. We've already done Paleo, so we'll start this section off with The Zone.

In order to get in The Zone, however, we have to start off by talking about a buzz-word. You have, no doubt, heard of "inflammation." Perhaps you've even taken a medicine called a nonsteroidal anti-inflammatory (NSAID) drug to counteract this process. If you've ever sauntered over to your local Walgreens and picked up some ibuprofen or aspirin, you've purchased a NSAID. NSAIDs certainly have their uses, but so does inflammation. There's a reason your body lets it happen.

Creator of The Zone Diet, Dr. Barry Sears, defines the process fairly well:

> The pro-inflammatory phase induces pain, swelling, redness and heat, which are indicators that cellular destruction is taking place. Yet there are equally important anti-inflammatory mechanisms of the inflammation process that are necessary for cellular repair and regeneration. Only when these two phases are continually balanced, and progenitor endothelial cells can effectively repair the microtissue injury that results from inflammatory events, that molecular wellness is re-established.[10]

To put it in a different and less negative light, think about this for us. What's something you do, on a given day, that could lead to inflammation? If you

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10 (2010, September 30). Anti-Inflammatory Nutrition as a Pharmacological ... - NCBI - NIH. Retrieved September 24, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2952901/

guessed "lifting weights/exercise/resistance training," you would be 100% correct. Yes, exercise causes inflammation. You're stressing your tissues and forcing them to adapt, to make a long process short. Inflammation, as noted earlier, helps you heal. Part of that healing process is helping your muscles rebuild to adapt to the stimuli to which you're exposing them. But inflammation isn't all fun and games. In fact, it can be lethal.

Inflammation isn't always a helpful bodily response. In certain diseases, the immune system fights against its own cells by mistake, causing harmful inflammatory responses. These include:

- Rheumatoid arthritis, where many joints throughout the entire body are permanently inflamed
- Psoriasis, a chronic skin disease
- Inflammations of the bowel like Crohn's disease or ulcerative colitis

These diseases are called chronic inflammatory diseases, and can last for years or even a lifetime in varying degrees of severity and activity.[11]

Dr. Sears erroneously believes that obesity is the direct cause of hormonal imbalances as well as improper gene expressions. He states clear that "[o]besity is a multifactorial condition resulting from improper balances of hormones and gene expression induced by the diet."[12] With all that in mind, Sears' The Zone was an effort to combat diet-induced inflammation, which on The Zone's website is defined as:

1. Excess dietary caloric intake causing oxidative stress.
2. Excess dietary intake of omega-6 fatty acids that promote inflammation.

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11 (2018, February 22). What is an inflammation? - National Library of Medicine ... - NCBI - NIH. Retrieved September 24, 2018, from https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0072482/

12 (2010, September 30). Anti-Inflammatory Nutrition as a Pharmacological ... - NCBI - NIH. Retrieved September 24, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2952901/

3. Excess dietary intake of the saturated fatty acids, especially palmitic acid, that promote inflammation.
4. Lack of dietary intake of omega-3 fatty acids that reduce inflammation.
5. Lack of dietary intake of polyphenols to activate anti-oxidative genes to reduce oxidative stress.
6. Lack of dietary intake of polyphenols to promote gut health.
7. Lack of dietary intake of fermentable fiber to promote gut health.[13]

Knowing this, we can look further to the list of restrictions in this diet. The diet itself divides itself up based on what a plate ought to look like. For instance, a third of the plate is dedicated to a lean protein source (like a chicken breast or a piece of fish) about the size and thickness of the palm of your hand. The rest of the plate is then devoted (mostly) to vegetables, legumes, and fruit, with an emphasis on the vegetables. If you look at their graphic, you'll also notice a thin sliver of plate space devoted to a paltry serving of monounsaturated fat, like avocado or almonds.[14]

The Zone's website hammers this point home by having vegetables cover the base of the pyramid, followed by fruits, low-fat protein sources, monounsaturated fats, and at the top, with the smallest amount of space to fill, grains. The actual macronutrient breakdown of this diet by percentage is 40/30/30 (carbs, protein, and fat), and since we're not a fan of percentages, we will break it down in terms of the actual numbers. For the sake of argument, let's say your maintenance calories (TDEE) calculate at 2000 calories a day. This means 40% of those calories are from carbohydrates, which comes to 800 calories. Because you remember from earlier that a carbohydrate is four calories a gram, we can figure out our carbohydrate intake like so:

800 ÷ 4 = 200

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13 (n.d.). The Zone Diet | Dietary Program To Reduce Inflammation. Retrieved September 24, 2018, from https://www.zonediet.com/the-zone-diet/

14 (n.d.). The Zone Diet | Dietary Program To Reduce Inflammation. Retrieved September 24, 2018, from https://www.zonediet.com/the-zone-diet/

This means we eat 200 grams of carbs a day from the approved foods. If we follow it to the letter, that means we're going to be eating a lot of vegetables and fruits before anything else. To give you an idea, an apple has roughly 30 grams of carbohydrates, so you'd need to eat about 6.5 apples to hit your intake goal. If we're talking spinach, can you imagine how much you'd have to eat to reach 200 carbs?

For the protein, we would find we need 600 calories to equal 30% of our daily intake of 2000. Using math, again we get:

600 ÷ 4 = 150 grams of protein

And for fat, we would take 600 (because 30% of 2000 is 600) and divide by nine as follows:

600 ÷ 9 = 66.6 rounded up to 67

That leaves us with a macro split of 150 grams of protein, 200 grams of carbs, and 67 grams of fat. If we decide to lose weight, we could drop our calories down to 1600 and do the same math to determine our macros. It comes out to:

640 calories from carbs, which when we divide by four, leaves us with:

640 ÷ 4 = 160 grams of carbs

For protein, we find 30% of 1600, which is 480 calories, which yields:

480 ÷ 4 = 120 grams of protein

And for fat, we also have 480 calories, which gives us:

480 ÷ 9 = 53.3 grams of fat rounded down to 53 grams of fat

At the end of the day, The Zone is not quite a low-carb diet, but it's more of a moderate-fat, moderate-carbohydrate diet. Compared to some of the others, it does have portion sizes to guide and a slight (but woefully incomplete) focus on individual macronutrients. The Zone itself isn't a bad dietary guideline, since it tends to be less zealot-based than other diets, but it still makes incorrect assumptions about the causes of obesity. It also rudimentarily categorize foods as generally "bad" or "good." But as popular diets go, it's one of the least sucky offenders of science. In fact much of my [Layne] research was based off of using a similar macronutrient breakdown (30% protein, 40% carbohydrate, and 30% fat).

Now, we'll look at Whole30. Let me tell you now, there are a ton of rules and regulations on this diet. Here they are:

> **Yes: Eat real food.**
>
> Eat moderate portions of meat, seafood, and eggs; lots of vegetables; some fruit; plenty of natural fats; and herbs, spices, and seasonings. Eat foods with very few ingredients, all pronounceable ingredients, or better yet, no ingredients listed at all because they're whole and unprocessed.
>
> **No: Avoid for 30 days.**
>
> - **Do not consume added sugar, real or artificial.** No maple syrup, honey, agave nectar, coconut sugar, date syrup, stevia, Splenda, Equal, Nutrasweet, xylitol, etc. Read your labels, because companies sneak sugar into products in ways you might not recognize.
> - **Do not consume alcohol, in any form, not even for cooking.** (And ideally, no tobacco products of any sort, either.)
> - **Do not eat grains.** This includes (but is not limited to) wheat, rye, barley, oats, corn, rice, millet, bulgur, sorghum, sprouted grains, and all gluten-free pseudo-cereals like quinoa, amaranth, and

buckwheat. This also includes all the ways we add wheat, corn, and rice into our foods in the form of bran, germ, starch, and so on. Again, read your labels.

- **Do not eat legumes.** This includes beans of all kinds (black, red, pinto, navy, white, kidney, lima, fava, etc.), peas, chickpeas, lentils, and peanuts. No peanut butter, either. This also includes all forms of soy – soy sauce, miso, tofu, tempeh, edamame, and all the ways we sneak soy into foods (like lecithin).
- **Do not eat dairy.** This includes cow, goat, or sheep's milk products like milk, cream, cheese, kefir, yogurt, sour cream, ice cream, or frozen yogurt.
- **Do not consume carrageenan, MSG, or sulfites.** If these ingredients appear in any form on the label of your processed food or beverage, it's out for the Whole30.
- **Do not consume baked goods, junk foods, or treats with "approved" ingredients.** Recreating or buying sweets, treats, and foods-with-no-brakes (even if the ingredients are technically compliant) is totally missing the point of the Whole30, and will compromise your life-changing results. These are the same foods that got you into health-trouble in the first place—and a pancake is still a pancake, even if it's made with coconut flour.

Some specific foods that fall under this rule include: pancakes, waffles, bread, tortillas, biscuits, muffins, cupcakes, cookies, brownies, pizza crust, alternative flour pastas, cereal, or ice cream. No commercially-prepared chips (potato, tortilla, plantain, etc.) or French fries either. However, this list is not limited strictly to these items—there may be other foods that you find are not psychologically healthy for *your* Whole30. Use your best judgment with those foods that aren't on this list, but that you suspect are not helping you change your habits or break those cravings. Our mantra: *When in doubt, leave it out*. It's only 30 days.

One last and final rule:

- **Do not step on the scale or take any body measurements for 30 days.** "The Whole30 is about so much more than weight loss, and to focus only on body composition means you'll overlook all of the other dramatic, lifelong benefits this plan has to offer. So, no weighing yourself, analyzing body fat, or taking comparative measurements during your Whole30. (We do encourage you to weigh yourself before and after, so you can see one of the more tangible results of your efforts when your program is over.)"

The Fine Print

These foods are exceptions to the rule, and are allowed during your Whole30.

- Ghee or clarified butter. These are the only source of dairy allowed during your Whole30. Plain old butter is NOT allowed, as the milk proteins found in non-clarified butter could impact the results of your program.
- Fruit juice. Some products or recipes will include fruit juice as a stand-alone ingredient or natural sweetener, which is fine for the purposes of the Whole30. (We have to draw the line somewhere.)
- Certain legumes. Green beans, sugar snap peas, and snow peas are allowed. While they're technically a legume, these are far more "pod" than "bean," and green plant matter is generally good for you.
- Vinegar. Nearly all forms of vinegar, including white, red wine, balsamic, apple cider, and rice, are allowed during your Whole30 program. (The only exception is malt vinegar, which generally contains gluten.)

> - Coconut aminos. All brands of coconut aminos (a brewed and naturally fermented soy sauce substitute) are acceptable, even if you see the word "coconut nectar" in the ingredient list.
> - Salt. Did you know that all iodized table salt contains sugar? Sugar (often in the form of dextrose) is chemically essential to keep the potassium iodide from oxidizing and being lost. Because all restaurants and pre-packaged foods contain salt, we're making salt an exception to our "no added sugar" rule.[15]

Not bad. I mean, there are a lot of rules. Unlike The Zone, this one has a time limit of 30 days. Yet another starting and stopping point. However, the emphasis on smart food choices is similar to that of The Zone, and it's hardly a bad thing. In addition to that, if you look at some recipes on their blog, there's no real emphasis on calorie counts, and they do offer suggested serving sizes.[16] [17] However, much like the previously mentioned diets, the emphasis is on whole foods with limited amounts of processing. Now that you've come this far, you know those types of foods as something else: nutrient-dense foods. So, in all the previously mentioned diets, despite all the restrictions and time limits, the overarching themes revolve around sensible food choices, with some differences in the minor details of the respective diets.

It's likely that if you follow this diet, you will lose weight. It's also *unlikely* that you'll be able to sustain it, and as you've already learned, if you can't sustain it, then failure is a forgone conclusion. Further, the level of restriction and zealotry required to adhere to this diet will make it almost impossible to enjoy dinner out with friends on occasion, or any dinner with friends for that matter ("Oh,

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15 (n.d.). Whole30 Program Rules - The Whole30 .... Retrieved September 25, 2018, from https://whole30.com/whole30-program-rules/

16 (2018, September 23). The Whole30 Slow Cooker Sneak Peak: Turkey Breast Tenderloin .... Retrieved September 25, 2018, from https://whole30.com/2018/09/slow-cooker-2/

17 If you go through the blog recipes, you will see the lack of calories among

my God, you don't have *Ghee butter*? I'll have to pass!"). So sure, you'll get some results, because restricting yourself to a short list of foods will likely limit your calories by default, but good luck sustaining it. And what happens after the 30 days? Do you get a prize? Does fat regain suddenly not exist? Does Arnold Schwarzenegger come to your home and high-five you? No. You're simply left with another "finished" diet with no direction on how to sustain it.

Lunar Lunacy

Now it's time to move on to some of the less reasonable diets out there today. This particular one is a lunar-based diet called the Moon Diet Plan. You guessed it; this one is based off the timing of lunar phases. In fact, it's a form of intermittent fasting, except the fasting period lasts an entire day. Yes, 24 uninterrupted hours of no eating. Not only that, but this fasting phase must occur on either the new moon or the full moon, so you can harness the potential of the moon.[18] They even go on to describe what you can have during the fasting period:

> Consume only liquids during the 24 hours of the full or new moon—no solid foods! Drink plenty of water to maximize the moon's effectiveness. How much you drink depends on you. Six to eight pints is enough for most people, but you can drink as much as you want!
>
> You can drink more than just water. Natural, freshly squeezed fruit and vegetable juices are also recommended to provide your body with extra, clean nutrients and energy. Tea can be taken with honey but no other sugar. Tea and juice can be especially helpful if you start to feel hungry.
>
> Liquids containing sugar, fat, or salt will interfere with your weight loss

18 (n.d.). Moon Diet Plan - Basic - MoonConnection. Retrieved September 30, 2018, from http://www.moonconnection.com/basic-moon-diet.phtml

> and aren't allowed. That means no alcohol, no milk, and nothing that contains sugar or additives.[19]

We should point out that if you consume calories during your fasted phase, you aren't actually fasting. Aside from that, the website notes that drinking more fluids will "call on the power of the moon, stimulate renal activity, and allow your body to lose its excess water" which "flushes out the toxins that accumulate in the body due to unhealthy foods, bad digestion, and stress, and provides a detoxifying effect that will strengthen your immune system."

In a strange turn of events, after all the detoxing and fasting and lunar phases, the website goes on to say that you can still lose weight with "exercise and sensible eating habits during the rest of the month (low fat, low sugar, plenty of water)..." Despite all the hoopla over the moon having an effect on your excretory system, that last sentence is not unreasonable. Suffice it to say, this diet is the product of *lunacy* and is not supported by *any* scientific data whatsoever. If you lose fat on this diet, it's because you restricted calories, not because of the moon's energy or any such nonsense.

The Serpentine Offering

Up next, we have yet variant of intermittent fasting called The Snake Diet. So named because snakes eat a large amount of food and then sit around underneath heat lamps and on heat rocks for about a week or more until their next feeding. This diet advocates for similar feeding patterns. In practice, according to the website, you have a one-to-two-hour refeeding period after one or two days of fasting. The beginning of the diet has you fasting for 48 hours, followed by a refeed, then a 72 hour fast, and then another refeed, and then yet another

19 (n.d.). Moon Diet Plan - Basic - MoonConnection. Retrieved September 30, 2018, from http://www.moonconnection.com/basic-moon-diet.phtml

fast for a prolonged (more ambiguous) amount of time.[20] Moreover, the diet promotes eating the "same fucking thing" so "you know you're not gonna fuck something up."[21] The routine is succinctly summed up here:

> Fast: During fasting periods you are totally abstaining from any calorie consumption. The only thing being consumed is Snake Juice (recipe below). Fasting durations vary from person to person. An obese individual can fast for a longer period of time than an individual with a low body fat percentage. The basic Snake Diet fasting protocols are simple: 1. Stop eating 2. Drink Snake Juice 2. Continue for as long as you feel good.
>
> Re-feed: When you re-feed keep it simple. Be consistent with what you are eating you don't need day-to-day variety. You are changing the way you live so keep it simple, keep it consistent and keep the feeding window tight are key. The Snake Diet promotes deliberate and intentional eating. Don't eat just because.[22]

Unlike the previously mentioned lunar diet, the fasting periods for this one actually *don't* allow for any calorie-containing beverage consumption. However, there is a recipe for a drink called "snake juice" of which you're allowed to drink copious amounts. Snake juice is essentially water with added electrolytes, and the recipe consists of:

- Water=2L
- Potassium chloride =1 tsp (No Salt)

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20 (n.d.). Getting Started — Snake Diet| Fasting Focused Lifestyle. Retrieved October 2, 2018, from https://www.snakediet.com/getting-started/

21 (2018, May 27). FASTING & RE-FEED CONSISTENCY Is Key To FAT LOSS! - YouTube. Retrieved October 2, 2018, from https://www.youtube.com/watch?v=ASaVPtvb87w

22 (n.d.). Getting Started — Snake Diet| Fasting Focused Lifestyle. Retrieved October 2, 2018, from https://www.snakediet.com/getting-started/

- Sodium chloride = 1/2 tsp (Himalayan Pink Salt)
- Sodium Bicarbonate = 1 tsp (Baking Soda)
- Magnesium Sulphate = 1/2 tsp (Food Grade Epsom Salts)[23]

That about covers the basics of this one. It's important to note that while this diet *looks* like caloric restriction, it apparently is not according to the website. In fact, on the FAQ, it states, "The Snake Diet focuses on the duration between feeds. The Snake Diet addresses the question about when you eat. Calorie reduction diets are food-focused diets that focus on what you are eating. These are two very different concepts and trigger different bodily reactions."[24] As we've already covered, any diet that produces fat loss does so through caloric restriction, and nonlinear, intermittent-fasting-based diets have not been shown to be superior for fat loss or dietary adherence; sorry reptiles.[25] Keep that in mind as we continue.

Other Variants on Fasting

If some of the previous information is any indicator, what we call intermittent fasting wasn't born from the desire to get shredded. No, fasting was once a means to a spiritual goal. In the Gospels of Luke, Matthew, and Mark, Jesus was purported to have fasted for 40 days and nights in the desert after John the Baptist baptized him in the Jordan River. Upon his retreat to the desert, Satan appeared to tempt Jesus into breaking his meditative fast, among other things, and jesus rebuked him.[26]

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23 (n.d.). Getting Started — Snake Diet| Fasting Focused Lifestyle. Retrieved October 2, 2018, from https://www.snakediet.com/getting-started/

24 (n.d.). Getting Started — Snake Diet| Fasting Focused Lifestyle. Retrieved October 2, 2018, from https://www.snakediet.com/getting-started/

25 (2015, September 16). Do intermittent diets provide physiological benefits over continuous .... Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26384657

26 (n.d.). Matthew 4:1-11 NRSV - The Temptation of Jesus ... - Bible Gateway. Retrieved October 4, 2018, from https://www.biblegateway.com/passage/?search=Matthew+4%3A1-11&version=NRSV

In Islam, one of the five pillars of faith is to fast for the entire month of Ramadan. Among many reasons, it was a ritual passed down by their descendents as a method of forging or repairing a relationship with the believer and God as described in Surah Al-Baqarah verses 183, 184, and 185:

> O you who have believed, decreed upon you is fasting as it was decreed upon those before you that you may become righteous
>
> [Fasting for] a limited number of days. So whoever among you is ill or on a journey [during them] - then an equal number of days [are to be made up]. And upon those who are able [to fast, but with hardship] - a ransom [as substitute] of feeding a poor person [each day]. And whoever volunteers excess - it is better for him. But to fast is best for you, if you only knew.
>
> The month of Ramadhan [is that] in which was revealed the Qur'an, a guidance for the people and clear proofs of guidance and criterion. So whoever sights [the new moon of] the month, let him fast it; and whoever is ill or on a journey – then an equal number of other days. Allah intends for you ease and does not intend for you hardship and [wants] for you to complete the period and to glorify Allah for that [to] which He has guided you; and perhaps you will be grateful.[27]

In the early 20th century, Elijah Muhammad—successor to Fard Muhammad, founder and magus figure of the Nation of Islam[28]—took the idea of fasting one step further. According to Elijah Muhammad, one should:

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27 (n.d.). Surah Al-Baqarah [2:177-203] - Quran. Retrieved October 4, 2018, from https://quran.com/2/177-203

28 The Nation of Islam is a sectarian branch of Islam limited to black men and women (or any non white person) that started in the early 20th century; Malcolm X popularized the movement as the head minister in the mid 1950s through the early 1960s. At the time, if you asked Sunni Muslims, they would have likely viewed them as heretical insofar as their founder (Fard Muhammad) was believed to be an avatar of God. In Islam, as well as in Christianity and Judaism, this can be viewed as a violation of God's first commandment, that is, the commandment of having no other gods before God.

> Eat one good meal of food a day for good health. One meal a day or every two days could spell the end of much medicine, doctor bills and the building of hospitals if we would eat the proper food and eat it only when it is necessary to eat it.
>
> There are a lot of people who think their appetite is their god; but we, by nature, have been made to control ourselves if we want to. I have much self-experience in the way of eating. I am often experimenting as I teach you, so that I will know what happens if you go contrary to the Teachings of "How To Eat To Live." Eat one meal a day and eat the proper food in that meal, and do not eat between meals (a little of this and a little of that). I repeat, you will not be sick (only once in a great long time).
>
> Every meal that we put in our bodies has some poison in it. And some of our food, as I have said in this book, takes 36 hours to digest. If we do not wait until our previous meal has been digested and add a new meal to the previous meal, we have new poison in its full strength to aid the dying poison of the previous meal or to help it to revive in strength; and we will continue to be sick.[29]

In addition to fasting, Elijah Muhammad placed a lot of emphasis on the navy bean, so much so that they made and sold bean pies on street corners to those passing by. If you've ever been in Chicago and saw one or more black men wearing a bow tie and fez, you were likely witnessing some of the Nation of Islam members selling their sacred wares.

All this isn't to provide you with an education of religious beliefs and practices. The point is to show you that a lot of ideas you see espoused are not only un-

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29 (2006, December 18). Do not eat between meals by the Honorable Elijah ... - The Final Call. Retrieved October 4, 2018, from http://www.finalcall.com/artman/publish/Health_amp_Fitness_11/Do_not_eat_between_meals_by_the_Honorable_Elijah_M_3122.shtml

original (which isn't necessarily a bad thing), but they had your health in mind above the profits of the diet creators. And this claim of lasting health is still present in a lot of the marketing today, whether you believe these claims to be genuine or not. No, the point is to provide a historical context, albeit a limited one, to the practices we see today.

The Alkaline Diet

So, before we dive in here, let's take a brief crash course on spotting bullshit. From what it seems, this diet came from an honest to goodness question, like all science does. We call it a hypothesis. The hypothesis is called the "acid ash hypothesis," and the idea is that high protein and low potassium can lower your Ph balance, thereby raising your body's acidity and resulting in a myriad of health problems, like osteoporosis (this is what a lot of the literature focuses on, as you'll see). Briefly, the Ph scale is a measure of how acidic or basic a solution is. The scale ranges from zero all the way to 14, with zero being the most acidic, and 14 being the most basic. Seven is considered neutral.

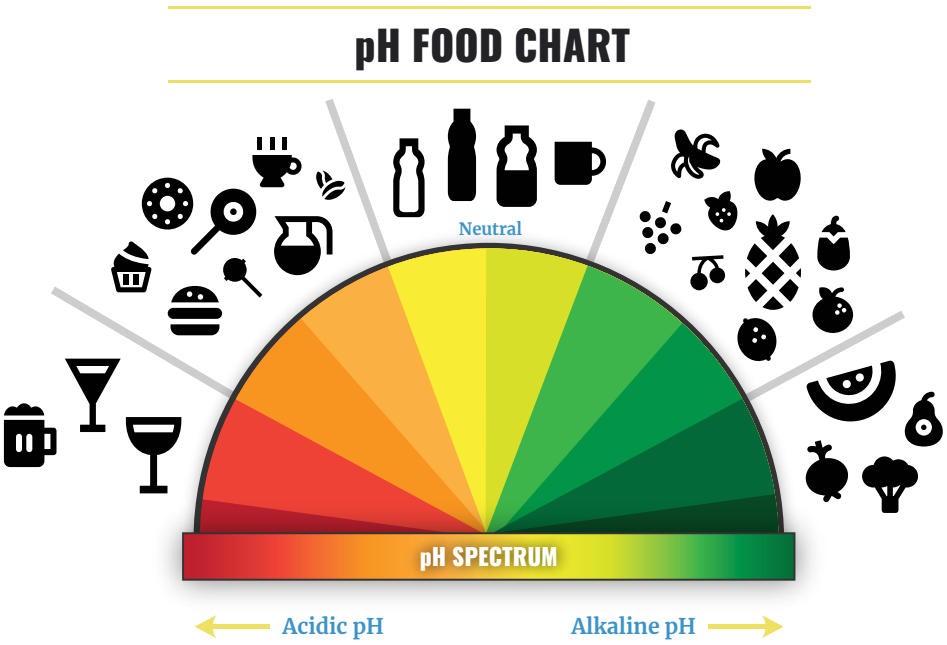

Figure 1: Alkaline diet proposed pH levels of various foods claimed by the alkaline diet

If you've seen the movie *Fight Club*, you may recall the scene where Brad Pitt pours lye on Ed Norton's hand, resulting in a pretty damn gnarly wound. Pitt then warns Norton not to pour water on it, as tempting as it may be, and explains why. In this context, lye is a base. Like, it's a really basic base. In fact, it's alkaline. In the case of lye, or codename sodium hydroxide (NaOH), its Ph is at a 14.[30] Water, on the other hand, is at a seven on the Ph scale (assuming it is distilled water, which we will for our purposes). If a substance has a Ph balance of seven, it's neither acidic or alkaline; it's neutral. So, when Norton wants to pour the water on his hand, the Ph balance of seven isn't enough to fully neutralize the high level of alkalinity. Ergo, they opt for an acid, vinegar, to neutralize the lye. Vinegar has a Ph level of about three. When Pitt pours the vinegar on, you see the relief in Norton's eyes, because of the chemical reaction.

So, the hypothesis seems like it's born out of a genuine concern. However, things get dicey when you go to acidalkalinediet.com, because the first thing you see is a lot of advertising and fear-mongering. Now, I [Peter] love marketing. I also like science. Not only that, Layne and I hate a lack of ethics when people try to mix the two. This is where we get into the crash course on spotting bullshit, and it's an easy one: the main portion of that previously mentioned homepage doesn't tell you anything. From the website itself, it says:

> Most people don't feel any where near as good as they could. In fact, the vast majority of people feel that their lack of energy and health is just part of the aging process. The funny thing is, so many people I know have nagging health problems. They're baffled why they no longer feel as good as they did when they were a child.
>
> In fact, they haven't got a clue. And that really makes sense when you consider the types of foods they're eating day-to-day, and the dangerous, often toxic, medications they've used throughout life.

30 Commercial lye that you can get from the hardware store, if you look at the ingredients, isn't pure NaOH. It has a mixture of of potassium hydroxide and NaOH downgrading the Ph to 13.

But let me ask you something: Do you think medication is the answer to health problems?

Of course not. If medication or a magic pill was the real answer, then you'd already feel as good as you want to be.

For many years mainstream medicine ignored the role that diet can play in both health and disease. More recently it began emphasizing the need to eat healthier foods to keep illness at bay.

One of the most exciting discoveries has been the effect some foods have on the body's acid-alkaline pH levels when digested.

A Slightly Alkaline Body Is Crucial For Good Health

Regardless of how much you work out and try to eat right, if you can't balance the acids in your body, you'll never feel as good as you'd like to be.

The problem is, on a whole, the average western diet is acid-producing. And when acidic wastes accumulate, they can cause organs to malfunction and break down.

We are forcing our bodies to work with less than optimal inner terrain.

This creates a fertile breeding ground for various forms of chronic illness that are now experienced by more than half the population.

If you often feel tired, it's a safe bet that you are overly acidic. The simple fact is, most people are. You need to counter acidity with alkaline foods as soon as possible.

> Eating the proper foods and getting the best nutrients in balance will help you avoid all that – along with the misery and poor quality of life that so often precede death, sometimes by decades.[31]

This doesn't even make us want to give them an email. It tells us literally nothing about the diet. So, not only does it tell us nothing after loads of promise, but the marketing itself isn't even good. Consider that tangential lesson a nice primer on spotting bullshit. Now, we can get into the decidedly non-alkaline meat and potatoes of it all.

As stated, the premise of the diet is to raise your alkalinity. The belief is that too much protein and no or low potassium is going to make your bones break and lead you right into the grave, and the cause of your demise is being too acidic. That is, your pH is headed to the left of that number seven on the pH scale. In order to live, humans need a serum pH of 7.35 to 7.45. Note two things: it's not a big range, and it's not fully neutral. In fact, it's slightly alkaline (basic).[32] This concentration refers to your *serum* levels, which is a fancy medical way of saying the "pH of the clear liquid stuff that you get from clotted blood." The blood serum is that liquid without your red and white blood cells and platelets.

This doesn't mean that different areas of your body have the exact same pH as your overall blood serum. In fact, there is a distinct rise in our consumption of acidic foods along with simple sugars, low fiber, higher saturated fat, and as we've discussed here, general overconsumption of food.[33] In fact, Schwalfenberg notes "[w]ith the agricultural revolution (last 10,000 years) and even more recently with industrialization (last 200 years), there has been a decrease in

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31 (n.d.). Alkaline Diet. Retrieved November 11, 2018, from https://www.acidalkalinediet.com/

32 (2011, October 12). The Alkaline Diet: Is There Evidence That …. Retrieved November 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3195546/

33 (2011, October 12). The Alkaline Diet: Is There Evidence That …. Retrieved November 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3195546/

potassium (K) compared to sodium (Na) and an increase in chloride compared to bicarbonate found in the diet." He later notes the flipped ratio of the above named elements; potassium to sodium once was ten to one, and now it's the exact opposite, one (up to three) to 10.[34] In an examination of low carb high protein diets, Reddy et al. found:

> Urine pH decreased from 6.09 (Usual) to 5.56 (Induction; $P < 0.01$) to 5.67 (Maintenance;$P < 0.05$). Net acid excretion increased by 56 mEq/d (Induction; $P < 0.001$) and 51 mEq/d (Maintenance; $P < 0.001$) from a baseline of 61 mEq/d. Urinary citrate levels decreased from 763 mg/d (3.98 mmol/d) to 449 mg/d (2.34 mmol/d; $P < 0.01$) to 581 mg/d (3.03 mmol/d; $P < 0.05$). Urinary saturation of undissociated uric acid increased more than two-fold. Urinary calcium levels increased from 160 mg/d (3.99 mmol/d) to 258 mg/d (6.44 mmol/d; $P < 0.001$) to 248 mg/d (6.19 mmol/d; $P < 0.01$). This increase in urinary calcium levels was not compensated by a commensurate increase in fractional intestinal calcium absorption. Therefore, estimated calcium balance decreased by 130 mg/d (3.24 mmol/d; $P < 0.001$) and 90 mg/d (2.25 mmol/d; $P < 0.05$). Urinary deoxypyridinoline and N-telopeptide levels trended upward, whereas serum osteocalcin concentrations decreased significantly ($P < 0.01$).[35]

Their conclusion even states that the diet leads to an increased acid load in the kidneys, which could potentially increase the risk of bone loss and the formation of kidney stones. However, one of the glaring problems with this particular study is the low sample size of ten people and the six-week duration. In a study that examined urine pH over a five-year period, along with measurements of bone mineral density, Fenton et al. found urine pH not to be an indicator of oste-

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34 (2011, October 12). The Alkaline Diet: Is There Evidence That .... Retrieved November 11, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3195546/

35 (n.d.). Effect of low-carbohydrate high-protein diets on acid ... - NCBI - NIH. Retrieved November 12, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12148098

oporosis,[36] and Schwalfenberg goes on to say "urinary losses of calcium are not a direct measure of osteoporosis. There are many regulatory factors that may compensate for the urinary calcium loss."[37] While Schwalfenberg notes that the loss in bone mineral density does exist, he notes, "adequate protein is necessary for prevention of osteoporosis and sarcopenia; therefore, increasing the amount of fruit and vegetables may be necessary rather than reducing protein."[38]

For our purposes, think about what we know so far. Mainly that the body tries to maintain homeostasis at all times. We've seen this with metabolic adaptation. So, the fact that your urine pH might be higher due to having a higher acid load doesn't necessarily mean that your serum pH levels will be reflective of that. In his review, Schwalfenberg concludes:

> Alkaline diets result in a more alkaline urine pH and may result in reduced calcium in the urine, however, as seen in some recent reports, this may not reflect total calcium balance because of other buffers such as phosphate. There is no substantial evidence that this improves bone health or protects from osteoporosis. However, alkaline diets may result in a number of health benefits as outlined below
>
> 1. Increased fruits and vegetables in an alkaline diet would improve the K/Na ratio and may benefit bone health, reduce muscle wasting, as well as mitigate other chronic diseases such as hypertension and strokes.

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36 (2010, May 10). Low urine pH and acid excretion do not predict bone fractures or the .... Retrieved November 12, 2018, from https://bmcmusculoskeletdisord.biomedcentral.com/articles/10.1186/1471-2474-11-88

37 (2011, October 12). The Alkaline Diet: Is There Evidence That .... Retrieved November 12, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3195546/

38 (2011, October 12). The Alkaline Diet: Is There Evidence That .... Retrieved November 12, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3195546/

> 2. The resultant increase in growth hormone with an alkaline diet may improve many outcomes from cardiovascular health to memory and cognition.
> 3. An increase in intracellular magnesium, which is required for the function of many enzyme systems, is another added benefit of the alkaline diet. Available magnesium, which is required to activate vitamin D, would result in numerous added benefits in the vitamin D apocrine/exocrine systems.
> 4. Alkalinity may result in added benefit for some chemotherapeutic agents that require a higher pH.
>
> From the evidence outlined above, it would be prudent to consider an alkaline diet to reduce morbidity and mortality of chronic disease that are plaguing our aging population. One of the first considerations in an alkaline diet, which includes more fruits and vegetables, is to know what type of soil they were grown in since this may significantly influence the mineral content. At this time, there are limited scientific studies in this area, and many more studies are indicated in regards to muscle effects, growth hormone, and interaction with vitamin D.[39]

Now, this might sound like it's a miracle cure. But think about everything we've said so far. We've touted the benefits of making better food choices within the confines of your caloric needs. We've spoken about the benefits of a micronutrient-rich diet (aka eating your fruits and vegetables). If you look at the alkaline diet, our recommendations jive with a lot of their recommendations. Indeed, then, it's not miraculous. The overarching premise seems pretty in-line with common sense, and buying overpriced supplements and cookbooks don't have to be a part of your common practice to reap the benefits of better health.

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39 (2011, October 12). The Alkaline Diet: Is There Evidence That .... Retrieved November 12, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3195546/

Oh, and do you remember the ethics lesson early on? A well known author and proponent of the alkaline diet, a naturopath named Robert Young, was found guilty by a jury of his peers for practicing medicine without a license. Young advised Dawn Kali, a cancer patient, to forgo actual treatment and rely on his alkaline theories (such as injecting IV sodium bicarbonate) to treat her cancer. Her cancer is now at stage four and she has three or four years to live.[40] Young was ordered to pay over 100 million dollars in damages due to his unethical practices that may have gotten people killed (he's complained about the amount of the judgement rather than shown remorse). Young rose to prominence through his book, The *pH Miracle*, which was promoted on the Oprah Winfrey Show by demonstrating his "treatment" of Kim Tinkham for breast cancer. Tinkham and Young claimed he had "cured" her, but she died shortly thereafter of the disease.[41] Who knows how many desperate cancer patients died due to Young's influence, which urged them to avoid traditional chemotherapy and instead follow his ridiculous advice. Sadly, much of this bullshit advice is still propagated in alkaline-zealot circles on the internet.

Blood Type Diet

In 1897, we saw the release of the classic book *Dracula*. Bram Stoker wrote about blood transfusions, was an emerging new form of science at the time. While some credit is due to him for that, there's one thing they didn't take into account when his character Dr. Van Helsing performed the blood transfusions—the blood types of the donors and recipients. Now we know better. Many of you reading likely donate blood to various organizations, and they store it for later use in patients who need to receive blood for whatever reason.

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40 (2018, November 2). Jury awards $105M in suit against pH Miracle author - The San Diego .... Retrieved November 12, 2018, from http://www.sandiegouniontribune.com/news/courts/sd-me-phmiracle-civil-verdict-20181102-story.html

41 (n.d.). Robert O. Young - Wikipedia. Retrieved November 14, 2018, from https://en.wikipedia.org/wiki/Robert_O._Young

According to the Red Cross,

> There are four major blood groups determined by the presence or absence of two antigens – A and B – on the surface of red blood cells. In addition to the A and B antigens, there is a protein called the Rh factor, which can be either present (+) or absent (–), creating the 8 most common blood types (A+, A-, B+, B-, O+, O-, AB+, AB-).[42]

The same website goes on to mention that there are also 600 antigens we know of, which, create various rare blood types depending on their presence or absence.

If, during a transfusion, two incompatible blood types mix, it creates an immune response due to the foreign antigens entering the body. In fact:

Many of the adverse effects of blood transfusions are mediated by the recipient's immune system. In general, the formation of this and other immune responses occur in three stages:

- the immune system detects foreign material (antigen)
- the immune system processes the antigen
- the immune system mounts a response to remove the antigen from the body

The immune response varies tremendously, depending on the individual (the health of his or her immune system and genetic factors) and the antigen (how common it is and how "provocative" it is to the immune system).[43]

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42 (n.d.). Blood Types & Groups Chart | A, B, AB & O | Red Cross Blood Services. Retrieved November 13, 2018, from https://www.redcrossblood.org/donate-blood/how-to-donate/types-of-blood-donations/blood-types.html

43 (n.d.). Blood transfusions and the immune system - NCBI - NIH. Retrieved November 13, 2018, from https://www.ncbi.nlm.nih.gov/books/NBK2265/

So, either Van Helsing was hashtag blessed with a serious bout of good luck, or Bram Stoker used a little bit of artistic license in his narrative.

Doctor Peter D'Adamo, a naturopath (see a theme yet?), posits that a diet based on your blood type (which we can trace back to our ancestors) will improve our overall health markers, if we just adhere to it. For their systematic review, Cusack et al. ask, "In humans grouped according to blood type (population), does adherence to a specific diet (intervention) improve health and/or decrease risk of disease (outcome) compared with nonadherence to the prescribed diet (comparison)?"[44]
This question refers to a model (PICO) for collecting data in relevant studies so the authors can do a systematic review. After looking for relevant data during the inclusion process, Cusack et al. found:

> Ultimately, only one of the 16 identified papers fulfilled all of the inclusion criteria; Birley et al (29) studied the effects of a low-fat diet on LDL-cholesterol concentrations of study participants grouped according to MNS blood type. None of the studies showed an association between ABO blood type diets and health-related outcomes
>
> The identified study analyzed a total of 254 participants [127 subjects within experimental groups (MN genotype: n = 67; MMgenotype: n = 38; NN genotype: n = 22) and 127 subjects within control groups (MN genotype: n = 61; MM genotype: n = 40; NNgenotype: n = 26)]. Intervention groups were given the objective of a 25% reduction in dietary fat intake, and their diet was supplemented with 25 g unprocessed wheat bran/d. Control groups did not change their diets. LDL cholesterol values of both control and experimental groups within each MNS blood type were measured at baseline and 6, 12, and 18 mo.[45]

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44 (n.d.). Blood type diets lack supporting evidence: a systematic review. - NCBI. Retrieved November 13, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23697707

45 (n.d.). Blood type diets lack supporting evidence: a systematic review. - NCBI. Retrieved November 13, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23697707

And in that particular study, they found that MNS blood types did respond to the lower fat diet with a decrease in their low density lipoprotein (LDL Cholesterol aka the "bad" cholesterol). However, proponents of blood type diets usually look at the ABO groups previously mentioned, which are distinct from the MNS groups in the study the Cusack et. al. used for their systematic review. In addition to that, the study didn't directly address PICO requirements, not all the participants were analyzed (254/315), and the imprecision (small sample size) deemed it pretty low in its grade for the overall strength of evidence. So, while the MNS groups who followed the intervention (the lower fat diet) did reduce their LDL, Cusack et al. note that there may be other factors involved.[46] Cusack et al.'s conclusion states:

> In conclusion, a standard PICO question and a systematic search of established medical and scientific databases yielded no evidence regarding the validity of blood type diets. Evidence exists that links an increased vulnerability of certain blood types to particular diseases (3), and studies that considered an association between genetic variation and responses to specific diets are also available (46). However, there is currently no evidence that an adherence to blood type diets will provide health benefits, despite the substantial presence and perseverance of blood type diets within the health industry. Until the health effects of blood type diets have been substantiated, the widespread claims should be clarified so that consumers are aware that the advertised health benefits are theoretical and not supported by scientific evidence.[47]

What does this mean in context of everything else we've presented? Well, for one, caloric restriction improves blood markers, regardless of the type of foods con-

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46 (n.d.). Blood type diets lack supporting evidence: a systematic review. - NCBI. Retrieved November 13, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23697707

47 (n.d.). Blood type diets lack supporting evidence: a systematic review. - NCBI. Retrieved November 13, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23697707

sumed. Higher protein diets are generally good for your health in terms of satiety, weight loss, and tissue repair. Furthermore, based on the systematic review, we don't know if the calories were restricted to put the participants in a deficit, or if the single qualifying study only intended for them to have a lower fat content.. So, while a blood-type-based diet might have insufficient evidence to support its necessity, we've presented enough bigger picture options for you that will yield not only fat loss, but overall health improvements without any of the fads.

Detoxes

Some of you might be familiar with the search engine known as Google. In this search engine, you can search the world's information at the stroke of a few keys. The bad news about that is you can also find a lot of ill-informed information (at best) and a lot of deliberately misleading information (at worst). With the deft blend of marketing and statements that sound scientific, anyone can attain Googleability and make a killing off of nonsense. One of the biggest loads of nonsense out there today is detox diets. The idea of these is to primarily remove toxins from your body, and secondarily, to lose weight. However, Klein and Kiat note in their review:

> In the context of commercial detox diets, the term 'toxin' has adopted a much hazier meaning; encompassing pollutants, synthetic chemicals, heavy metals, processed food and other potentially harmful products of modern life. Commercial detox diets rarely identify the specific toxins they aim to remove or the mechanisms by which they eliminate them, making it difficult to investigate their claims. The detox industry founds itself on the notion that chemicals can be neatly divided into 'good' and 'bad' categories; in reality, for the vast majority of chemicals, it is the 'dose that makes the poison'.[48]

48 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

But the premise sounds logical. After all, who wants to be riddled with toxins? If you were to search for "detox diets" in Google, you'll end up with hundreds of results reminiscent of the description quoted above.

In fact, the first one we found says the following:

> In essence, the idea behind a detox diet is creating an opportunity to give your digestive system a brief 'pause' from its regular activities so that it has the opportunity to heal itself better.
>
> Sometimes a detox diet requires you to give up most solid food in favor of detox diet drinks, but other times it's merely a strategy of adding gut-healthy foods like detox foods into your diet instead.
>
> A detox diet is an opportunity to feed your body the nutrients it needs while temporarily cutting out the potentially harmful ingredients like sugar, simple carbs, sweetened drinks, and processed foods.
>
> In the same way that rehabilitation clinics help their patients overcome an addiction to drugs or alcohol, a detox diet will help you train your body to quit craving unhealthy foods and function better on wholesome ingredients instead.[49]

Let's unpack that a little bit. For one thing, it's your digestive system's job to work to digest food. Imagine if you needed to give your heart a rest from pumping blood throughout your body. Last I heard, having your heart stop is not something you want. There is no evidence that the digestive system needs a "rest." Second, based on everything you've read thus far, there are very few "harmful" foods (with the exception of trans fats and hydrogenated oils, which

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49 (2018, March 20). 10 Detox Diets to Cleanse Your Body - Teami Blends. Retrieved November 14, 2018, from https://www.teamiblends.com/10_detox_diets_to_cleanse_your_body

don't seem to have any positives or acceptable doses). Not even the dreaded sugar demon. You also know that you probably don't want to eat "junk" food all the time, but based on everything we've gone over, you won't be able to eat nutrient-void foods. Our strategies are what's called "self-regulating," meaning it will be hard to subsist on less nutritious foods for extended periods of time. And if you recall where spoke of fiber, you're doing your gut a favor and helping the self-regulation process by eating it.

In their review, Klein and Kiat also note: "the handful of studies that have been published suffer from significant methodological limitations including small sample sizes, sampling bias, lack of control groups" in addition to the reliance on self-reporting.[50]

To add, the only clinical reports of detoxes out there involve one program and one product, according to Klein and Kiat. The program in question was the brainchild of L. Ron Hubbard (yes, that L. Ron Hubbard, the founder of the Church of Scientology) and was used to treat rescue workers exposed to chemicals after the attacks on the World Trade Center on 11 September 2001.

> This programme employs niacin supplementation, sweating in a sauna and physical exercise to mobilise stored toxins out of adipose tissue. Participants consume polyunsaturated oils to assist with toxin excretion and are also supplied with a range of vitamins, minerals and electrolytes to 'support healing'. The Hubbard programme was administered to 14 firemen who were suffering from significant memory impairments after exposure to high levels of polychlorinated biphenyls (PCBs) in a transformer fire.[51]

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50 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

51 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

Klein and Kiat note that their scores on memory tests improved, though the sample size was incredibly small. One of the arms of the church also administered a similar program on 103 volunteers with a control group of 19 and found statistically significant improvements in blood pressure, cholesterol levels, and psychological test scores."[52] The authors also noted the "study was limited by lack of randomisation and blinding, and the duration of the intervention period varied widely from 11 to 89 days."[53]

The product in question is called UltraClear® and claims to detoxify the liver. They note:

> MacIntosh & Ball examined the effects of UltraClear® in 25 naturopathy students, without the inclusion of a placebo control group. A statistically significant (47%) reduction was observed in the volunteers' scores on the Metabolic Screening Questionnaire (MSQ) over the 7-day treatment period. The MSQ comprises a short set of questions designed to gauge the severity of a broad range of health complaints, including headaches, nausea, genital itch, coughing, chest pain, mood swings, acne and dark circles under the eyes. The rate at which participants cleared a dose of 300–400 mg of caffeine was used to determine the effect of UltraClear" on phase I liver detoxification capacity, whereas the conversion of a dose of 3 g of benzoate was used as a crude measure of phase II glycine conjugation activity. Increases in caffeine clearance and benzoate conversion were observed after the 7-day treatment with UltraClear", although these changes were nonsignificant.[54]

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52 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

53 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

54 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

Now, in our years of working with clients, we've learned a few things. One of them is that anecdotally, detox diets and regiments seem to help people feel better, at least in the short term. Usually, when a client has gone on (or knows someone who has gone on) some sort of detox, it involves eliminating a lot of food groups. Alcohol, caffeine, processed foods, sugar, and the like. If you have a standard American diet, eliminating those foods and eating "cleaner," a usual requisite for a detox program, likely causes you to default to eating better and more nutrient-dense foods while possibly restricting calories.

Not to beat a dead horse, but do you remember the benefits we discussed regarding controlling and reducing your calories? By even following a moderate detox program, you have stumbled on that modality and thereby reap the benefits of it. In our observations, which line up with the data presented earlier, most detox regimens don't make permanent changes. As a result, you'll go back to drinking more and eating more and feeling like you did "pre-detox."

Regarding weight management, Klein and Kiat say:

> Currently, no scientific studies have investigated the effectiveness of commercial detox diets for losing weight. Because one of the principal claims of the detox industry is that these diets are useful for shedding weight, this is an area that requires attention. Information regarding the short-term and long-term impact of detox diets on weight and other health measures would be of value to consumers and health professionals, whereas comparisons with other types of dietary modifications are also needed.
>
> In the absence of any clinical evidence, we can only extrapolate from studies of other diets. It is known that dieting in general has an estimated success rate of only 20%(84). A possible explanation for this lack of success is that animals and humans have evolved mechanisms to defend

> against weight loss because starvation can lead to reduced fertility and even death (85).[55]

Sounds familiar, right? To conclude:

> there is no compelling evidence to support the use of detox diets for weight management or toxin elimination (97,98). Considering the financial costs to consumers, unsubstantiated claims and potential health risks of detox products, they should be discouraged by health professionals and subject to independent regulatory review and monitoring.[56]

To wrap it up, save your money and eat well most of the time. If anyone tries to sell you a "detox," first ask them what toxins they specifically aim to "detox," and then watch them scramble around trying to put together "sciencey" words to appear intelligent.

Meal Frequency

Much has been made of meal frequency for fat-burning purposes. Fitness experts have claimed, "Eat smaller, more frequent meals to boost metabolism!" Some have even suggested that meal frequency was more important than overall caloric intake (notice a trend with these zealots?). Metabolism is smarter than you are, and there aren't really any "hacks" like eating small, frequent meals to "stoke your metabolic furnace." Research has convincingly demonstrated that it doesn't matter how many meals per day are consumed; it's total energy balance that drives fat loss. To our knowledge, there are no studies that

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55 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

56 (2014, December 18). Detox diets for toxin elimination and weight management: a ... - NCBI. Retrieved November 14, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/25522674

show differences in fat loss due to meal frequency when calories are equated.[57] [58] Indeed, we're currently experiencing the opposite trend of fasting for fat loss and anabolism. While we don't think eating small, frequent meals is superior for fat loss, we also don't think consuming a single huge meal is superior, either.

Let's look at an example of two meals per day versus eight meals per day with calories equated. At each of those small meals, there will likely be less fat deposited in adipose due to the meals being smaller, which means fewer nutrients being shuttled into adipose on a per-meal basis (see Figure 1). The two big meals would likely have a large amount of fat deposited into adipose tissue for the first few hours post meal. Ah ha! So more frequent meals are better for fat loss, right? Simply put, no. Although two large meals would result in a large amount of energy stored in adipose initially, the body would then burn quite a bit of body fat in the postabsorptive state, since there would be a long postabsorptive phase where stored energy would need to be utilized. And, while the smaller meal group is storing less body fat at each small meal compared to the two big meals, they're still storing some at each small meal, or if they're in a caloric deficit, they're spending less time in a postabsorptive state and not getting a big increase in fat burning. Once again, the net overall difference is zero with regards to fat loss.

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57 Increased meal frequency does not promote greater weight loss in .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19943985

58 Effects of Increased Meal Frequency on Fat Oxidation and Perceived .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4391809/

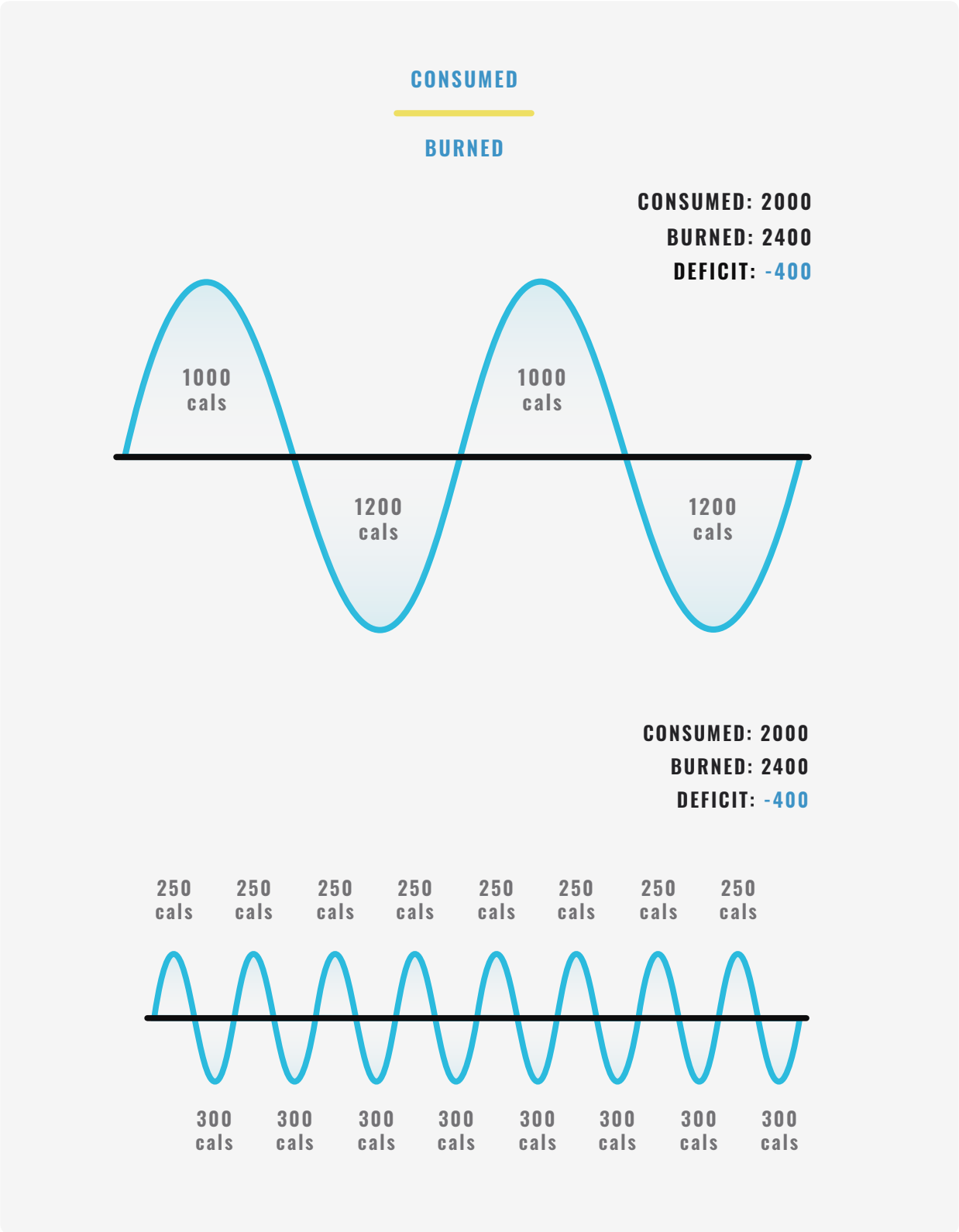

Figure 1. Comparing two meals vs. eight meals and their overall effect on fat loss when calories are equal.

What about muscle building? Do smaller, more frequent meals produce better gains? Or is fasting anabolic? Well, as per usual, the answer is in the middle. While fasting is not anabolic, and one or two protein-containing meals per day is probably not sufficient to maximize anabolism, eating too frequently can trigger a "muscle full" effect and actually have a negative impact on anabolism, as well.[59] Therefore, based on most current data, we suggest a meal frequency of approximately three to five meals per day, containing sufficient protein at each meal in a balanced distribution if maintaining maximum LBM is your goal.

But When Do We Stop?

"Nothing ends, Adrian. Nothing ever ends." Near the end of Alan Moore's *Watchmen*, the demigod Dr. Manhattan uttered those words to a questioning Ozymandias, who wondered if he did the right thing by annihilating a good portion of the world's population to scare the world's people into cooperating with each other. In our dietary world, it's true that nothing ever ends. We'll continue to eat for as long as we live, and in lieu of ending, things will change.

If you look at all these diets in conjunction with the information we've given you in the previous chapters, you can make a few educated guesses regarding your fat loss goals. All these diets have tons of anecdotal testimonies about how great they work, because they do work. They just don't always work because of the reasons touted by their proponents. If the diet works, it's because it enabled you to create a caloric deficit, something you can do on your own *without* weird dietary rules and restrictions.

Early on, we looked extensively at the research regarding how beneficial it is to not be obese. We also spoke about how limiting calories yields weight loss due to

59 Muscle full effect after oral protein: time-dependent concordance and .... Retrieved January 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20844073

the energy balance equation. And what's the common thread of most of the previously mentioned diets? They emphasize nutrient-dense and calorically sparse foods, or they limit the time duration in which you consume food. If you go from eating calorically dense foods multiple times per day to eating calorically sparse foods more often, I have news: you've significantly cut down your caloric intake, and you've likely upped your fiber and micronutrient intake. So it's *not* magic. In the case of the lunar and snake diets, the emphasis, while on time restriction, still skews towards nutrient-dense and calorically sparse foods. In the case of The Snake Diet, having a one- or two-hour refeeding window limits how much food you can actually consume in your eating window. Even if you *did* manage to eat a few thousand calories in a sitting (which is possible), if you're fasting and drinking the "snake juice" for several days, the chances of this practice lowering your weekly caloric intake and putting you in a deficit are high. That is the crux of all the fad diets. To restrict and limit. What isn't so clear is whether you can do a given named diet for the long haul. So, if we had to boil down all the good parts of the fad diets to make something that can work for you, it would be as follows:

- Don't limit everything if you don't have to. However, if you're the type who can't have one doughnut without eating the other 11 in the box, then maybe restricting doughnuts is a good idea
- Don't restrict nutrient-dense foods you happen to like. If you stick with things you like, you'll adhere to your unique diet better. So if you like beans (a nutritious food), it might not be wise to make them off limits
- Do get comfortable with the idea that you might have to deviate sometimes. Those family gatherings, weddings, funerals, and Christmas parties. Deviations are okay; just don't go too crazy. If you do, don't focus on the past—focus on how to be better and more aligned with your goals in the future
- Do keep track of what you eat, at least for a while, so you learn the skill of eating like an adult and not like a college-aged lush

Not only that, we also want you to know what to look for, so you don't wind up getting suckered out of hundreds (or worse, thousands) of dollars. To that end, if you do wind up following a named diet—because you've decided you can stick with it for the long term due to its high sustainability *for you*—then there are some things to look for to avoid losing money and possibly your dignity:

- No post-diet game plan. I know we spoke often about diets not having a follow-up game plan, and we attempt to rectify that, but to its credit, the Atkins Diet actually does have a follow-up plan, because Dr. Atkins likely realized that you couldn't eat an extremely low-carb diet forever.
- Heavy amounts of restriction and/or fasting. While a low-carb diet is pretty restrictive, there are some diets out there that restrict even more than a low-carb diet. We've spoken of some of them previously, like the Lunar Diet or the Snake Diet.
- Spending large amounts of money. Look, we're coaches. We help people implement these changes as part of our livelihood. Sometimes, depending on the goal, it might be pricey. However—and this applies to the broader spectrum of clients we have, meaning those who don't have an interest in competing of any kind—our goal is to ultimately help our clients not need us anymore. That said, look at what you're buying. We, along with other competent coaches, have a lot in common. We're not getting sued for nefarious things like practicing medicine without a license, we don't preach things that sound like magic, and we can't always offer precise time frames. So, if you're looking into something, and it sounds even remotely too good to be true, it likely is. Recall that we spoke about optimum rates of fat loss earlier. If a product or program claims you can lose 15 pounds in a week (or something similar), how does that figure into what you've learned so far? If you see a claim like that, it should automatically get your skeptic meter going. Look into the claims further. How are you going to lose those 15 pounds? Are you going to water fast? Juice fast? Drink a tea of some sort? A simple metric is to go to Google and type

in the product name followed by the word "scam." If you get a lot of top results that talk about how awful a product or company is, there's likely a good reason for it. Now, occasionally, even honest people get caught up in things like that, but even then, the results you find aren't even comparable to detox products or various multi-level marketing companies.

- Finally, and who better to say it than one of our favorite scientists of the 20th century, we'll cap this off with a section of Carl Sagan's baloney detection kit:

> What skeptical thinking boils down to is the means to construct, and to understand, a reasoned argument and—especially important—to recognize a fallacious or fraudulent argument. The question is not whether we like the conclusion that emerges out of a train of reasoning, but whether the conclusion follows from the premise or starting point and whether that premise is true.
>
> Among the tools:
>
> - Wherever possible there must be independent confirmation of the "facts."
> - Encourage substantive debate on the evidence by knowledgeable proponents of all points of view.
> - Arguments from authority carry little weight—"authorities" have made mistakes in the past. They will do so again in the future. Perhaps a better way to say it is that in science there are no authorities; at most, there
> - are experts.
> - Spin more than one hypothesis. If there's something to be explained, think of all the different ways in which it could be explained. Then think of tests by which you might systematically disprove each of the alternatives. What survives, the hypothesis that resists disproof

in this Darwinian selection among "multiple working hypotheses," has a much better chance of being the right answer than if you had simply run with the first idea that caught your fancy.*

- Try not to get overly attached to a hypothesis just because it's yours. It's only a way station in the pursuit of knowledge. Ask yourself why you like the idea. Compare it fairly with the alternatives. See if you can find reasons for rejecting it. If you don't, others will.
- *Quantify. If whatever it is you're explaining has some measure, some numerical quantity attached to it, you'll be much better able to discriminate among competing hypotheses. What is vague and qualitative is open to many explanations. Of course there are truths to be sought in the many qualitative issues we are obliged to confront, but finding them is more challenging.
- If there's a chain of argument, every link in the chain must work (including the premise)—not just most of them.
- Occam's Razor. This convenient rule-of-thumb urges us when faced with two hypotheses that explain the data equally well to choose the simpler.
- Always ask whether the hypothesis can be, at least in principle, falsified. Propositions that are untestable, unfalsifiable, are not worth much. Consider the grand idea that our Universe and everything in it is just an elementary particle—an electron, say—in a much bigger Cosmos. But if we can never acquire information from outside our Universe, is not the idea incapable of disproof? You must be able to check assertions out. Inveterate skeptics must be given the chance to follow your reasoning, to duplicate your experiments and see if they get the same result.[60]

*This is a problem that affects jury trials. Retrospective studies show that

60 (n.d.). The Fine Art of Baloney Detection. Retrieved November 15, 2018, from http://www.inf.fu-berlin.de/lehre/pmo/eng/Sagan-Baloney.pdf

> some jurors make up their minds very early— perhaps during opening arguments—and then retain the evidence that seems to support their initial impressions and reject the contrary evidence. The method of alternative working hypotheses is not running in their heads.

While Sagan's sage wisdom is a good reminder for us in our daily lives, it's a solid checklist as it relates to dieting and the diet industry. Lastly, remember it's a way of life, not a series of steps to get to the end.

15

SUPPLEMENTS

When people look into losing weight, the first things they want to talk about are supplements. Supplements are sexy, and they offer a theoretical shortcut to your goals. "Slash body fat by 70%, no diet needed!" While these claims are big on words, they're almost always short on data. Even when data is used, it's often purposefully twisted to suit an agenda. For example, a study may show that a group using a particular supplement dropped from 20% body fat to 17% body fat, while the placebo group dropped from 19% body fat to 17% body fat. In reality, the difference between the groups was not significant, but the supplement company won't discuss that. Instead they'll claim, "Super-supplement X slashes body fat by 50%!" Technically, they aren't wrong. The supplement group lost 3% body fat, and the placebo group lost 2% body fat, which is technically 50% more. Never mind the fact that it was only a 1% difference in overall body fat—and it wasn't actually a real difference, because it wasn't significant.

Supplement companies are *notorious* for using these sorts of tactics to sell their products. This is coming from a guy who has been sponsored by supplement companies and even owned a supplement company at one point, so I'm not hating on supplements, overall. Some of them can make a small but significant difference. Notice we said, "*small* but significant difference." Even the absolute best supplements (barring actual anabolic steroids marketed as supplements via loopholes) are only going to produce small differences in body composition. The purpose of this chapter is not to be an authoritative guide on supplements. There are already several great resources for that, including Examine.com, which is a site that writes about supplements in far more depth than we ever could. The

purpose of this chapter is to provide you with recommendations for supplements that may be useful for long-term fat loss by either improving lean body mass, reducing body fat, or decreasing hunger.

Keep in mind that listing a supplement here is not an endorsement of any one particular company, nor is it a requirement. One of the questions we get asked constantly is, "What supplements do I need?" You don't *need* any supplements. The very definition of "supplement" implies that it's not needed. However, some of them can be helpful. Are they worth spending money on? We can't tell you that. It depends on your own individual budget constraints and how important this is to you. If it's the most important thing in the world to you and you have a large budget, then by all means, knock yourself out. However, if this isn't your main priority and you're operating on a very slim budget, then feel free to not buy many or any supplements. In the end, what you spend your money on is up to you. But before you make any purchases, just be sure that you weigh any positives and negatives of supplementation along with the absolute financial costs.

Finally, it's extremely important to note that the data fails to find any association between the usage of dietary supplements and long-term weight loss. To be honest, the people who spend the most money on supplements usually get the least results. Not because all supplements are bunk (most are), but because the people who spend the most cash on supplements are also those people who tend to focus on quick fixes rather than long-term, *real* solutions.

*****Disclaimer*****

Neither Layne Norton nor Peter Baker are physicians. Before using any supplement, it is imperative that you speak with a physician regarding any supplements you plan on taking. If a supplement causes any side effect, discontinue use immediately. We cannot and do not claim to know all research safety data on every supplement. We have only included what we could find, and thus it's extremely important to weigh the risks and rewards before consuming any sup-

plement. Understand that supplements are not evaluated by the FDA for safety or effectiveness.***

Whey Protein:

Whey protein is an extremely high-quality protein derived from milk protein. It's high quality because it has a high bioavailability, high PDCAAs (a measure of digestibility and amino acid content), and high leucine content. Leucine, one of the branched chain amino acids, is the amino acid responsible for stimulating the mTOR pathway and triggering protein synthesis in muscle (MPS).[1] In fact, the leucine content of a protein source may be the most important factor in determining that source's anabolic potency.[2] Our lab determined that whey was superior to every other protein source we tested for anabolism based on its leucine content.[3] Most protein sources—virtually all animal sources, rice, soy, pea, and many others—contain approximately 8% leucine, though corn protein seems to be promising with a leucine content similar to whey. Whey has around 11% leucine (can vary between 10% and 13% from source to source).

There has been some debate around the best form of whey protein, since three versions exist: whey protein concentrate (WPC), whey protein isolate (WPI), and whey protein hydrolyzate (WPH). WPC is less refined, since it's formed by centrifuging milk (to separate out the fat content) and then adding acid to separate the insoluble (casein) fraction from the soluble (whey) fraction. Once the soluble fraction is concentrated, you have WPC. WPC naturally has a pleasant

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1 Leucine regulates translation initiation of protein synthesis in skeletal .... Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16424142

2 (2012, July 20). Leucine content of dietary proteins is a determinant of postprandial .... Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3488566/

3 (2016, November 30). Meal Distribution of Dietary Protein and Leucine Influences Long-Term .... Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27903833

taste to it, and it's rich in bioactive fractions that may have a positive impact on immune function.[4] [5] WPI is made from WPC by running the WPC through extra filtration processes that remove a significant amount of byproduct including lactose, extra fat, and carbohydrate. WPI is typically higher in protein concentration (approximately 90% of product weight versus 80% of product weight) and lower in carbohydrate and fat than WPC. WPI is easier for many people to digest due to the reduction in lactose and other byproducts. In fact, many people do not tolerate 100% WPC well, and WPI may be a great option for these people. The downside to WPI is that it's significantly more expensive than WPC. WPH is formed through enzymatic hydrolysis, a process by which added enzymes "chop up" whey protein into shorter, more easily digested peptides. This makes it extremely easy to digest for most people. The downsides to WPH are a significant increase in price over WPC and WPI, a loss of bioactivity of the lactalbumins due to pre-digestion by enzymes, and it typically doesn't taste nearly as good as WPI or WPC.

Some supplement companies have made claims that certain whey proteins are more anabolic than others, specifically with regards to WPH. These claims usually say that WPH produces more muscle growth than WPC or WPI. This isn't supported by any known data. Additionally, some companies are now selling "grass-fed whey" or "goat's whey." Both of these seem to be high-quality protein sources, but neither of them should produce more muscle mass, hypertrophy, or better performance based on any available data or mechanism that we could possibly think of. Grass-fed beef may be beneficial, since it changes the fatty acid composition of beef (increased omega-3 versus omega-6 fatty acids), but this seems to be irrelevant in whey protein because it has a very low fat content anyway. While both proteins would likely work just fine, grass-fed whey

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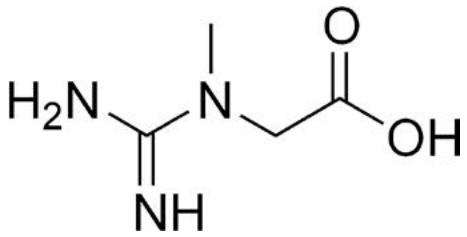
4 Modulation of immune function by a modified bovine whey protein .... Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/10457202

5 Whey protein concentrate (WPC) and glutathione modulation in ... - NCBI. Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/11205219

and goat whey are both more expensive than normal whey and would not likely provide any additional benefit, unless someone was so allergic to whey protein that they could not tolerate any form of it, in which case goat's whey might be a viable alternative.

Dosing and frequency: 20 to 30 grams of whey protein will increase MPS in most people, and the maximum benefits of whey are probably topped out around 40 grams, depending on the individual's lean body mass. Whey protein can be used as frequently or infrequently as you like to meet your protein goals. Some have ascribed magical properties to the post-workout whey shake, but there's nothing special about consuming whey protein post-workout other than the fact that you are consuming a high-quality protein source.



Creatine Monohydrate:

It may not seem sexy, but you cannot have a supplement list without mentioning creatine. It is possibly *the most* effective legal non-hormonal ergogenic aid in the history of supplements. There is no other compound with the breadth of positive effects as well as the loads of studies to back up its effectiveness. Creatine seems to work through several mechanisms, but the most prominent is by increasing muscle concentrations of creatine phosphate. Creatine phosphate acts as a high-energy phosphate donor to improve anaerobic exercise perfor-

mance.[6] [7] Creatine is especially useful for those who are dieting for multiple reasons including increasing lean body mass, improving strength, performing well overall at resistance training, and developing fatigue resistance.[8] [9] [10] As we mentioned, maximizing LBM retention during a diet is crucial to not only losing the weight, but also keeping it off.

Many supplement companies have tried to continuously reinvent the wheel by bringing out new (read: more expensive) versions of creatine, so that they can improve their bottom dollar. You see, creatine monohydrate is ubiquitous and as such, it's extremely affordable since thousands of companies sell it and the competition is high. Some of the major players that have been purported to be superior to creatine monohydrate include creatine ethyl ester, buffered creatine, and creatine HCl. Thus far, there is *no* evidence that any of these products are superior to creatine monohydrate. In fact, creatine ethyl ester was actually inferior to monohydrate in head-to-head comparisons.[11] Buffered creatine was also no better than monohydrate in comparisons, and if anything, it was a little worse.[12] Creatine HCl, while promoted as requiring a lower dose than monohydrate, has no empirical evidence to support those claims as of this time. As such, the recommended form to take is the tried-and-true creatine monohydrate.

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6 Creatine supplementation improves sprint performance in male ... - NCBI. Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/11252467

7 (2017, November 2). Effect of creatine supplementation during resistance training on lean .... Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5679696/

8 (2017, November 2). Effect of creatine supplementation during resistance training on lean .... Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5679696/

9 Creatine Supplementation during Resistance Training in Older ... - NCBI. Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/24576864

10 Low-dose creatine supplementation enhances fatigue ... - NCBI. Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20591625

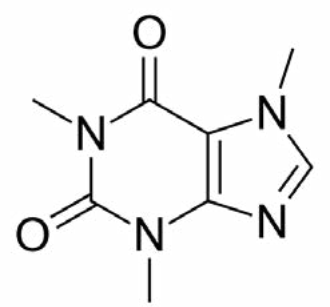
11 The effects of creatine ethyl ester supplementation combined ... - NCBI. Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19228401

12 (2012, September 13). A buffered form of creatine does not promote greater ... - NCBI - NIH. Retrieved July 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3479057/

It is important to note that while creatine works well for most people, approximately 30% of people are considered "non-responders." To be frank, this is not surprising, since there are non-responders to many compounds. In the case of creatine, it has been hypothesized that "non-responders" already have saturated levels of creatine phosphate in their muscle cells, and thus further supplementation doesn't produce any additional benefit. So if you don't get improvements from supplemental creatine, try not to fret too much; it simply means you were naturally gifted with high levels of creatine phosphate already.

Some people may find it counterintuitive to use creatine while dieting, since creatine can increase body weight in the short term. This increase in body weight is from increased water inside the cell as well as increased LBM, *not* increased fat mass. If you can deal with the fact that you might gain a small amount of weight initially when you start taking creatine, then there's nothing about it that will hinder your fat loss goals. It will only help through the mechanisms we discussed.

Dosing and Frequency: To reap the benefits of creatine, you want to saturate your muscle cells with creatine phosphate. There are a few ways to do that. The first way is to load. You can load for five days at 20 to 25 grams per day followed by a maintenance dose of 3 to 5 grams per day. This will saturate your cells within a week. The downside is that many people experience gastrointestinal (GI) distress due to the increased solute load in the GI. The alternative is to take 3 to 5 grams per day with no loading phase, and within 4 weeks, your cells should be saturated with creatine. The downside is that it takes longer to reach saturation, but the upside is there's a lower chance of GI distress and bloating. In the end, both will produce the same result, so you should pick the strategy that works best for you. One will just work a bit faster than the other. And to reiterate, if it's your first time supplementing with creatine during a diet, you might want to wait to run the experiment of whether to load it or not.



Caffeine:

This may seem like a "duh" recommendation, since caffeine consumption is so ubiquitous in our society and especially amongst competitors. However, it's worth putting caffeine on this list simply because it's one of the most effective performance boosting supplements available. Caffeine has a laundry list of beneficial effects for those undergoing a fat loss diet, including but not limited to fatigue resistance, improved performance, increased strength, decreased perception of fatigue, and increased power.[13] Now, if you're someone who doesn't exercise, then caffeine will probably have little benefit for you since it doesn't seem to increase fat loss or LBM or affect hunger.

The problem with caffeine is that everyone responds differently to it. Some people are very sensitive to its effects, and for them it may cause a number of undesirable effects such as anxiety and jitters. Because of this, it's wise to assess your sensitivity to caffeine and determine if it's is a good idea for you. Further, caffeine doesn't work the same forever. It's well documented that caffeine tolerance builds up over time, making the same dose less effective.[14]

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13 (2018, March 5). Effects of caffeine intake on muscle strength and power: a ... - NCBI - NIH. Retrieved August 1, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5839013/

14 Caffeine tolerance and choice in humans. - NCBI - NIH. Retrieved August 1, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/1410146

Another potential downside to caffeine is that it may offset the benefits of creatine supplementation.[15] Researchers are unsure of how this occurs, and there only a few studies examining this interaction, so we'll stop short of saying to not take them together—but the jury is still out.

Dosing and frequency: Everyone is different with regards to caffeine. Some people can take 75 milligrams and feel a big difference, while others can take 500 milligrams and go take a nap. Variation between individuals makes it difficult to pinpoint an exact recommended dosage. However, most studies demonstrating exercise performance benefits have used 3 to 6 milligrams per kilogram, and of those studies showing an increase in strength, it's typically on the higher end of that range. Due to the build-up of caffeine tolerance, it may be wise to take week-long caffeine breaks to reset tolerance. Save the hardcore caffeine doses when you need them most, near the end of a diet when energy is low and training volume is pretty high. We'd recommend possibly timing "caffeine breaks" with either tapers in training or during diet breaks when you should have more energy from greater calorie intake. These breaks will help you get more out of caffeine when you really need it by the end of your diet. During these breaks, it may be helpful to supplement with Rhodiola Rosea since it may help prevent the "crash" during the initial caffeine break.

Caffeine uptake and distribution to tissues is pretty rapid with 99% being absorbed into tissues within 45 minutes of ingestion. It's half life is 4-6 hours, and thus it really is a great pre-workout supplement as you can take it about an hour before you work out,. That should give you a great boost for the workout and last the whole time, unless your workout is excessively long.

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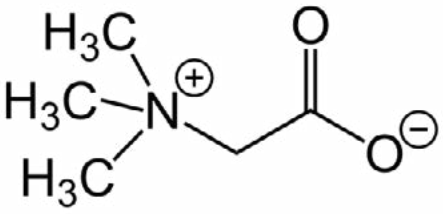
15 Creatine and Caffeine: Considerations for Concurrent Supplementation.. Retrieved August 1, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/26219105



Betaine (aka Trimethylglycine):

While Betaine has been around for a while, its popularity as an ergogenic aid has only recently come to the forefront. Originally popular as a methyl donor and also digestive aid (in the form of Betaine HCl), Betaine supplementation has been demonstrated to improve power output, exercise performance, and recently has been shown to increase lean body mass.[16] [17] Betaine, like creatine, appears to require time to "build up" in order to exert its ergogenic effects. It also seems to be well-tolerated with minimal side effects. People who don't produce much stomach acid may also benefit from Betaine HCl, but if you suffer from acid reflux, you likely want to refrain from using this form of betaine and instead use betaine anhydrous.

Dosing and Frequency: Most studies have observed the best effects from using 2.5 grams of betaine each day, one time per day.

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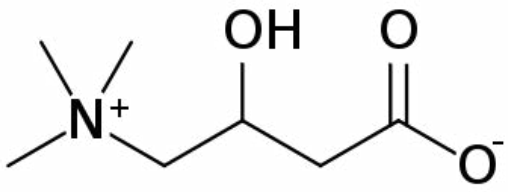
16 (2010, July 19). Ergogenic effects of betaine supplementation on strength and ... - NCBI. Retrieved July 6, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20642826

17 (2013, August 22). Effects of betaine on body composition, performance, and ... - NCBI - NIH. Retrieved July 6, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3844502/



Carnitine:

Carnitine has a myriad of effects that seem to be beneficial. It also has various forms, each of which may change the functionality of carnitine slightly. Carnitine L-Tartrate (LCLT) has been shown to improve workout performance by decreasing fatigue and blood lactate and slightly increasing power output.[18] LCLT may also decrease delayed onset muscle soreness and increase androgen receptor density in muscle cells.[19] [20] More androgen receptors in muscle cells may mean that your current levels of anabolic hormones like testosterone may work more efficiently, and your body can respond more appropriately to these hormones. Androgens like testosterone contribute to muscle growth by stimulating myogenesis, the formulation of muscular tissue. Further, LCLT may also increase blood flow to deliver oxygen and nutrients to hard-working muscles. Interestingly, LCLT may also help improve recovery by decreasing muscle damage and soreness in response to a training session.[21]

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18 (2018, March 13). l-Carnitine Supplementation in Recovery after Exercise - NCBI - NIH. Retrieved July 20, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5872767/

19 Androgenic responses to resistance exercise: effects of feeding ... - NCBI. Retrieved July 20, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16826026

20 The effects of L-carnitine L-tartrate supplementation on ... - NCBI. Retrieved July 20, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12930169

21 The effects of L-carnitine L-tartrate supplementation on ... - NCBI. Retrieved July 20, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12930169

There are other forms of carnitine, and Acetyl L-Carnitine (ALCAR) may also have benefits that affect cognition due to its ability to more readily cross the blood-brain barrier.[22] While carnitine was originally postulated to be a fat burner due to its involvement in the transport of fatty acids in the mitochondria, that ferver died off some time ago. In fact, we'd already written out that "carnitine is not a useful fat loss agent" when we came across a new meta-analysis we hadn't seen before. Surprisingly, this analysis demonstrated that carnitine does have significantly positive effects on fat loss.[23] Before you get too pumped up, however, realize that this effect on fat loss was pretty small. Still, it appears that carnitine has a myriad of beneficial effects for dieting.

Dosing and Frequency: This is a bit trickier. For ALCAR, cognition benefits have been seen at 630 milligrams to 2500 milligrams. For LCLT, a dose of 1000 to 4000 milligrams has been used. However, for both, it appears that 2000 milligrams elicits most of the benefits. We would consume it an hour or two pre-workout, and then one other time during the day.

Orlistat

Orlistat isn't really a dietary supplement, but we decided to discuss it since it's available via prescription (brand name Xenical) and as an over-the-counter drug (brand name Alli). Orlistat appears to cause significant reductions of 5% to 10% of body weight compared to placebo.[24] Orlistat works by reducing fat absorption in the GI tract by acting as a pancreatic and gastric lipase inhibitor,

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22 Acetyl-L-carnitine permeability across the blood-brain barrier ... - NCBI. Retrieved July 20, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/14595704

23 The effect of (L-) carnitine on weight loss in adults: a systematic review .... Retrieved July 20, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27335245

24 (n.d.). Evaluation of efficacy and safety of orlistat in obese patients - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3125014/

inhibiting fat breakdown so that fat is excreted rather than absorbed (decrease in absorption of about 30%).[25] This drug/supplement has the advantage of being non-stimulant in nature and thus doesn't have side effects that are normally associated with stimulants, like increased blood pressure and heart rate. However, it does have several significant digestive side effects such as diarrhea, leaky stool, and anal leakage (fun).[26] These effects may be exacerbated for those using a high-fat diet. As such, it's generally not recommended to exceed more than 30% of your calories from fat while using orlistat. It also blocks the absorption of fat soluble vitamins like A, D, E, and K, so taking it in conjunction with a vitamin supplement is likely advisable.[27] Because of the side effects, orlistat is not recommended unless people have shown an inability to lose weight by conventional means and have failed several attempts.

Dosing and Frequency: If orlistat is being prescribed by your physician, we advise you to follow their recommendations. If you're taking it over-the-counter, typical dosing is a single 60 milligram capsule (half of the dosage of the prescription Xenical at 120 milligrams) with each meal containing more than 10 grams fat. It's also recommended not to exceed three capsules in a day. Another way to express this would be to say have it with your three meals that contain the largest amount of fat each day.

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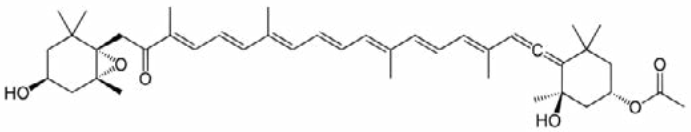
25 (n.d.). Obesity management: Update on orlistat - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2350121/

26 (2010, November 11). Taking Orlistat: Predicting Weight Loss over 6 Months - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2989378/

27 (2010, November 11). Taking Orlistat: Predicting Weight Loss over 6 Months - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2989378/



Fucoxanthin:

I'm not really big on many fat burners, because the vast majority of them are completely ineffective. There are a few like yohimbe that do seem to have some positive effects on fat loss, but these come at the cost of a greater chance of side effects. However, fucoxanthin, a component of brown seaweed, seems to be an effective fat loss agent that doesn't have much in the way of side effects.[28] Fucoxanthin is probably the most effective fat loss supplement available based on the data. There are many compounds that will reduce weight gain during overfeeding, and these are usually present in most fat-loss supplements. Unfortunately, what prevents weight gain is a *different* question than what causes fat loss. In a study of obese women who took fucoxanthin for 16 weeks but ate at maintenance, the results were extremely impressive.[29] They lost an average of 5 kilograms while eating at *maintenance*. Not surprisingly, they found that fucoxanthin increased resting energy expenditure, which accounted for the weight loss. What's impressive is that these people lost weight even though they shouldn't have been in a deficit. It appears that the increase in metabolic rate from fucoxanthin is likely from its ability to increase the expression of UCP1, an uncoupling protein that increases thermogenesis.[30]

Dosing and Frequency: The study that showed such impressive results with fucoxanthin used a name brand form called *Xanthigen*, which is a combination of fucox-

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28 (2015, May 27). Fucoxanthin: A Promising Medicinal and Nutritional ... - NCBI - NIH. Retrieved July 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4461761/

29 (2009, October 13). The effects of Xanthigen in the weight management of obese ... - NCBI. Retrieved July 25, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19840063

30 (2016, May 10). The Effect of Xanthigen on the Expression of Brown Adipose Tissue .... Retrieved July 25, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4951448/

anthin and pomegranate seed oil (PSO). We recommend this form of fucoxanthin, since there seems to be quite a bit of bunk on the market. For effective dosing, we would use 2.4 milligrams of fucoxanthin in combination with 300 milligrams of PSO taken daily with a meal containing fat. You could also just take 8 milligrams of straight fucoxanthin per day, which seems to be effective. PSO seems to increase the bioavailability of fucoxanthin, and since this is what was used in the study where fat loss was demonstrated, that's what we would recommend.

Synephrine:

Also known as Bitter Orange Extract, synephrine has been demonstrated to modestly decrease body weight and body fat in humans, which is pretty rare for most supplements. Synephrine's fat loss mechanism seems to be its ability to increase metabolic rate.[31] It also appears to increase lipolysis (release of fat from adipose cells), and decrease appetite while still being relatively safe.[32] It's a stimulant, so those who are sensitive may want to avoid it or start at a very low dose. This supplement appears to work at both ends of the energy balance equation by decreasing appetite (calories in) and increasing energy expenditure (calories out), so it may be useful for those looking for an small boost. That said, there's some evidence that it may slightly increase heart rate and blood pressure and have negative impact sleep quality. However, this is confounded by the fact that these studies examined multi-ingredient products that did not only contain synephrine. Thus, the negative effects may be been due to another ingredient, but it's difficult to know.[33]

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31 (2012, August 29). A review of the human clinical studies involving Citrus aurantium - NCBI. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/22991491

32 (n.d.). Safety and efficacy of citrus aurantium for weight loss. - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15541270

33 (2012, August 29). Bitter Orange - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3444973/

Dosing and Frequency: A wide dosing range appears safe (10 to 80 milligrams per day), but most of the studies demonstrating benefits typically used around 50 milligrams of synephrine per day. We recommend breaking this up into two doses: one in the morning and one in the early afternoon. We don't recommend consuming close to bed. If you train, we recommend consuming it approximately 45 to 90 minutes pre-training. If you're very sensitive to stimulants or have heart issues, don't use this product, or speak with a physician first. If you decide to use it, we recommend starting at a low dose to assess your tolerance.

Hydroxycitric Acid (HCA):

Isolated from Garcinia Cambogia, it appears that HCA has a small but significant impact on weight loss, though it's probably less than synephrine.[34] It appears to increase energy expenditure and act as an appetite suppressant similar to synephrine, but probably not quite as strong.[35] [36] It also appears to be relatively safe for usage even up to high doses, with the most frequent side effect being GI distress.[37]

Dosing and Frequency: Dosages from 1 to 2.8 grams per day have demonstrated benefits, but currently the "optimal" dosage is unknown. We recommend dosing similar to synephrine, since the mechanisms appear similar. That would be 0.5 to 1.4 grams two times per day, once in the morning and once in the early afternoon. Begin at a low dose to assess tolerance before moving to a higher dose. Speak with a physician first if you have heart or blood pressure issues.

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34 (2013, August 6). Updates on Antiobesity Effect of Garcinia Origin (-)-HCA - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3748738/

35 (n.d.). Safety and mechanism of appetite suppression by a novel ... - NCBI. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/12349913

36 (2013, August 6). Updates on Antiobesity Effect of Garcinia Origin (-)-HCA - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3748738/

37 (2013, August 6). Updates on Antiobesity Effect of Garcinia Origin (-)-HCA - NCBI - NIH. Retrieved November 5, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3748738/

Fish Oil Omega 3s (EPA and DHA):

EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are both omega-3 fatty acids found in fish oil that seem to provide a myriad of benefits. Both of them are anti-inflammatory, which can be a good thing but also can be a bad thing. It appears there's an "optimal range" of inflammation for anabolism. For example, in healthy young adults, using anti-inflammatories can reduce muscle building.[38] However, in older adults with higher basal levels of inflammation, anti-inflammatories enhanced muscle growth.[39] These omega 3s seem to have a myriad of health benefits, but for our purposes, they may be useful for dieting due to their anti-catabolic and anabolic effects. EPA in particular seems to be an inhibitor of muscle protein breakdown.[40] Further, they also may enhance the anabolic effects of a meal when co-ingested.[41] Further, fish oil may also decrease soreness and improve recovery.[42]

Dosing and Frequency: The studies showing increased anabolism from fish oil used a dosage of about 465 milligrams EPA and 375 milligrams DHA per gram of capsule. The study used 4 grams for a total dosage of 1860 milligrams EPA and 1500 milligrams DHA. Keep in mind that most fish oils contain around 180 milligrams EPA and 120 milligrams DHA per gram of capsule. Unless you want to consume 10 to 11 fish oil capsules per day, it may be beneficial to find a more concentrated fish oil supplement than standard supplements.

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38 (2017, September 16). High doses of anti-inflammatory drugs compromise muscle strength .... Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28834248

39 (2010, December 15). Influence of acetaminophen and ibuprofen on skeletal muscle .... Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3064281/

40 Effect of eicosapentaenoic acid, protein and amino acids on protein .... Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15213711

41 (2015, November 19). Omega-3 Fatty Acids and Skeletal Muscle Health - NCBI - NIH. Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4663562/

42 Effects of Fish Oil Supplementation on Postresistance Exercise Muscle .... Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/27441600

Branched Chain Amino Acids (BCAAs):

BCAAs are one of the most controversial supplements on the market today. Not because they're dangerous, but rather because of the discrepancy in people's opinions. Some people absolutely love them and swear they're great muscle builders and "must haves," while others claim they're complete garbage and absolutely useless. We think the data is pretty clear that they're not big-time muscle builders, but then again, most supplements aren't. Some studies have demonstrated an increase in LBM with BCAA supplementation, while others have not.[43] [44] Another study demonstrated that BCAAs helped maintain LBM while in caloric restriction compared to placebo.[45] We think that BCAAs are probably better recovery agents than muscle builders. BCAAs have been demonstrated to increase MPS after exercise, specifically because of the BCAA Leucine.[46] [47] BCAAs also seem to reliably decrease muscle soreness and improve time to recovery post-exercise (although consuming the BCAAs *before* exercise may have a superior effect on soreness).[48] [49] BCAAs also improve strength recovery post-training, meaning they can help you recover so you can train again harder and hopefully

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43 "Consuming a supplement containing branched-chain ... - NCBI - NIH." 31 Jul. 2009, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3313152/. Accessed 11 Jul. 2018.

44 "The data do not seem to support a benefit to BCAA ... - NCBI." 11 May. 2016, https://www.ncbi.nlm.nih.gov/pubmed/27175106. Accessed 11 Jul. 2018.

45 "In a single-blind, matched group design: branched-chain ... - NCBI - NIH." 5 Jan. 2016, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4700774/. Accessed 11 Jul. 2018.

46 "Branched-Chain Amino Acid Ingestion Stimulates Muscle ... - NCBI - NIH." 7 Jun. 2017, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5461297/. Accessed 11 Jul. 2018.

47 "Leucine regulates translation initiation of protein synthesis in ... - NCBI." https://www.ncbi.nlm.nih.gov/pubmed/16424142. Accessed 11 Jul. 2018.

48 "Effect of BCAA supplement timing on exercise-induced muscle ... - NCBI." 22 Sep. 2017, https://www.ncbi.nlm.nih.gov/pubmed/28944645. Accessed 11 Jul. 2018.

49 "The effects of acute branched-chain amino acid ... - NCBI." 27 Jan. 2017, https://www.ncbi.nlm.nih.gov/pubmed/28177706. Accessed 11 Jul. 2018.

sooner.[50] It has also been proposed that BCAAs may improve exercise performance by decreasing fatigue via competing with tryptophan for entry through the blood-brain barrier, therefore decreasing serotonin production. Serotonin production may increase fatigue during exercise, but the effect of BCAA doesn't seem strong enough to produce notable increases in performance.[51]

Another benefit of BCAA that I [Layne] put forward around eight years ago was the possibility that they could improve meal responses of MPS by extending the duration of MPS when consumed between meals.[52] After consuming a meal that stimulates MPS, an observed "refractory period" occurs where MPS declines even in the face of elevated anabolic signaling and amino acids. By providing BCAAs in between meals, approximately two to three hours post-meal and two to three hours before another meal, we observed that this refractory period could be overcome, and MPS extended. This is likely due to providing a source of ATP to the muscle cells, since increases in MPS actually cause depletion of ATP in muscle cells. Since BCAAs can be metabolized in muscle cells to form ATP, BCAAs provide a method of preventing this decline in ATP. We also demonstrated that ingesting carbohydrates between meals produces a similar effect, since it provides ATP for muscle and overcomes the refractory effect. Thus, either five to 10 grams of BCAAs or 30 to 40 grams of carbohydrate between meals may help overcome the refractory phenomenon and extend MPS after a meal. So, why spend money on BCAA if carbohydrate will do the same thing? It appears BCAA can produce the same effect at a lower dose and thus less calories, which is greater "anabolic bang" for your "caloric buck." This can be an advantage during a diet when calories are limited. However, whether this

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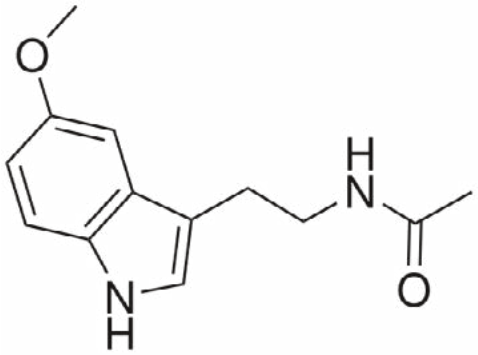
50 "The effects of acute branched-chain amino acid ... - NCBI." 27 Jan. 2017, https://www.ncbi.nlm.nih.gov/pubmed/28177706. Accessed 11 Jul. 2018.

51 Branched-chain amino acid supplementation does not ... - NCBI. Retrieved July 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/18974721

52 Leucine or carbohydrate supplementation reduces AMPK and ... - NCBI. Retrieved July 11, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21917636

translates into more muscle over time has yet to be determined. Even if it does, it's likely a small effect. Still, if building as much muscle as possible is the goal, then this may be a strategy you wish to consider.

Dosing and Frequency: To reduce soreness, consume 10 to 20 grams of BCAAs pre-workout. If you wish to be more "experimental" and attempt to attenuate the anti-anabolic effects of the "refractory period" post-meal, consume 0.03 to 0.05 grams of BCAA per kilogram of lean body mass in between meals (1.5 to 3 hours post meal, 1.5 to 3 hours before the following meal).



Melatonin:

Melatonin, known as "the hormone of darkness" because it responds to darkness, is a neurohormone secreted by the pineal gland that assists in regulating sleep by decreasing the time it takes to go to sleep.[53] Unlike many hormonal supplements that have poor bioavailability, melatonin appears to be readily absorbed, and doses as low as one to five milligrams can produce peaks in plasma melatonin that are ten to a hundred times greater than normal physiological

53 Melatonin, the Hormone of Darkness: From Sleep ... - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4334454/

levels, with a peak about 60 minutes after ingestion.[54] Numerous studies have demonstrated that supplementing with melatonin can assist with sleep.[55] [56] This could be extremely useful during dieting, since previous research has demonstrated that sleep is disrupted during dieting.[57] While it's not surprising that melatonin can assist with sleep, what *is* surprising is that supplementing with it appears to have small but statistically positive effects on fat loss and body composition.[58] [59] [60] It also appears to modestly increase leptin, which may assist with reducing hunger levels.[61] Furthermore, leptin appears to attenuate markers of muscle damage, which may further assist with compromised recovery during dieting.[62] It's very possible that many of these beneficial effects of melatonin are secondary to people simply getting better sleep while taking melatonin. Either way, it *does* appear that melatonin has a very consistent beneficial effect in the research studies.

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54 Melatonin: Pharmacology, Functions and Therapeutic ... - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5405617/

55 (2014, November 7). The effectiveness of melatonin for promoting healthy sleep - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4273450/

56 Melatonin for Treatment of Sleep Disorders: Summary ... - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/books/NBK11941/

57 (2017, August 3). Case Study: Unfavorable But Transient Physiological Changes ... - NCBI. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28770669

58 (2014, December 30). The effect of melatonin supplementation on the quality of ... - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4352910/

59 (2017, September 21). Melatonin Supplementation Lowers Oxidative Stress and ... - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5632922/

60 (2014, November 18). Melatonin supplementation to treat the metabolic syndrome - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4416300/

61 (2011, March 1). Melatonin or L-tryptophan accelerates healing of gastroduodenal .... Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21362032

62 (2017, February 13). The benefit of a supplement with the antioxidant melatonin on ... - NCBI. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/28192673

Dosing and Frequency: One to 10 milligrams taken 30 to 60 minutes before bed will help improve sleep. It appears that melatonin only requires a small dose to improve sleep, and more does not seem to enhance the effect further. However, high doses of 100 milligrams per day have also been studied and do not seem to cause side effects. However, one to 10 milligrams is what most of the studies have utilized previously. Based on the research and our personal experience with melatonin, we think three to five milligrams per evening is just fine.

Rhodiola Rosea:

Rhodiola Rosea is a compound that seems to have numerous beneficial effects for someone during a fat loss phase. Among the most striking benefits are a decrease in the perception of fatigue (diet long enough and you'll feel it, trust us), improved endurance exercise performance, improved cognition, and feelings of well-being.[63] [64] [65] So basically, rhodiola rosea will help to make you feel less like crap when the doldrums of a diet hit. It also may improve exercise recovery by decreasing muscle damage, although this effect is somewhat contradictory between studies.[66] [67] Regardless, it does seem like rhodiola rosea reliably improves mood and cognition, both of which deteriorate during dieting.

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63 The effects of an acute dose of Rhodiola rosea on endurance exercise .... Retrieved July 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/23443221

64 (2014, April 27). The Effect of Acute Rhodiola rosea Ingestion on Exercise ... - NCBI - NIH. Retrieved July 22, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4590898/

65 Acute Rhodiola rosea intake can improve endurance exercise ... - NCBI. Retrieved July 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15256690

66 Effects of chronic Rhodiola Rosea supplementation on sport ... - NCBI. Retrieved July 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20308973

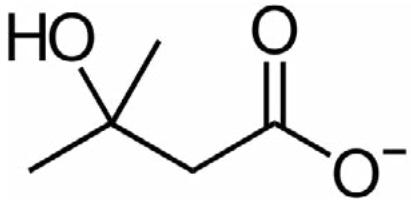
67 Effects of chronic Rhodiola Rosea supplementation on sport ... - NCBI. Retrieved July 22, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/20308973

Dosing and Frequency: It appears both a low dose taken over a long time and a large dose taken acutely can have benefits. Chronic doses of 50 milligrams per day can have benefits, but large doses of 300 to 600 milligrams (standardized for 3% rosavins and 1% salidroside) can have an immediate beneficial effect. We recommend not exceeding 600 milligrams, because it seems that high doses may negate the benefits of rhodiola rosea. In this way, it appears to work on a bell-curve dose response (ie. there is an optimal dose, and too little or too much is not desirable).

Essential Amino Acids (EAAs):

Essential amino acids are popular for many of the same reasons as BCAAs. However, in the case of EAAs, instead of only three BCAAs (leucine, isoleucine, and valine) the EAAs contain the other six EAAs (threonine, lysine, histidine, phenylalanine, methionine, and tryptophan). The downside is that they're less anabolic per gram due to lower leucine content. The upside is that since they contain the full spectrum of EAAs, they provide the substrates necessary for forming new complete proteins, and not just the stimulus for muscle protein synthesis. This may be especially useful for people who train fasted and do fasted cardio. While we don't advise fasted training or cardio, some people choose to do them because it fits their lifestyle better. Consuming EAAs first thing in the morning before cardio or training can provide a source of anabolic amino acids to overcome catabolism from an overnight fast. It can also be consumed rapidly, so that it doesn't disrupt someone's lifestyle, or their enjoyment of training fasted. If you don't train fasted, we would simply utilize BCAA instead of EAA, because there will be ample substrate available for synthesis of new proteins if you're consuming a high-protein diet overall.

Dosing and Frequency: 15 grams of EAA consumed in the morning before training or cardio. You can also consume this at any time if you suffer from IBS symptoms and are struggling with digesting complete sources of protein.



HMB (β-Hydroxy β-Methylbutyrate):

HMB is a metabolite of the amino acid leucine that began receiving press in the late 90s for its purported "muscle-building" properties. In reality, HMB does not appear to be a muscle builder, but rather an anti-catabolic agent. It appears to significantly decrease rates of muscle protein breakdown.[68] It also appears to work well as an anti-catabolic agent during conditions in which rates of muscle protein breakdown are elevated. These include cancer, sepsis, and novice trainers where extensive muscle damage occurs.[69] [70] [71] It also increases rates of muscle protein synthesis, though the effect is not as powerful as that seen with leucine. It appears that HMB has limited to no benefit in experienced trainers who don't have elevated rates of muscle protein degradation (the repeated bout effect protects muscles from subsequent damage). However, it does appear to have a small but notable effect on increasing lean body mass and strength in novice trainers. So it's possible that HMB supplementation may

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68 (2013, April 3). Effects of leucine and its metabolite β-hydroxy-β ... - NCBI - NIH. Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3690694/

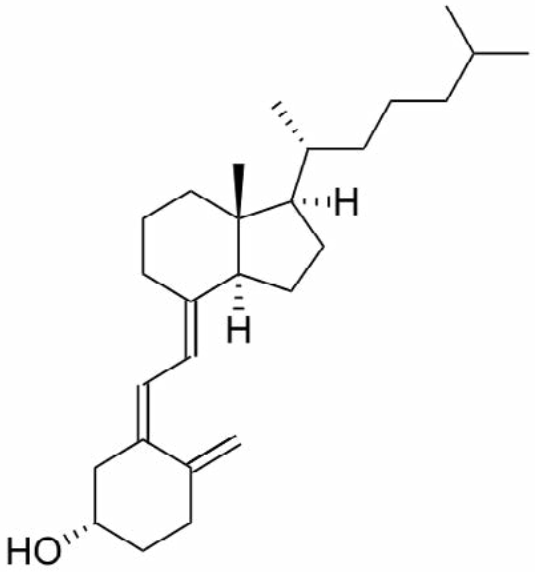
69 Effects of beta-hydroxy-beta-methylbutyrate supplementation ... - NCBI. Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19387395

70 Attenuation of proteasome-induced proteolysis in skeletal muscle by .... Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/15665304

71 (2017, May 10). Beta-hydroxy-beta-methylbutyrate supplementation and skeletal .... Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5566641/

provide a small but significant benefit to advanced trainers during dieting when caloric restriction decreases protein balance. This is completely theoretical, but at minimum, HMB may assist in recovery from exercise and reduce delayed onset muscle soreness.[72]

Dosing and Frequency: It appears that a dose of 3 grams of either calcium HMB or HMB free acid is effective at decreasing muscle protein breakdown and muscle soreness when taken one time daily, with pre-training likely being the best.



Vitamin D:

Most vitamins aren't sexy, but a lot of data has come out on vitamin D recently, particularly in athletes, that suggests supplementing with it may be helpful. Many people appear to be deficient in vitamin D, especially those that live in colder climates with less sun. Vitamin D is synthesized in response to UV light, and unless you're getting exposure to direct sunlight more than 20 minutes per

72 Supplementation with beta-hydroxy-beta-methylbutyrate (HMB) - NCBI. Retrieved July 15, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/16286672

day, it's likely you're deficient in vitamin D. I [Layne] live in Florida, and I was shocked to find out that even I was slightly deficient in vitamin D. Low vitamin D is associated with reduced testosterone and energy. Supplementing with it at ~3000 IU per day has been demonstrated to restore testosterone.[73] If you have normal vitamin D levels, however, it's unlikely that supplementing with super high levels of vitamin D will also supraphysiologically increase testosterone. Vitamin D supplementation was also shown to have a small effect on improving weight loss in people who are deficient.[74] Further, vitamin D appears to have protective effects on heart disease and cancer.[75] [76] Overall, if you already have good vitamin D status, consuming more probably won't make a huge difference, but it's a nice preventative measure in case you might be deficient.

Dosing and Frequency: 1000 to 3000 IUs per day should get you into the "optimal" range for vitamin D. We wouldn't recommend going much higher than this, since vitamin D is fat soluble, and super high doses could cause toxicity issues since it's not readily excreted. However, in the majority of studies, it appears to be quite safe.

Multi-Vitamin:

Most research on multivitamins is equivocal. Many foods are now fortified with vitamins and minerals, and large scale deficiencies seem to be pretty rare.

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73 (2010, December 10). Effect of vitamin D supplementation on testosterone levels in ... - NCBI. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/21154195

74 (2014, March 12). Vitamin D3 supplementation during weight loss: a double ... - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3985208/

75 The Role of Vitamin D in Cancer Prevention - NCBI - NIH. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1470481/

76 Vitamin D and cardiovascular disease. - NCBI. Retrieved August 3, 2018, from https://www.ncbi.nlm.nih.gov/pubmed/19601865

However, with competitors who are calorically restricting, it may be more and more difficult to consume sufficient vitamins and minerals across the broad spectrum, especially as food choices become more and more restricted (ie. not getting enough iron due to not consuming red meat in an attempt to limit fat). We won't recommend specific multi-vitamins, and there are a ton of them out there. We will say not to waste your money on multivitamins that have super high doses of the B-vitamins (expensive urine) but don't have the full RDA of things like iron and vitamin D. We would also say focus on a product that uses the more absorbable forms of vitamins and minerals like natural vitamin E (d-alpha tocopherol) versus synthetic (a racemic mixture of vitamins D and l that is less absorbable); vitamin D3; and heme-iron instead of non-heme iron.

Dosing and Frequency: This will depend on the product you choose to buy, but one time per day at breakfast should suffice for most products. There is no evidence that you need to distribute your vitamin and mineral intake throughout the day.

SUMMARY

This list of supplements is not meant to be exhaustive. Some of these supplements may or may not be worth it, and it largely depends on your budget. While something like creatine has a huge amount of scientific data to support it, some of these supplements like boron have relatively little data supporting them. So, if you've got a ton of money and bodybuilding is the most important thing to you, then maybe it makes sense to take every single thing on this list. But if you're on a budget, perhaps it's more prudent to pick up the ones that have large amounts of research supporting them. Just remember: at the end of the day, *they are supplements*. As such, they're used to supplement everything else, so they aren't *needed* to reach your goals.

16

CONCLUSION

When we began writing this book, we didn't completely understand the direction it would take. Books are funny in that way. It's hard to anticipate *exactly* how they will go. As writing progresses, it takes on a life of its own. One idea leads to another, and down the rabbit hole you go. Reading research is much the same way. Reading one study leads you to look up other studies cited by the first study. Then you look up the studies cited by the subsequent studies, and then of course you must go back and look at the authors'' previous works... and down the rabbit hole you goes. Without being too gratuitous to ourselves, we learned a lot while writing this book. We do our best to look at data objectively, and that means doing our best to put biases aside. Some things we thought we'd be able to say we actually couldn't say, and some things we never thought about saying *had* to be said. Now, this book doesn't solve the obesity crisis, because at the end of the day, behaviors are difficult to change. We all know we should stress less, sleep more, exercise more, brush our teeth, exfoliate, meditate, etc, but how many of us do all of the things we're *supposed* to do for optimal health? Probably not many, ourselves included.

The difference between our book and other fat loss books is we acknowledge that obesity is a multifactorial disease with many causes including genetic, physiological, psychological, sociological, and other factors. No other book that we know of has acknowledged these complicated factors. Further, we address what we feel is one of the major gaps in the fat loss literature: acknowledgement of the massive weight regain problem that exists and how to combat it. If we change nothing else but simply get half the number of people who lose weight to *keep it off*, then we would theoretically cut the obesity rate by one-third to

one-half. We aren't talking about trying to get more people to lose weight; we're simply talking about getting half the people who lose weight to keep it off. As simple as that sounds, it's much more difficult in practice. We walked through the complex, redundant, persistent, self-defense system that drives weight regain. However, we also gave many options for how to combat the self-defense system so that you can lose weight and keep it off. What we discovered in our research, however, was that much of what drives adherence, sustainability, and success in fat loss and maintenance varies from individual to individual. It's important that we treat people as individuals. While we do have data on what generally works more often than not, it's important to always consider these data in the context of the individual. We spent a lot of time discussing flexible dieting, because we've found it to be one of the best dieting systems for long-term sustainability. That said, there are some people who hate counting macros and find it far more sustainable to simply eat in a time restricted manner, or restrict carbs, or some other form of restriction. As we presented, the best diet is likely the diet that you can stick to when you consider that the vast majority (>95%) of the benefits of dieting are simply due to the weight loss itself.

Another theme that emerged while we wrote this book was how frustrated and upset we were by the number of self-proclaimed "experts" who prey upon the gullibility, ignorance, and desperation of people to sell quick fixes, fads, and "simple" solutions. Hopefully, after learning more about fat loss and regain physiology, you understand how ridiculous it is to expect a simple solution to such a complex problem. We see it every day on social media. Buzzwords, quick fixes, simple solutions, and quite frankly, it makes us sick. It drove us to really dig into the research as far as we possibly could while still maintaining some semblance of sanity, so that we could lay out the evidence-based recommendations to the best of our ability. We hate bullshit, and people who use bullshit to sell bullshit. At times, we may have come across as negative about things like the ketogenic diet, but not because we hate the ketogenic diet. It's because we generally hate how it's been used by charlatans to sell a quick fix. Generally, we

think the ketogenic diet has some merit; after all, we gave it a chapter to itself. But just "cutting out carbs, bro" is not the answer to the obesity problem. It might be the answer for some people, but certainly not for everyone, and probably not even for the majority of people.

We aren't arrogant enough to presume we know the answer to the obesity problem for every individual. The fact is, there probably is some "solution" for each individual, but finding the right combination of nutrition, behavior modification, etc. for each person is not easy. The more we read, the more we're convinced that the majority of the information purveyed to the general public is relatively unhelpful and often purposefully misleading. Most people major in the minors. Rather than focusing on the major elements that produce sustained weight loss (sustainability, adherence, cognitive restraint, self-monitoring, exercise, etc.), people focus on demonizing individual nutrients, processed foods, and blaming a whole host of far less important variables for the lack of progress in fighting the obesity crisis.

In most cases, misinformation and bullshittery are conveyed by charlatans eager to take your hard-earned money. They really don't care about the effectiveness of their protocols. This is why we did our best to set our biases aside and look into the research to determine what was the most effective fat-loss protocol. What emerged from the data was not a single diet or elimination of a particular nutrient, but rather a series of behaviors that allowed for optimized adherence to whatever nutrition strategy the individual found was most sustainable. People don't fail diets because they ate carbs or fat, or because they didn't get the right ratio of PUFA to SFA, or because they had fructose, or ate after 6 p.m., or any other such nonsense. They failed because they could not sustain or adhere to whatever strategy they were using.

Instead of wasting time demonizing individual nutrients or arguing over "clean" and "dirty" foods, we should focus on what diets people can maintain for a life-

time. We should also understand that the diet will be different for each individual. Some individuals have stumbled upon strategies that work for them and are sustainable, and many of them unknowingly become zealots for their particular strategy. Why? They found it so effective for themselves that they want to promote it to others, so they can help people with similar struggles. While nobel in nature, they often fail to acknowledge individual differences, and that what works for them won't work for everyone. This is why people who've had success on keto can't wait to tell you about keto. People who found that paleo worked for them will talk your ear off about paleo. The list goes on, but you get the gist.

You see, many times zealots mean well. Unfortunately, many of these groups end up fighting with the other. Keto zealots fight with vegan zealots. Clean eaters fight with flexible dieters. Vegans fight with, well, everyone. Each side presents their arguments, claiming to back them up with science while also providing a myriad of testimonials. The unintended side effect of this bickering is that much of the public becomes extremely confused regarding what works, since it appears that everything works and nothing works at the same time. That's because everything *can* work based on the scientific data, as long as people can adhere to their chosen diet and sustain a caloric deficit. For this reason, we tried our best to be intellectually honest when we discussed the effectiveness of various diets. Sure, there are certain advantages to various diets, but all of those pale in comparison to what is sustainable for the duration of someone's life. For example, many people report a complete lack of hunger on the ketogenic diet. This is a great benefit (though mostly anecdotal) and would seem to possibly be a "cure" for the obesity crisis. After all, obesity is caused by overeating, so anything that causes reduced hunger should fix it, right? Not so fast. Many people find that a ketogenic diet is not sustainable simply due to various sociological and psychological factors. Unless you're planning to omit carbs for the rest of your life, it's not likely a long-term solution for you.

Many people have tried to come up with "hacks" and quick fixes to game the system. While some things may feel like hacks to an individual insofar as they make

the process of fat loss easier, there is nothing magical about any of the strategies we have listed in this book. Flexible dieting felt like a hack for us as individuals. We don't mind taking a few minutes out of our day to track what we've eaten so we have the flexibility to choose whatever foods we like within the confines of our macronutrient targets. That is an extremely sustainable method that we can adhere to. It will not be sustainable for everyone. For some people, the process of tracking each macronutrient will be more stressful and require more willpower than another strategy. For these people, they may find it's easier to simply omit carbohydrates (or fats), or practice time-restricted eating, or some other strategy that enables them to create a caloric deficit without feeling like it sucks up all their willpower. As we mentioned earlier, you want to choose the method that requires minimal willpower, since it will be easier to adhere to when life gets stressful, which it invariably will. Just keep in mind that whatever works for *you* as an individual is not going to work for everyone else. What worked for someone else won't work for you. What we can unequivocally say is that this process is not something that you can do with "one easy trick" or with no sacrifice. Every single one of the strategies for weight loss will require some kind of sacrifice and restriction. If you don't want to track your macros, then you will need to restrict food choices, macronutrient choices, amount of time to feed, or some other form of restriction. If you don't want to restrict your food choices, then you'll need to restrict your macros/calories, etc. So if you're looking for the diet plan where you can eat as much as you want of whatever you want as often you want, then you'll be disappointed to learn that doesn't exist for weight loss.

Long term fat loss is very difficult. The people who win at it are the people who develop the appropriate behaviors and mindset to produce lasting results. For those of you who want to lose a lot of weight, this is going to be a hard process. There will be ups, and there will be downs. There will be setbacks and frustration. There will probably even be a few tears. But no matter how difficult this may be, realize that it's *possible*. Say it to yourself: "It's possible." Possible doesn't mean easy. Possible doesn't mean fast. Possible means it has been done

before and it can be done again. No matter how dire you feel your situation is, someone has come from worse and made it to the other side. Even if your metabolism is slow (which in most cases, it isn't), it's still possible. It might take longer and require more sacrifice. That might seem really unfair when John Doe can seemingly eat whatever he wants and stay lean. It isn't fair. Then again, you already knew that life wasn't fair. Some people are born into healthy families with financial means where they're loved and supported and don't have to worry about finances. Others are born into broken homes where they're abused and scrape by with no financial help. Is it fair? Of course not. But some of the most successful people in history have come from *nothing*. Like them, some amazing success stories have been seen with people who have "slow" metabolisms. You may just have to outwork them. More discipline. More restriction. More exercise. It's not fair, but if you want to wait around for life to be fair then I wouldn't be in a rush. The point we're making is that success is possible; it's just very difficult. There is a reason 95% of dieters fail. If this were easy, then we wouldn't have an obesity problem. The difference now is that you have an entire kit of tools at your disposal to lose fat and keep it off.

We would like to thank you for reading our book. This was an enormous undertaking reading through hundreds of scientific studies, talking with experts, and many hours and late nights putting words on paper. We hope you have enjoyed the book, but more than anything, we hope that it helps you. We love selling a ton of books and making money off our hard work, no doubt. But what we love *more* than anything is hearing that our work helped people. There is nothing that brings a bigger smile to our faces then seeing transformation photos... and then diet-after-the-diet transformation photos where people *keep* it off. So please include us on your journey, tag us on social media and let us know how you're doing @biolayne and @peterdbaker.

LAYNE NORTON, PH.D & PETER BAKER

Be tenacious

Be persistent

Be patient

Be consistent

Be committed

NEVER QUIT