

EAT

FOR

ENERGY



**HOW TO BEAT FATIGUE, SUPERCHARGE YOUR
MITOCHONDRIA, AND UNLOCK ALL-DAY ENERGY**

ARI WHITTEN

WITH ALEX LEAF, M.S.

“This is required reading for anyone who wants a scientific road map out of lethargy and into full vitality.”
— Susan Peirce Thompson, Ph.D., *New York Times* best-selling author of *Bright Line Eating*

Praise for *Eat for Energy*

“This book is required reading for anyone who wants a scientific road map out of lethargy and into full vitality. Ari Whitten has been my go-to reference for the true science of the human body for years—there’s no one I trust more. No matter what kind of eating approach you currently follow, this book will give you dozens of new nutrition strategies to fully optimize your energy.”

— **Susan Peirce Thompson, Ph.D.**, *New York Times* best-selling author of *Bright Line Eating*

“Ari Whitten shows us how to activate our own internal energy powerhouses—the mitochondria—to lose fatigue and gain clarity and energy. Ari’s approach is innovative, compassionate, and most of all effective. Whether you’re struggling with chronic fatigue, or simply want a bit more energy, I highly recommend *Eat for Energy*.”

— **Izabella Wentz, PharmD**, *New York Times* best-selling author of *Hashimoto’s Protocol*

“Nutrition is one of the five key foundations for turbocharging your energy production and mitochondrial function. Here is a science-based approach that will expertly guide you on how to do this!”

— **Jacob Teitelbaum, M.D.**, fibromyalgia specialist and author of the best-selling *From Fatigued to Fantastic!*

“If you’re ready to have the energy of a child again and want the most cutting-edge methods to make it a reality, *Eat for Energy* will literally have you bouncing off the walls. Read it. Apply it. And reignite the energy stores within you!”

— **John Assaraf**, *New York Times* best-selling co-author of *The Answer* and CEO of NeuroGym

“In these informative pages, you’ll learn why, how, what, and when to eat. Eating is simple—when done right. And Ari

makes that happen for you.”

— **Dr. Ben Lynch**, best-selling author of *Dirty Genes* and founder of SeekingHealth.com

“Ari has put together an invaluable science-backed resource on achieving optimal health at a cellular level! *Eat for Energy* offers insightful, and comprehensive blueprints that will empower your powerhouse. If you’re sick and tired of feeling sick and tired, this is the book you’ve been waiting for.”

— **David Friedman, N.D., D.C., DACNB**, syndicated TV and radio show host, and international best-selling author of *Food Sanity*

“There are few feelings better than having effortless energy to power through a day of activities. *Eat for Energy* provides an understanding and a plan of action to reboot and regain that energetic life.”

— **Joel Kahn, M.D., FACC**, clinical professor at Wayne State University School of Medicine, author of *The Plant-Based Solution*, founder of the Kahn Center for Cardiac Longevity

“Ari Whitten highlights cutting edge mitochondrial research while busting longstanding myths around fatigue and aging. For anyone seeking accessible and effective approaches based in science that will boost energy, sleep, cognition, and longevity, read this excellent book!”

— **Maya Shetreat, M.D.**, pediatric neurologist, herbalist, and author of *The Dirt Cure*

“Ari provides a systematic road map to burn fat, build muscle, and supplement strategically. This is a compilation of decades of science, synthesized together in a coherent scientific framework of human energy optimization.”

— **Dr. Stephanie Estima**, author of *The Betty Body*

“Packed with practical, evidence-based advice, this book not only helps you understand what is going on in your body but empowers the reader to take what they learned to supercharge their life!”

— **Madiha Saeed, M.D.**, author of *The Holistic Rx* and *The Holistic Rx for Kids*, and creator of *The Holistic Kids' Show* podcast

“Learning how to optimize your child’s mitochondrial function through Ari’s proven approach will lay the foundations to both prevent and reverse chronic disease no matter what stage of health your child is currently in.”

— **Elisa Song, M.D.**, integrative pediatrician and pediatric functional medicine expert, and founder of Healthy Kids Happy Kids

“Ari Whitten has done a masterful job of explaining the mechanisms of energy production and how you can learn to optimize your body’s potential. This is a must-read book for anyone suffering from fatigue.”

— **Datis Kharrzian, Ph.D., DHSc, DC, M.S., MMMSc, FACN**, Harvard Medical School researcher, Associate Clinical Professor at Loma Linda University School of Medicine

“Ari’s book is for everyone who wants to learn and practice the what, when, where, why, and how to nourish oneself for vibrant life energy.”

— **Theodore B. Achacoso, M.D.**, founding pioneer of Health Optimization Medicine and Practice Association and European double-board certified in Anti-Aging Medicine and Nutritional Medicine

“In *Eat for Energy*, Ari Whitten looks at almost a thousand scientific papers to provide you with the science behind the relationship between nutrition, mitochondria, and energy.”

— **Evan H. Hirsch, M.D.**, chronic fatigue specialist, and author of *Fix Your Fatigue*

“Ari touches on imperative topics that are often overlooked, including skeletal muscle and protein. This book contains easy-to-follow science that can be utilized for daily actions to energy and improve body composition.”

— **Dr. Gabrielle Lyon**, founder of the Institute for Muscle-Centric Medicine™

“*Eat for Energy* provides a clear blueprint that will take your life up a level and more. It is practical, informative, and easy to read.”

— **Michael T. Murray, N.D.**, co-author of *Textbook of Natural Medicine*

“As a scientifically trained college holistic nutrition professor, finding adequate nutrition texts for my students has been impossible ... until now. With Ari Whitten’s long-needed *Eat for Energy*, the nutrition world finally has a text that is rooted in scientific honesty.”

— **Lori Valentine Rose, Ph.D.**, CNP, board-certified holistic nutrition consultant, RH (AHG), NBC-HWC, FDN-P, and Hill College life sciences professor

“In a world that is overwhelming us with information, this book distills the most up-to-date and useful scientific data and creates a fully actionable blueprint for people that want to look and feel 20 years younger.”

— **Ben Pakulski**, former Mr. Canada, IFBB pro bodybuilder, and founder of Muscle Intelligence and MI40

“In this comprehensive book, Ari walks you through what causes low energy and how to eat and live to increase energy.”

— **Rajka Milanovic Galbraith, M.D.**

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*To my wife, Marcela, and my kids, Mateo
and Kaia, who inspire me to create a more
beautiful world for them to live in.*

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INTRODUCTION

The Hidden Epidemic

Imagine that every day, for some odd reason, you stabbed yourself in the foot with a fork. Then you went to the hospital and all the doctor did was send you home with painkillers. You're not in pain anymore, but the next day you stab yourself in the foot again, so you go back to the doctor. More painkillers. The next day, the pattern repeats.

The obvious solution is to stop stabbing yourself in the foot rather than use painkillers to suppress the symptom.

It's the same idea with chronic fatigue. Your lack of energy is a symptom of something that is off inside your body, and every day, through the food and lifestyle choices you make, you are stabbing yourself—unintentionally, of course. And rather than simply pushing through the fatigue, or covering it up with stimulants, sugar, or caffeine, the smart solution is to address the underlying factors that control how the human body produces energy.

It isn't your fault that you haven't already been doing that. No one has taught you about the factors controlling human energy levels. No one has shown you the science behind why, and how, to give your body and brain the right nourishment they need. As a result, you're unknowingly making choices that sap you of energy and restrict your cells' ability to properly function. The solution is to learn the science of what controls and regulates your energy levels, so you can stop unknowingly making energy-destroying choices and start doing more of the things that build energy.

Yet, as a culture, we have normalized fatigue.

We think it's normal. Or worse, a badge of honor conferring status, as we even use our level of fatigue and low energy levels to virtue signal to others how important and busy we are. How often do you hear people say, "I'm so exhausted" or "I've just been slammed at work," meaning *I'm so ambitious and I'm such a go-getter, and so important at work that I don't get enough sleep.*

We are exhausted, stressed, burned out, anxious, depressed, and plagued with brain fog, memory loss, and poor concentration. We're constantly borrowing energy from tomorrow to pay for today as we drag ourselves through the day with caffeine, sugar, and stimulants. We have lost the core ingredient necessary to thrive in our relationships, our work, and our lives—energy.

I'm not just talking about people who have been medically diagnosed with chronic fatigue syndrome (or myalgic encephalomyelitis, ME/CFS), the most severe and worst-case scenario that affects about 1.5 percent of the world's population and about 5.4 million adults in the U.S., which is defined as more than six months of severe fatigue, combined with the presence of other symptoms like post-exertional malaise.¹

I'm talking about the true fatigue epidemic that affects 50 to 100 times more people. In fact, fatigue falls on a spectrum running the gamut from the severe, debilitating ME/CFS to the far more common general state of daily low energy levels and lack of vitality that afflicts a huge percentage of the population.

Just how big a problem are we talking about? Consider this:

- In the National Safety Council's Fatigue in the Workplace report,² 76 percent of workers say they feel tired at work, 53 percent feel less productive, 44 percent have trouble focusing, and 27 percent have trouble making decisions because of fatigue.
- Of those who visit doctor's offices, about 40 percent complain of fatigue and one in five have chronic fatigue

syndrome.³

- In probably the largest study to date, which assessed over 1 million adults, one out of three men and one out of two women report being easily fatigued.⁴

Of course, occasionally feeling a little tired or wanting to lie down and rest after a long day of hard physical and mental work is perfectly normal. But having near-constant low energy levels is most definitely not.

That's your body crying for help.

MY FATIGUE STORY

I've spent more than 20 years helping people fix their health problems using lifestyle, nutrition, and targeted supplements. Not only have I witnessed thousands of clients go from their couch to hiking mountains, but I've experienced the transformation myself.

What first inspired my obsession with the science of optimizing human energy was my own debilitating journey through chronic fatigue that no medical expert—conventional or alternative—was able to help me fix.

Years ago, I was a healthy, active, energetic 24-year-old in a brief stint of living and working on a communal farm in Israel when I contracted the Epstein-Barr virus and came down with a severe case of mononucleosis (also known as “glandular fever” or “the kissing disease”). I had no idea that I would spend nearly a year trying to recover my health, well-being, and energy. I went from loving my full-throttle life to being incapable of getting out of bed. My throat became so sore, swollen, and filled with pus that I couldn't eat anything but soup, and I rapidly lost more than 30 pounds of muscle mass. I lost all endurance and stamina to the point that small activities winded me and lost all my resilience such that I needed to lie in bed for 24 hours after even mild physical activity.

Like anyone, I wanted answers and I wanted to get better, so I went to see doctors—people with M.D.s after their names and years of experience. To my shock, no one knew what was causing my conditions. It took multiple doctors and visits to the emergency room before I was finally diagnosed with the Epstein-Barr virus (EBV). At first, I felt relieved knowing what was wreaking havoc on my health, only to quickly discover that the doctors had virtually nothing to offer—no treatments, no real help for people with mono.

Recovery took months, and I was left with severe fatigue that didn't improve. I felt like my life was passing me by, as I was unable to muster enough energy to engage in physical activities I love, like rock climbing, strength training, and surfing. I didn't have the energy to spend time with friends or to be with my girlfriend, or to have any semblance of a social life. And I was unable to do the physically demanding job I had at the time, working in the farm's fish ponds doing intense manual labor (often in over 100 degree heat). It felt like everything in my life was being taken away from me, because I just didn't have the energy to do it.

Unable to live like this or to wait any longer to regain my life, I turned to the alternative health community for help. Instantly, I was diagnosed with adrenal fatigue, and I finally had hope. I became obsessed with the adrenal fatigue hypothesis—the notion that chronic stress wears out our adrenal glands causing them to be unable to produce enough cortisol (a key stress hormone produced by the adrenal glands), resulting in fatigue and all sorts of other symptoms. I read every book and watched every video on the subject, many created by people I considered mentors and experts in natural health and functional medicine.

I was convinced I had adrenal fatigue and that I had a path to healing, but when I mentioned it to my conventional doctors, they brushed it off, telling me there was no such thing as adrenal fatigue and that it was pseudoscience. This frustrated me. *How could they dismiss this serious condition and have no way of helping people like me?* I was determined to prove the Western medical establishment wrong, so I devoted about a year to combing through and analyzing the

full texts of hundreds of published studies, doing nothing day after day but digging through every piece of literature I could find related to fatigue and adrenal function/cortisol, to prove the adrenal fatigue theory.

Except ... I couldn't prove it. Ultimately, I was beyond frustrated to discover that the body of scientific research on this doesn't support the idea that low cortisol or abnormal adrenal function was to blame for chronic fatigue. The vast majority of studies that tested adrenal function (and cortisol levels) in those with chronic fatigue conditions versus normal healthy people found no differences whatsoever in adrenal function or cortisol levels. Even though I didn't want to admit it, the research was clear that adrenal dysfunction and abnormal cortisol levels were not a valid explanation for chronic fatigue, because they were not even present in the vast majority of people with fatigue.

So there I was, stuck, without so much as a shred of hope that anyone had the answers to my chronic fatigue issues. The conventional medical community had nothing to offer me as I was suffering with fatigue, while most of the alternative/functional medical practitioners were still operating in a paradigm of energy that the science clearly did not support.

It was this moment that I realized: virtually no one in the medical establishment had really solved the human energy puzzle.

This revelation changed the course of my life.

After that point, I became utterly *obsessed* with making sense of the science of human energy. For *years*, I wanted to do nothing more than spend all day, every day digging into the scientific literature and piecing together an actual understanding—a true scientific framework—of the *real* factors that regulate and control human energy levels, why people get fatigued, and, most importantly, how to fix it.

This book is an extension of my decades studying, compiling research, and developing programs and protocols

that can help anyone and everyone suffering on the fatigue spectrum regain their energy and life.

WHERE HUMAN ENERGY COMES FROM

Over the last decade, a considerable body of research has been conducted revealing the real cause of fatigue: *mitochondrial dysfunction*.

We have hundreds to thousands of mitochondria inside almost all of the trillions of cells in our body, and they literally produce virtually all the energy that each cell needs to perform its unique function. Mitochondria are often referred to as the “powerhouse of the cell.” You can think of them as the battery or energy generators of our cells. When our mitochondria become dysfunctional or, more accurately, when they *turn down energy production* (for reasons we’ll discuss in depth), then they cannot produce the energy that our cells need to do their jobs. Heart cells can’t effectively pump blood, muscle cells can’t effectively move your body, immune cells can’t effectively fight infection, gut cells can’t effectively digest food, gland cells can’t produce hormones optimally, and neurons can’t effectively power your brain functions.

This lack of efficient cellular energy production results in *you* feeling the symptom of fatigue, or chronically low energy levels.

The great news is that you can do something about it. In the last decade, science has uncovered critically important facets of how mitochondria function to power our cells, which factors shut down their energy production, and how to optimize them to help them regenerate, grow, and even how to build new mitochondria from scratch—thus allowing you to conquer your fatigue.

Eat for Energy is designed to help you better understand the real science behind your fatigue; the role your mitochondria play in producing and enhancing your energy; how your body works to regulate your energy levels; and how you can use nutritional strategies, targeted foods, and powerful supplements and compounds to supercharge your

mitochondria, get rid of your fatigue, and experience all-day energy, every day.

Years ago I joined forces with several top health experts and renowned doctors with a singular goal in mind: to advance our understanding of the causes of fatigue and pioneer new protocols that help people overcome fatigue and live with abundant energy.

After many years of hard work, our team of experts developed a powerful, comprehensive, evidence-based system for energy optimization, *The Energy Blueprint*, which is quickly becoming recognized as the world's top program for people looking to overcome fatigue and increase their energy levels.

Over the last few years, we've reached over 2.5 million people through our free educational articles and podcasts, and over 200,000 people use *The Energy Blueprint* training programs, coaching services, and supplements. Our work provides our clients with hundreds of energy-building strategies and "biohacks," as well as premium energy-enhancing supplements to help them overcome fatigue and get their health, energy, and lives back.

Eat for Energy is the best nutritional wisdom that my team and I have uncovered, systematized, and refined over the last decade with thousands of our clients. In this book, I'll do what I do with all my clients and in all my programs: cut through the pseudoscience to illuminate the real causes of fatigue and how you can rewire your body (and mitochondria) to produce youthful levels of energy once again.

I've divided the book into two parts. [Part I](#) explores the real culprit of fatigue—poor mitochondrial function—and how to fix many of the biggest factors that affect our mitochondria, including:

- Circadian rhythm dysregulation and poor sleep
- Carrying too much body fat and too little muscle mass
- Poor gut and microbiome health

- Blood sugar dysregulation
- Nutritional toxicities and deficiencies
- Neurotransmitter and hormone imbalances

In these chapters, I explain the connection between these stressors and how they affect your mitochondria and energy levels, before diving into numerous diet and nutritional strategies you can use to improve the functioning of these systems, your mitochondria, and your energy.

You are not meant to try all the strategies included in a chapter at once. Instead, I recommend picking one strategy in a chapter, mastering that over a couple of weeks (or longer if needed), and then adding another strategy, mastering that, and then another, and so on. This is called *stacking strategies*. It's the slow and steady approach that allows you to really master new ways of eating for energy.

These chapters will give you a holistic understanding of energy and how every organ and system in your body is connected. It's critical to understand that when it comes to fatigue, issues are never localized. It's never just one thing that's wrong. For example, if you have poor gut or microbiome health, that issue doesn't stay in the gut. We now have thousands of studies on the gut-brain axis, the gut-immune axis, and the gut-mitochondria axis. So a problem in the gut will often quickly turn into brain problems, skin problems, immune problems, or energy problems. And this applies across the board to pretty much all systems of the body. Such is the interconnectedness of the systems of the human body.

Fortunately, this also works in the other direction. By optimizing your nutrition, circadian rhythm, sleep, gut health, body composition, brain health, and, in particular, your mitochondrial health, you can cause a cascade of positive effects that spread throughout all the systems of your body. Just as one example, we know that optimizing your circadian rhythm can simultaneously boost your energy levels, improve your brain function, help prevent cancer, improve exercise

performance, improve your mood, and help you lose fat—all at the same time. This is how the body works—either our inputs are creating downward spirals of negative effects pulling us toward accelerated aging, disease, and fatigue, or positive upward spirals of disease prevention, youthful vitality, resilience, and energy.

Then in [Part II](#), once you've put together an optimal foundation by getting your diet in order, I share specific foods, supplements, and compounds that you can add to the nutritional strategies outlined in the previous chapters to supercharge your mitochondria and increase your energy levels. So even if you're a health science nerd like me who has already spent 25 years studying natural health, and you're already dialed in on your nutrition and other lifestyle habits (exercise, sleep hygiene, circadian rhythm, stress management, hormesis, etc.), you're still going to get a ton of value in [Part II](#) of this book, where you'll get detailed guidance on how to optimize your supplement regimen to build a better brain and higher energy levels.

To be clear, we are not sharing some kind of new hyped-up bizarro diet that we're claiming is the new big thing. We're not sharing any one specific diet at all. We're sharing nutrition principles, strategies, and tactics that can be applied universally and paired with a wide variety of specific dietary choices, from veganism to the Mediterranean diet to paleo to keto. The nutritional strategies in this book are culled almost entirely from controlled interventions in humans and have been scientifically vetted numerous times to support their efficacy. I will be sharing this evidence liberally throughout the book and in the Endnotes because I never want anyone to simply take my word for it.

Most importantly, these powerful, science-based solutions go far beyond the typical advice you will likely get from your doctor or health coach or functional medicine practitioner. When it comes to the health of your mitochondria and overall energy levels, nutrition is arguably the biggest factor in the fatigue epidemic, but if you go to a conventional doctor, they typically won't even ask about your nutrition or consider using it as a tool.

It's also vitally important to know that it's not just an epidemic of fatigue we're dealing with in the Western world. We're also contending with alarming rates of:

- Cancer
- Heart disease
- Neurological diseases like Alzheimer's and Parkinson's
- Diabetes
- Obesity

These are modern lifestyle and civilization diseases, and a whopping 80 percent of the overall disease burden in the United States and throughout the West can be traced to nutrition and lifestyle factors.⁵

With that in mind, you should know that not only will the nutritional strategies in this book help you fix your energy levels but they will significantly reduce your risk for developing dozens of other damaging and deadly chronic diseases. It is not a big leap to say that by getting your nutrition on track, you will likely add years, if not decades, to your life. For many people, it can be the difference between dying from a heart attack at the age of 63 and living relatively healthy to 100 and beyond.

Every day I hear stories from clients who have reached bottom. They have sought help from conventional and alternative medical practitioners, only to be told there was little they could do to fix their energy.

It may sound like I'm trying to bash doctors or that I'm anti-doctors. I'm not. My goal is always to communicate the facts born of the research and studies. And you'd better believe that if I get shot, stabbed, have an acute life-threatening infection, lose a limb, or am faced with several other health scares, I will go to a conventional medical doctor because they do incredible work in these and many other areas.

Unfortunately, when it comes to fatigue and most other “diseases of civilization” caused by nutrition and lifestyle factors (which, again, comprise over 80 percent of the disease burden in the West), with a few exceptions, conventional medicine typically has little to offer.

And when it comes to functional medicine and natural health/wellness practitioners, while many offer us more than the conventional ones, it’s hit or miss whether your physician understands the role that mitochondria play in our energy levels.

But fatigue is not a life sentence.

There is a way out.

Eat for Energy is for anyone suffering on the fatigue spectrum, from full blown and debilitating to a more subtle kind that follows you throughout the day. The strategies you are about to learn can help you maximize your physiology—allowing your body and brain to work as they were designed, so you can live at the peak of your energy, brain function, mood, and health.

Many of my clients find that when they implement these strategies, it’s not just their energy levels that go up, but other trans-formative health benefits occur, such as better sleep; fat loss; lower blood pressure; more stable blood sugar levels; better brain functioning, including memory and concentration; and an increased feeling of motivation, happiness, patience, and being able to connect with their friends and family.

Energy matters.

It’s time for you to live the life of your choosing.

PART I

**RESTORE
YOUR
ENERGY**

CHAPTER 1

MEET YOUR MITOCHONDRIA, YOUR ENERGY GENERATORS AND REGULATORS

When I first met Rea, she appeared to be the picture of health. In her mid-30s, she worked out five times a week, ate a mostly healthy diet rich in whole foods, and limited her sugar and processed carbs. But on the inside, over the last couple of years, her energy levels had steadily plummeted. Every morning, she struggled to get out of bed, despite sleeping for at least seven to eight hours. She didn't "get going" until after her first cup of coffee, and she had to keep guzzling the dark stuff all day. She had been to her primary care physician, but her test results came back normal, and she had spent a small fortune trying different healing modalities, from naturopaths to herbalism, homeopathy to acupuncture, and talk therapy to kinesiology. Nothing worked.

Similarly, my client Neal couldn't shake his anxiety or exhaustion. In his early 50s, Neal shared with me, "My energy levels are so low that I don't want to do anything or be around anyone, not even my wife or kids. I barely sleep four hours at a time, and it's increasingly hard to concentrate at work. Even though I don't want to, I snap at my employees. My anxiety is getting worse, and my doctor wants to increase my medication, but I'm worried. What if nothing helps? What if I keep getting worse? What if there is no getting better?"

A third client, Jasmine, had strong stomach pains, bloating, irregular bowel movements, and an exhaustion that she could never shake. When we met, she shared pages of test results that doctors had run before diagnosing her with irritable bowel syndrome. She had also seen a naturopathic doctor, who had told Jasmine she had adrenal fatigue. Desperate for relief, Jasmine explained that she had tried hormone replacement therapy and integrated de-stressing activities like deep-breathing exercises and gentle yoga, and she had experimented with taking vitamin C, licorice root, and magnesium supplements. While she had noticed some small improvements with each treatment, nothing lasted. A single mother of two young boys, she tearfully confided, “I can live with the low energy and the stomach issues—I’ve had those forever—but my mental capacity feels off now, and that scares me because if I can’t work or if I lose my job, then I can’t provide for my sons.”

Three people, all struggling with fatigue and a multitude of other health conditions that no doctor could explain or treat. On the surface, it may appear they had different illnesses, but deep inside their bodies they shared a common cause.

THE CRUX OF CHRONIC FATIGUE

At the most basic, biological level, fatigue is fundamentally an imbalance between energy supply and energy demand. You have chronically low energy levels when your cells do not get the energy supply they need, or the demands on them are too high—or both. This creates an *energy deficit*, which results in the symptom of fatigue.

While there are many contributing factors to this energy deficit, the single most important thing to understand is that the fatigue story centers around your *mitochondria*.

What are our mitochondria? Well, you might remember them from your biology courses in high school or college as the “powerhouse of the cell.” Within almost *every* cell of our body, we have between 500 to 2,000 mitochondria whose job is to literally make the energy your cells need to work.

Mitochondria take the oxygen you breathe and the food you eat (primarily carbs and fats) to create *adenosine triphosphate (ATP)*, the fuel used to power all cellular and metabolic processes.

Without mitochondria, your cells wouldn't have the ability to create the energy they need to function, meaning no process in the body can happen the way it was designed. It's no stretch to say that without mitochondria there is no life!

Fundamentally, low energy levels are simply the result of a chronic cellular energy deficit. Fatigue is the *symptom* that results when the mitochondria in the trillions of cells that make up your body—your muscles, your hormone-producing glands, your heart, your liver, your brain, etc.—are not producing enough energy to power their functions effectively.

And as we now know through dozens of studies involving people with chronic fatigue or other disease states in which fatigue is commonly present,¹ consistent associations between fatigue syndromes and mitochondrial dysfunction include:

- Deficits in carnitine, which is required to transport fat into mitochondria for use as an energy source
- Deficits in coenzyme Q10 (CoQ10), which is required to produce energy
- Lower concentrations of antioxidants and higher levels of oxidative stress
- Lower rates of ATP (cellular energy) production
- Reduced gene expression in functional pathways for energy production, such as those related to metabolism, protein transport, and mitochondrial morphology

The core idea is that lack of energy at the macro level (you) is caused by lack of energy at the micro level (in the trillions of cells that you are composed of). But the reasons *why* mitochondria fail to produce enough energy—which is critical to understand if you want to increase your energy—is an

extremely complex story that has taken researchers decades to piece together, one that we'll unravel in depth in this book.

The vital questions are: What causes our cells to have a deficit of energy? And why do our mitochondria sometimes fail to produce enough of it?

And the answer is: *signals*.

The quality of mitochondria function is determined by the *signals* that your mitochondria are receiving about their environment—from the things you *do* or *don't do*. The signals from your environment are the critical factors that determine whether your mitochondria are performing at 20 percent or 100 percent of their capacity for energy production.

In the longer term, these signals also tell your cells to either increase or decrease the number and size of your mitochondria, which is a process that heavily affects not only your energy levels, but also your resistance to dozens of diseases, which heavily impacts your aging process and longevity.

If you want to beat fatigue and build a high-energy body, the big key is that you want to give your mitochondria the *signals* that allow them to function at as close to 100 percent of their capacity as possible.

SYMPTOMS OF MITOCHONDRIA BEING SHUT DOWN

- Brain fog
- Chronic inflammation
- Poor detoxification
- Poor stamina
- Poor mental and physical performance
- Chronic fatigue

Mitochondrial shutdown is the fundamental reason for chronic low energy levels.

So what are these environmental signals that are dictating how much energy your mitochondria are producing? To answer that, we must now turn to the work of the brilliant Robert Naviaux, M.D., Ph.D., who has been instrumental in advancing our knowledge of the causes of chronic fatigue, most notably the role of mitochondria in our energy levels.

A few years ago, Dr. Naviaux performed a ground-breaking “metabolomics” study where he and his team looked at over 600 metabolites (products of cell metabolism) from 63 biochemical pathways in people with chronic fatigue and found that, compared to healthy adults, a mind-blowing *80 percent of those metabolites were decreased*,² meaning that there were widespread systemic changes in metabolic function throughout their organs and cells of their whole body.

Interestingly, Dr. Naviaux described this downregulated metabolic state as chemically similar to a peculiar state of physiology called *dauer*, a state that worms enter as a survival mechanism when they are put in extremely harsh or toxic environmental conditions. These worms essentially shut down their metabolism to survive, keeping all their body’s machinery working just enough to stay alive (but not really to function well), with the hope that they can switch on again when in a safer, less toxic environment.

In other words, Dr. Naviaux found that the biochemistry of a person with chronic fatigue suggests that their body is going into a hibernation-like mode and turning down the dial on energy production. Their body is keeping just enough of the machinery on to stay alive and continue functioning, but not enough to actually function with vitality and abundant energy.

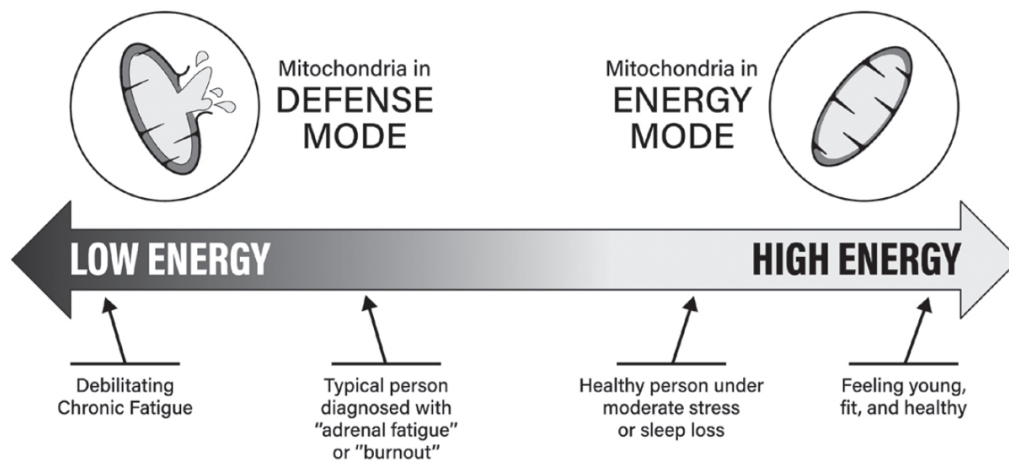
The key takeaway:

Fatigue is a type of survival mechanism that switches on in response to signals that you’re in a harsh environment.

MITOCHONDRIA AND THEIR DUAL ROLE

While mitochondria have long been known as the powerhouses or energy generators of our cells, they are generally talked about as though they are mindlessly taking the fats and carbs we eat and pumping out cellular energy. In reality, it turns out that they are much more than that.

Dr. Naviaux's work has shown that mitochondria actually have a second, newly discovered and critically important function beyond just their role in generating energy: cell defense.



This is a remarkable discovery that has huge implications for our understanding of fatigue.

Dr. Naviaux's recent research has uncovered that our mitochondria are not just energy generators—they are stress sensors *and* cell defenders. Mitochondria play a central role in protecting our cells from harm by initiating what Dr. Naviaux has termed the *cell danger response* (CDR).³ “The cell danger response (CDR) is the evolutionarily conserved metabolic response that protects cells and hosts from harm,” explained Dr. Naviaux. “It is triggered by encounters with chemical, physical, or biological threats that exceed the cellular capacity for homeostasis. The resulting metabolic mismatch between available resources and functional capacity produces a cascade of changes in cellular [function].”⁴

This cascade of cellular changes typically results in symptoms like brain fog, poor mental and physical performance, chronic inflammation, poor detox, and most commonly, *fatigue*. And the newly discovered role of mitochondria in cellular defense actually has an enormous

impact. It is, in fact, *the critical factor* in determining the amount of energy they generate. In Dr. Naviaux's words:

Mitochondria lie at the hub of the wheel of metabolism, coordinating over 500 different chemical reactions as they monitor and regulate the chemical milieu of the cell. It turns out that when mitochondria detect "danger" to the cell, they shift first into a stress mode, then fight mode that takes most of the energy-producing metabolic functions of mitochondria offline... . Energy production and cellular defense are two sides to the same coin... . Mitochondria cannot perform both energy and defense functions at 100% capacity at the same time.⁵

Here is the big key to understanding what controls our energy levels: Our mitochondria perform dual roles—in both energy production and cell defense—and these functions are mutually exclusive. The more your body shifts into defense mode, the more it shifts out of energy mode.

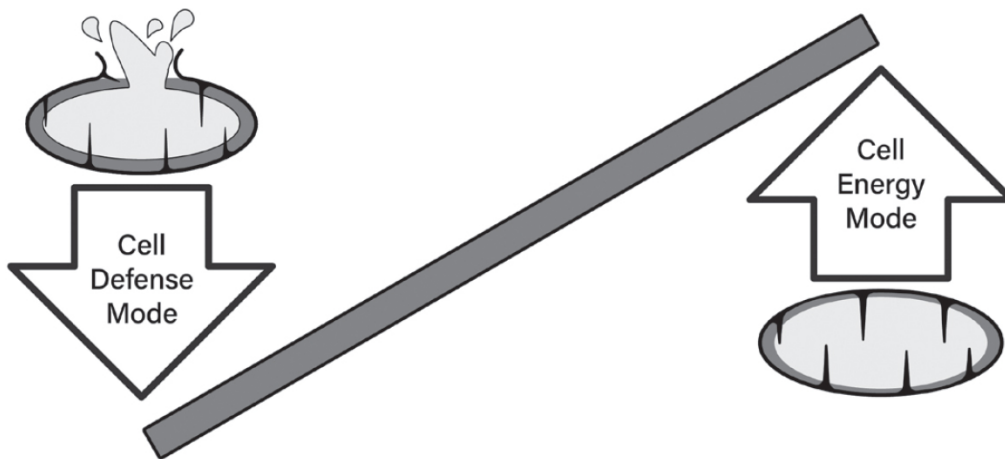
Your mitochondria are exquisitely sensitive environmental sensors that are taking samples and testing your body's status, constantly asking, "Are we in a peaceful and safe environment where we should focus on producing abundant energy, or are we under attack or in a state of stress?"

Think of it like this: Imagine someone threw poisonous gas outside your house. It would be a terrible, lethal mistake to say, "Oh, no big deal, let's just resume function as normal, keep the windows open, and let in the fresh air, and maybe later, we can go for a walk outside." If you kept functioning normally, you'd die. If you want to survive, your immediate reaction needs to be to shut all the doors, close all the windows, and stay inside your house.

And that's exactly what your mitochondria do when they sense a threat.

When mitochondria sense danger, they lock the cells, so that nothing from the outside can get in, and they turn off normal cell functioning (like energy generation). As Dr. Naviaux explained:⁶

All the air we breathe and all the nutrients we eat and drink are ultimately delivered to mitochondria to help us move, think, work, and play. Mitochondria continuously monitor the chemical environment of the cell and instantly respond to danger by changing their activities from healthy function (producing energy) to cellular defense. When cells go to war, they do what nations do when they go to war. When the CDR is activated, cells harden their borders, don't trust their neighbors, and restrict the exchange of resources with their neighbors.



Remember, the more your mitochondria shift into the cell danger response, the more they shift out of energy production mode. And the more your mitochondria operate in cell defense, the worse you will feel.

Keep in mind, this is not black or white, where either you have youthful high energy levels or debilitating chronic fatigue syndrome. This is not an on-off switch—it's a dimmer switch. So the more that mitochondria are getting the right inputs, the more they operate in "peacetime metabolism," where they invest most of their resources into producing abundant energy. And to the extent that they are detecting threats, they pull back energy production and shift most of their efforts to cellular defense, or "wartime metabolism," which causes fatigue, either to a slight or severe degree.

How do mitochondria decide whether to produce lots of energy or shut down energy production? Simple: in response to what kind of environment they perceive themselves to be in.

If all of this seems abstract to you, let me ground this in your own personal experience so it makes more sense. Just think for a moment about the last time you got an infection like a severe flu or cold and felt really sick. What was one of the key symptoms? Probably fatigue.

Remember how your body felt really tired and like you had a lot less energy than you do normally? These are classic signs of your body engaging the cell danger response. The reason why you feel you have less energy is because your body has literally shut down a large portion of your body's energy-producing machinery.

This simple everyday phenomenon is actually the key to understanding fatigue.

In response to stress or danger signals (a harsh environment), the body survives better by lowering the dimmer switch on energy production and shifting resources toward cell defense. Seen in this context, we can quickly realize that fatigue is actually a powerful, adaptive, and intelligent survival mechanism in the context of a harsh environment. It's also an intelligent and adaptive response during times of excessive stress, overexertion, and when energy demands are beyond the body's ability to sustain, because it helps decrease the tendency to continue to overwork oneself, and helps shift bodily resources toward healing, defense, recovery, and cell regeneration.

When you're sick, overly stressed, or in an overexerted and sleep-deprived state, it's not pathological to be fatigued—it's *the natural result* of your body's efforts to shift its focus to healing and regeneration to get itself back to health.

This is fundamentally what fatigue is: your energy declines to the degree that your cells are being forced to defend against threats.

So if you want to know why you're fatigued and how to fix it, here's the key to etch into your mind:

Your energy levels are ultimately a reflection of what kind of environment your mitochondria perceive themselves to be in.

Thus the central goal of overcoming fatigue and getting your energy back is to give your mitochondria the right signals so they feel safe enough to turn energy production back on.

This requires us to first understand and identify the factors in our environment and lifestyle that are sending these signals to our mitochondria, so that we can fix the bad ones and increase the good ones.

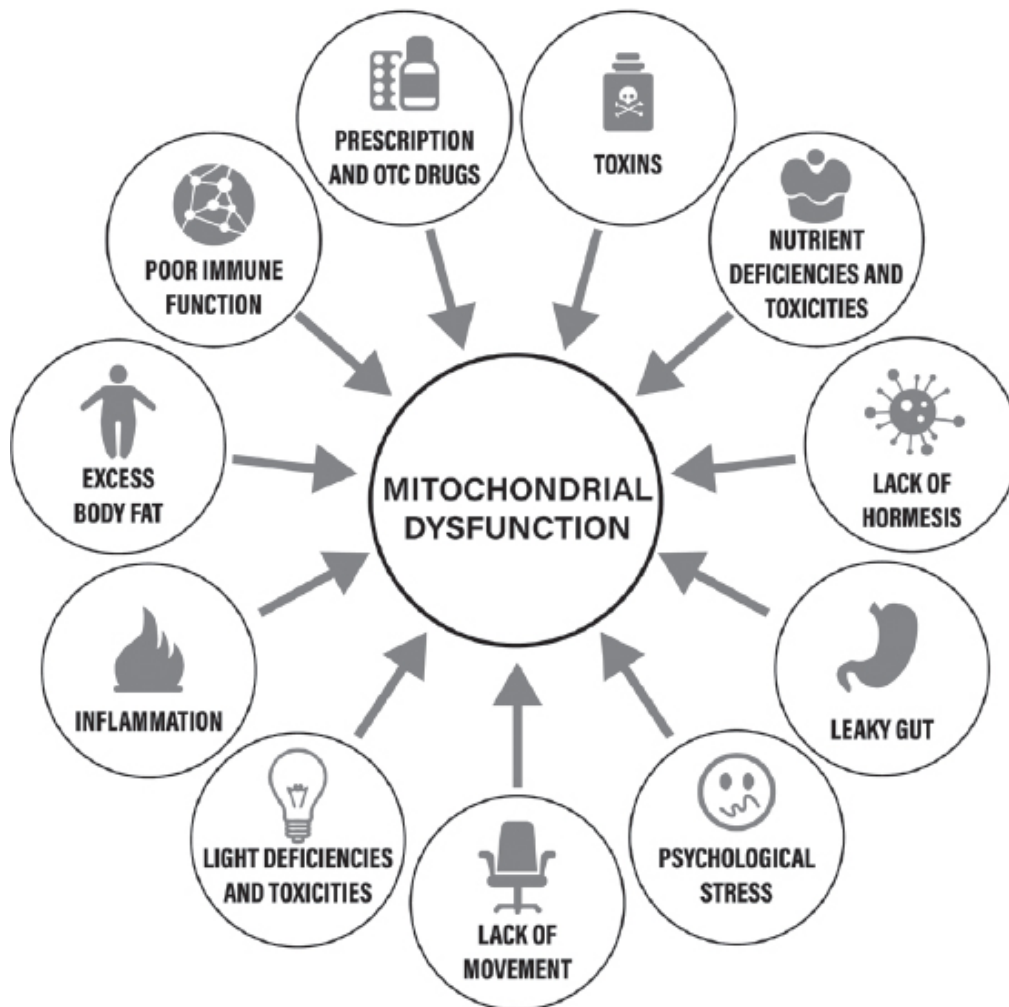
As you go about your daily life, take the time to ask yourself: *Are my mitochondria switched into high-energy mode or cell defense? And will this food choice enhance or deplete my mitochondria and energy levels?* By asking these questions, you will increase your awareness and ability to tune in to your body, which brings you and your actions around food into alignment with what your mitochondria need for your body to thrive.

THE CELL DANGER RESPONSE

Mitochondria are like the canary in the coal mine, as they are extraordinarily sensitive to virtually every type of threat, danger, or biological stressor you can imagine, including:

- Infections caused by viruses and bacteria
- Toxins like heavy metals, pesticides, and thousands of others
- Excess body fat
- Poor gut health like dysbiosis and/or leaky gut
- Physical injury or tissue damage (e.g., sunburns)
- Sleep deprivation and circadian rhythm disruption
- Psychological and emotional stress and trauma
- Nutrient deficiencies
- Overexertion and overexercising

- Poor diet



How can mitochondria possibly be able to detect such a wide variety of different types of stressors?

The answer lies in the fact that virtually every type of stressor ultimately converges into just a few cellular mechanisms of harm—mostly inflammation, oxidative stress, and cellular damage. Virtually every type of stressor stresses or damages our cells through one or more of these pathways. For example, poor diet, poor microbiome health, sleep deprivation, overexercising, carrying excess body fat, and being exposed to mercury can all lead to increased levels of inflammation. Inflammatory cytokines, the molecules of inflammation in our body, can be *directly sensed* by mitochondria, which interpret them as a “danger signal.” Oxidative stress is basically the opposite of antioxidants,

where oxidants or “free radicals” in the cells increase to excessive levels and cause damage to the cell.

Most biological stressors lead to oxidative stress. This oxidative stress can also be directly sensed by our mitochondria.

When cells are damaged, they leak certain compounds into the bloodstream that act as “danger signals” that can be directly sensed by mitochondria in other cells. The presence of these molecules signals that the body is being stressed or damaged and are what really drive the mitochondria to engage the CDR—to switch out of energy mode into defense mode.

Regardless of whether the stressor is poor diet, exposure to toxins like mercury or arsenic, sleep deprivation, excess body fat, circadian rhythm disruption, high blood sugar, psychological stress, or anything else, these stressors are translated in the body into increased levels of inflammatory cytokines, increased oxidative stress, and markers of cellular damage. In turn, the mitochondria shift more into defense mode and turn down the dial on energy production.

This is the fundamental cause of your fatigue.

To get more energy, you must *decrease* the threats by decreasing the stressors sending danger signals to your mitochondria.

You can take the most expensive drugs and undergo the fanciest medical treatments in the world, but if you don’t put in the time and energy to eliminate or significantly reduce the CDR triggers in your environment and lifestyle, your efforts are not likely to get you very far.

NUTRITION TO THE RESCUE

Starting with nutrition and creating new strategies were the foundation I used to help Rea, Neal, and Jasmine overcome their exhaustion. Like I do with all my clients, I encouraged them to focus for four to six weeks on revamping their diets by picking one stressor and beginning the work of eliminating its negative effects. For Rea, we focused on getting her circadian

rhythm regulated. This included having her eat more of her calories earlier in the day, consuming her food within a 10- to 12-hour window, and stopping her caffeine consumption by noon. Within three weeks, Rea noticed she was sleeping for longer periods, fell asleep faster, and felt more energetic.

She then went to work on her brain functioning, adding fish or seafood twice a week to her diet, and incorporating one to two servings of berries and two to four of leafy green vegetables into her daily diet. After another three weeks, Rea reported her sleep had improved further, she could concentrate for longer periods, and her energy was steadily improving.

For Neal, we started with his body composition, working to reduce his body fat and increase his lean muscle mass. Neal had about 80 pounds of fat mass to lose, so we focused on increasing his protein intake, making sure he ate at least 30 grams with every meal and/or snack. And he had to eat two meals per day that were prepared from scratch and/or contained only minimally processed ingredients that he could find in nature.

Initially Neal didn't believe body composition was the solution, but I encouraged him to try eating this way for just two weeks, keeping track of his energy and moods. To his surprise, not only did he lose 10 pounds in those weeks but he also reported feeling less tired, irritable, and anxious. That two-week sprint gave him the confidence to go for another two weeks, using the same strategies and adding another: consuming more fibrous vegetables with one to two meals per day. When we met at the six-week mark, Neal had lost a little over 20 pounds and was feeling better than he had in years. We talked about increasing his protein intake per meal to 35 to 40 grams and gradually adding strategies to improve his sleep, such as closing his window of eating, and increasing meal consistency and decreasing frequency.

As I had with Rea and Neal, I suggested that Jasmine pick the stressor that produced other uncomfortable conditions. For her, that meant focusing on her gut health. Because it had plagued Jasmine for so long, we started by slowly repopulating her gut with natural probiotics that she consumed

with one meal per day, and she experimented with the supplement glutamine, taking 15 grams per day. These were the only strategies she used for four weeks. Jasmine reported moderate improvements, so we added more strategies, including consuming cooked and cooled starches at one or more meals per day, and consuming fibrous vegetables with two meals per day.

Jasmine used these strategies for another four weeks. By the two-month mark, she reported more noticeable improvements. It still was not 100 percent, but her energy was headed in the right direction and her gut health and bowel movements seemed to stabilize. Because gut health can take time to fix, she continued working on her gut for another month before we moved on to tackling her next stressor, brain health.

Rea, Neal, and Jasmine all noticed marked improvements simply by working to reduce one stressor at a time and using one or two nutritional strategies for two to four weeks before adding other strategies or moving on to tackle another stressor.

What Rea, Neal, and Jasmine have experienced is what I want for you too.

Thankfully, you can address the most common CDR triggers using nutrition alone.

Every day, what you eat is either an opportunity to nourish your mitochondria or hurt them, and to give them signals that either sabotage or build your energy levels. Without the right nutritional strategies, you will not have the right foundation to generate the energy you need to live the life of your choosing.

This entire book takes you through the most common CDR triggers and the key nutritional strategies you can use today to enhance your energy.

Circadian dysregulation and sleep disruption, carrying too much body fat and too little muscle mass, poor gut health and dysbiosis and leaky gut, insulin resistance and blood sugar dysregulation, poor neuron functioning, key hormone and neurotransmitter imbalances, and nutrient toxicities and deficiencies are CDR triggers intimately tied to mitochondrial health and energy levels. It is through each of these that your

diet can improve your vitality. As we go through each chapter, I'll talk about how different triggers relate to your mitochondria and how you can use nutrition and targeted supplementation to lessen the stressors and to heal and build more and stronger mitochondria.

I want to encourage you to embrace a new perspective on your fatigue. It's easy to feel frustrated with our bodies, to get impatient, and to beat up on ourselves when we lack energy. It's easy to start hating the fatigue and wanting to "fight against it." We tend to harshly judge ourselves—whether it's conscious or not.

Here's the thing: Most of us aren't taught how to optimize our energy. We haven't been taught the factors that go into enhancing our energy levels. Most doctors in the conventional medicine world don't talk about mitochondria, and it's hit or miss in the functional medicine field too.

I invite you to go easy on yourself. Right now, that is all that matters. What you decide to do with the information in this book is what counts.

And that fatigue that's "plagued" you? Instead of hating it, what if you saw it for the amazing survival mechanism that it was designed to be? Because that fatigue is the by-product of your mitochondria working hard to keep your cells and all your organs and muscles *alive* in the midst of a toxic environment that's bursting with threats and stressors. Try thanking and honoring your mitochondria for doing their job, for keeping you safe, for alerting you to the danger that you've been living under.

You can fix the signals.

You can reduce the threats and stressors to the point where your mitochondria deem it's safe to turn on energy production again and dial back the CDR.

You can build and strengthen your mitochondria, and even create more of them from scratch via a process called mitochondrial biogenesis, so that when a threat comes knocking again—because it will—they are strong, resilient, and energetic enough to handle it.

CHAPTER 2

REWIRING YOUR ENERGY CLOCK

Megan fought back tears. She never felt rested, and at 43, she thought she was failing everyone.

“I can’t remember the last time I had a good night’s sleep,” she admitted during our first coaching session. Megan had tried all kinds of sleep hygiene hacks. She used blackout shades on her bedroom windows, diligently shut off screens an hour before bed, and spent 15 to 20 minutes journaling, meditating, or sitting quietly before turning in.

Nothing seemed to work.

Every morning when her alarm buzzed at 5:45 A.M., she had to drag herself from bed having logged maybe five hours of sleep. She didn’t have the energy or patience for her three kids. Her brain felt foggy, her memory suffered, and she struggled to stay alert—all problems that made her job as a paralegal more stressful and difficult. Megan also didn’t feel connected to her husband, but she didn’t have the energy to work on their relationship.

“I feel like there’s something deeply wrong with me and that I’ll never fix it,” Megan said to me.

UNLOCKING THE MYSTERIES OF YOUR CIRCADIAN RHYTHM

In the Western world, especially in the United States, we have a sleep problem.

According to the American Academy of Sleep Medicine and the Sleep Research Society, we need seven to eight hours of sleep per night. Anything less is bad for our health and linked to worse cardiovascular, metabolic, and mental health; decreased immune function and physical performance; and pain. It also increases the risks of dying.¹

But nearly 30 percent of American adults sleep less than six hours per night.² That's over 75 million adults. One in three adults also complain of difficulty falling asleep, difficulty staying asleep, or not getting restorative sleep.³ Sleeping has become such a challenge that 20 percent of Americans take at least one medication to help them sleep.⁴

It's not that people don't want to sleep; it's that they can't. And the reason is that they suffer from a dysfunction in their biological clocks also known as *circadian rhythm dysregulation*.

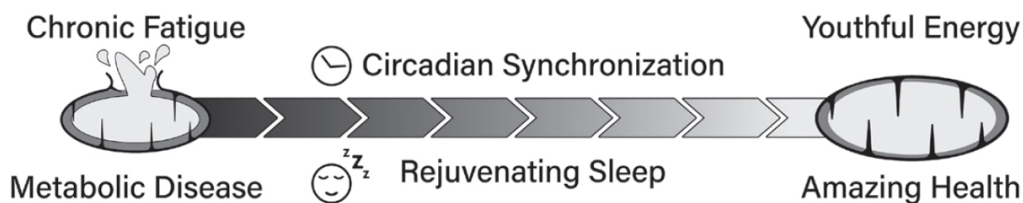
Your circadian rhythm is the key to enjoying a healthy and vibrant life. A large and rapidly growing body of research has discovered that the circadian rhythm is a key controller of mood, motivation, body fat, metabolism, hormonal rhythms, neurotransmitter balance, cellular regeneration, sleep quality, and the health of your mitochondria—all of which have a huge impact on your energy.

An optimized circadian rhythm means that you experience:

- Deep and undisturbed sleep (no midnight wakeups or tossing and turning)
- No insomnia
- A quiet and peaceful mind
- Improved mood
- Better brain function, including clarity, focus, and creativity

- Reduced risk of heart disease, diabetes, and cancer
- Bursts of energy and increased levels of energy all day

Many of my clients who live with disrupted circadian rhythms often suffer from other illnesses that make their fatigue worse. Circadian dysregulation is possibly one of the best-researched causes of modern chronic disease, so much so that an international team of researchers has proposed changing the term *metabolic syndrome*—which is a group of conditions including high blood pressure, high blood lipids, high blood sugar, and excess body fat—to *circadian syndrome*.⁵



Studies have also revealed that some of the most common health conditions have clear circadian links too, including:

- Obesity⁶
- Type 2 diabetes⁷
- Cardiovascular diseases^{8,9}
- Neurodegenerative diseases^{10,11}
- Psychiatric disorders^{12,13}
- Chronic, low-grade inflammation¹⁴
- Oxidative stress¹⁵
- Mitochondrial dysfunction¹⁶
- Cancer¹⁷

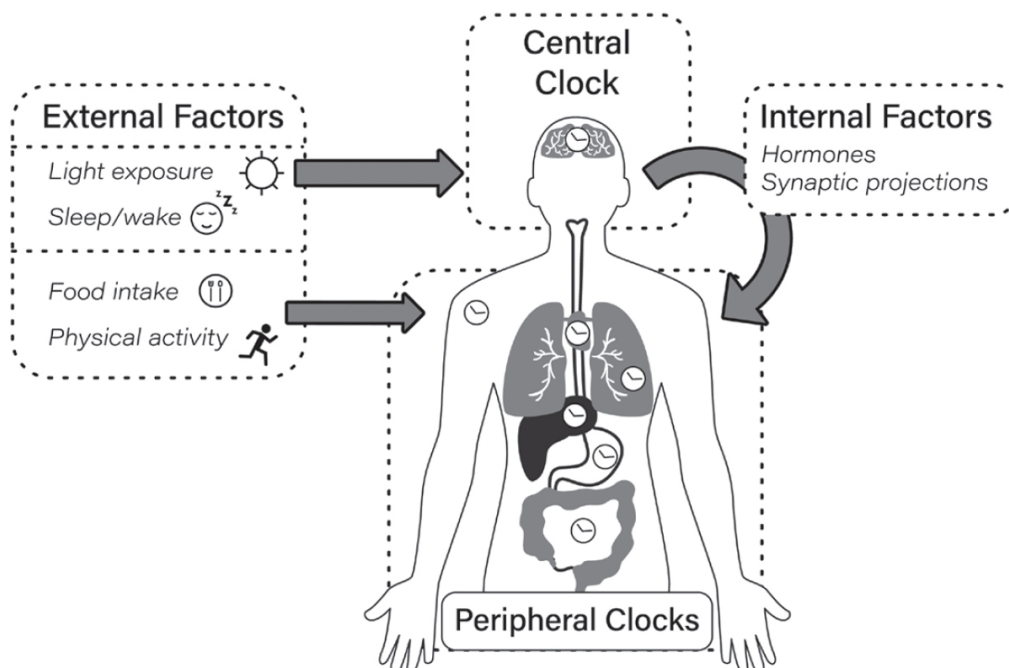
To understand how your circadian rhythm may have become disrupted, we must go back in time. The world may

look vastly different from the one our grandparents and great-great-grandparents lived in, but one thing has remained constant: every 24 hours, the sun rises and sets.

While modern living may have caused us to forget our connection to the 24-hour sun cycle, our biology hasn't. The sun rising and falling cues a symphony of hormonal, neuronal, and behavioral responses that govern our metabolism and appetite, stress levels, risks of developing a disease, aging, sleep/wake cycles, and energy levels.

The link between the outer world of light and darkness and the inner world of our biochemistry is our circadian clock or circadian rhythm. Our circadian rhythm consists of two parts:¹⁸

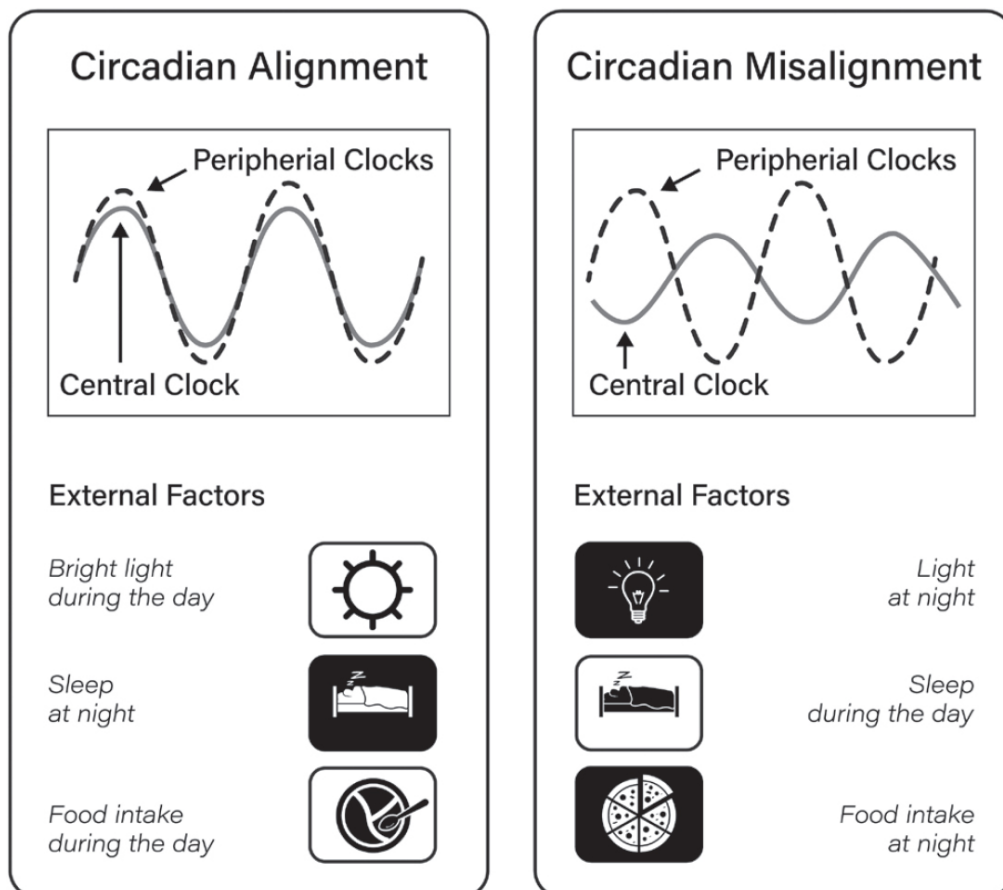
- **Brain clock.** This is the master clock located in the suprachiasmatic nucleus of the hypothalamus that picks up external signals from our environment and coordinates our body's responses via hormones and neurotransmitters.
- **Body clocks.** These are clocks in our tissues, organs, fat cells, gastrointestinal tract, and muscle tissue that regulate processes occurring at the cellular level.



Our brain and body clocks work together to synchronize our biology to the external world through a process called *entrainment*. Much as we set the hands of a watch to establish its time, our biological clocks are set, or entrained, by external or environmental factors called *zeitgebers* (German for “time givers”). Some of the most powerful *zeitgebers* include light, temperature, physical activity, drinking, and eating.

The *zeitgebers* affect different clocks. Light, for example, is a potent *zeitgeber* of the central clock in the brain, but it has no effect on other clocks like the skin.¹⁹ Similarly, eating is a strong *zeitgeber* for digestive organs like the liver and pancreas, but it has a lesser effect on the master clock.²⁰

Despite the different effects, our brain clock and body clocks constantly communicate with each other. And it’s this constant communication between our brain clock and body clocks that creates our circadian system, which oversees our sleep/wake cycles and energy levels. In fact, sleep and energy are two sides of a coin connected via the circadian system.²¹ Our circadian rhythms are the primary determinant of how well we sleep, controlling how much sleep we get, its quality, and what kind of cellular regeneration processes happen—or don’t—because of how deeply we sleep.



Our challenge is that we live in a world fundamentally mismatched to the signals that our brain clock and body clocks were designed for. Biologically, the human body is designed to live in tune with the rising and setting of the sun. We're designed to wake at dawn and to sleep at night. We're not designed to be indoors almost all day and then to stare at different artificial light sources after the sun sets. We're designed to eat early in the day when the sun is high and to stop as it gets dark for a fasting cycle, not to consume big meals or snack into the night.

Divorcing our lives from the natural 24-hour light/dark cycle sends the wrong signals to our brain clock and body clocks, causing them to become misaligned and resulting in *circadian dysregulation*. Circadian dysregulation leads to poor sleep; your body doesn't know when to shut down and go into rest mode or when to stay pumped with energy to remain alert and awake. But poor sleep also leads to circadian dysregulation so, very quickly, this becomes a vicious cycle

where the two play off each other, driving us more deeply into a pit of daily fatigue and suffering.

THE CIRCADIAN RHYTHM–MITOCHONDRIA LINK

When our brain clock and body clocks get out of sync and we battle a dysregulated circadian rhythm, it's depleting our energy levels in specific biological and cellular ways.

Weakened Mitochondria

Our circadian rhythm plays a vital role in keeping our energy producers—our mitochondria—healthy and strong. In fact, studies show that circadian dysregulation and poor-quality sleep directly contribute to fatigue by causing mitochondrial dysfunction.²²

In a study on genetically identical twins, researchers found that the twin who got less than seven hours of sleep per night and who reported worse sleep quality had significantly fewer mitochondria than the twin who slept more than seven hours and who enjoyed quality sleep.²³

Not only do circadian rhythms impact mitochondrial function but mitochondrial function impacts circadian rhythms in a metabolic cross talk. That is, circadian dysregulation and mitochondrial function can be addressed at each end of the spectrum. As one improves, the other will as well. This is how we turn spirals of poor sleep and low energy levels into deep sleep and high energy levels.

Our mitochondria also have their own daily rhythms that rely on their own circadian rhythm to regulate, including oxygen consumption and energy production. When that's disrupted, our mitochondria can't perform to their optimal levels. In studies where mice were genetically altered to lack key circadian genes, researchers discovered extensive damage to mitochondria that negatively affected their functioning including:

- Reduced oxygen consumption and energy production^{24,25,26,27,28}
- Less fat oxidization and usage as an energy source²⁹
- Less pronounced and fragmented changes in morphology^{30,31,32}
- Disrupted mitochondrial protein acetylation³³
- Increased oxidative stress within mitochondria³⁴
- Less mitochondrial resilience to oxidative stress-induced damage³⁵
- Impaired mitochondrial autophagy, called *mitophagy*³⁶



Disrupted Circadian Rhythm



Blunted Diurnal Cycling of Anabolism and Catabolism



Impaired Mitophagy



Low Energy and Lifespan



Optimal Circadian Rhythm



Optimal Diurnal Cycling of Anabolism and Catabolism



Enhanced Mitophagy



High Energy and Lifespan

While all mitochondria impairments can wreck energy levels, mitophagy deserves special attention.

Mitophagy evolved as a key mechanism for keeping a healthy pool of mitochondria in our cells, by eliminating mitochondria that are damaged and dysfunctional,³⁷ then regenerating more mitochondria from the healthier, stronger ones. Mitophagy is necessary to prevent the accumulation of old and damaged mitochondria that contribute to oxidative stress, crushed energy levels, and metabolic disease.

As you might guess, mitophagy takes place during sleep. And if you don't get enough sleep, your body cannot get rid of the damaged mitochondria, and then you're functioning today on yesterday's poorly functioning and damaged mitochondria. And if that trend continues over months and years, chronically low energy is the unsurprising and logical result.

Reduced Melatonin

Melatonin is commonly called *the sleep hormone* because it helps us do just that. When there is minimal or no light, our master clock in the brain picks up the lack of blue light waves and sends a message to the pineal gland (also in the brain) to secrete melatonin.

Staying up late and spending less time sleeping result in less time for our brain and body to be bathed in melatonin. But even more importantly, a disrupted circadian rhythm can also profoundly suppress our body's production of melatonin at night, by upward of 70 percent! Besides being a "sleep hormone," melatonin is also a powerful *energy hormone*: not in the sense of providing an immediate energy boost when it's present, but indirectly because it is arguably the most important hormone when it comes to mitochondrial health. Melatonin has antioxidant properties that help protect our mitochondria from oxidants and the highly toxic free radicals,³⁸ which, when in excess, damage our mitochondria, eventually leading to decreased energy production.

To keep our mitochondria healthy and our cells functioning, our bodies eliminate free radicals through the use of antioxidants like vitamin C and glutathione and minerals including zinc and copper. But while most antioxidants can only neutralize one free radical at a time, melatonin can simultaneously neutralize multiple free radicals and works synergistically when combined with other antioxidants.^{39,40} Plus, if a melatonin is lost to a free radical, then three other antioxidants will emerge to take its place.⁴¹

Amazingly enough, melatonin also increases the production and activity of other antioxidant enzymes like glutathione

peroxidase, superoxide dismutase, and catalase.⁴² It also has the special ability to easily pass through cell membranes and reach inside our mitochondria to provide antioxidant protection to the mitochondria, even more than vitamin E and vitamin C.⁴³ Furthermore, melatonin is as good as, or better than, fabricated antioxidants in protecting against mitochondrial oxidative stress.^{44,45} These factors and more⁴⁶ have led some researchers to call melatonin the true mitochondrial-targeted antioxidant.^{47,48,49}

Hindering Toxic Cleanup in the Brain

Every day, your brain produces toxic waste products from normal processes like thinking and coordinating bodily movements. Deep sleep allows your brain to clean and clear itself of these waste products using a process called *glymphatic drainage*.⁵⁰ The depth and quality of your sleep is vital to allowing the glymphatic system to work efficiently.

When circadian dysregulation and sleep disruption prevent our glymphatic system from properly functioning,⁵¹ these toxins accumulate in our brain, which can lead to neuroinflammation, a known cause of chronically low energy levels.⁵² Toxins also directly and indirectly shut down energy production by our mitochondria.

Hormonal Dysregulation

A dysregulated circadian rhythm invariably leads to hormonal havoc. That's a huge problem since hormones are directly and indirectly involved in energy production. For example, your *thyroid hormone* is essential for metabolism, heat production, and growth. Some of the most common and debilitating symptoms of having an underactive thyroid gland (hypothyroidism) are chronic fatigue, body aches and weakness, weight gain, chills, and constipation.

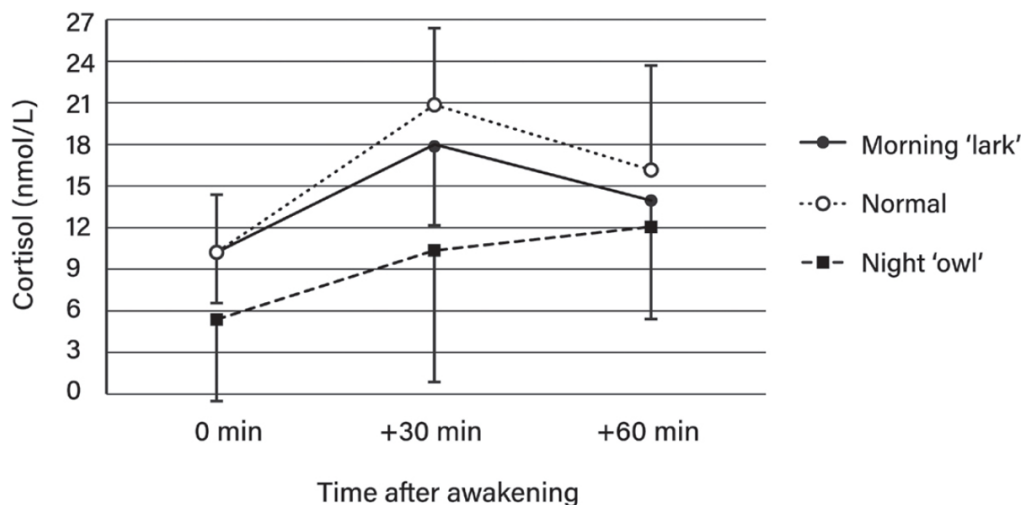
We've known for decades that thyroid hormone metabolism exhibits a circadian rhythm, with the lowest levels occurring during the day and the highest levels at night.^{53,54} Yet this natural oscillation from low to high gets demolished by sleep

disruption.⁵⁵ That's not good for your metabolism or your energy.

Circadian disruptions also impact the release of *human growth hormone*, which is critical for releasing energy reserves in fat and glycogen and promoting cellular growth and healing. Human growth hormone increases significantly during slow-wave (deep) sleep compared with light and REM (Rapid Eye Movement) sleep,⁵⁶ so if you struggle to get into deep sleep, your growth hormone levels will be lower, which can contribute to lower energy levels. In fact, adults with chronic fatigue syndrome only release half the growth hormone that non-fatigued adults do.⁵⁷

Finally, there is *cortisol*, a stress hormone that peaks each morning to get us up and going. While the majority of chronic psychological and physical stressors do not cause any detectable decrease in cortisol levels, even when present for several decades,⁵⁸ there is no doubt that having blunted cortisol levels or chronically elevated cortisol levels causes fatigue, either through not transmitting its signal (too low levels) or causing the body to become habituated to its signal (too high levels).⁵⁹

This is where things get interesting for you night owls. Several studies have shown that staying up late and sleeping in can cause morning cortisol levels to be reduced massively below normal.^{60,61,62,63}



Several studies have also shown that disrupted and poor-quality sleep will cause a lower peak in morning cortisol,^{64,65,66} one of which showed a dramatic 24 to 43 percent reduction,⁶⁷ enough to get one diagnosed with “adrenal fatigue.”

CIRCADIAN RHYTHM REBOOT

It takes effort and intention to take control of our environment and behaviors to bring our brain clock and body clocks back in sync and as close to the natural 24-hour light/dark cycle as we can. Sleep hygiene, like using blackout curtains to keep the bedroom dark, taking a hot shower or bath an hour before sleep to jump-start a temperature change in our body, shutting off devices and screens an hour before bed or using blue (and green) light-blocking glasses, or journaling or meditating for 20 minutes before bed can profoundly help rewire our clocks and reset our circadian rhythm.

So can nutrition.

With Megan, I wanted her to continue her sleep hygiene habits: using blackout shades, turning off screens at least one hour before bed, journaling or meditating for 20 minutes before sleeping, and taking a warm shower or bath at night. While those alone weren't enough to get Megan's sleep on track, I knew that if we layered on a few nutritional strategies, we could help her overcome her insomnia, rewire her clocks to reset her circadian rhythm, get her body into rest-and-regeneration mode at night, and ultimately give her the unlimited energy she needed, wanted, and deserved.

Use Chrono-Nutrition

The primary way our diet impacts our circadian clocks isn't so much through what we eat; it's through when we eat. Chrono-nutrition studies how eating relates to our circadian rhythm, and it involves four main strategies.⁶⁸

1. Window of eating

2. Clock time of eating
3. Stacking more calories earlier in the day
4. Consistency of eating

1. Window of Eating

Every human (and animal, for that matter) alternates between feeding and fasting, and these cycles are dominant synchronizing signals for our peripheral clocks.

In the Western world, we've been taught that we need to eat three meals per day: breakfast, lunch, and dinner. You may also hear recommendations to add in a snack or two in the midmorning and afternoon, leading to the societal norm of eating five to six times per day.

When the U.S. government asked over 62,000 adults about their eating habits, 60 percent said they ate three meals per day, while 90 percent said they eat at least one snack per day and 67 percent said they eat two or more snacks per day.⁶⁹ However, when Satchin Panda, Ph.D., an expert in the field of circadian rhythm research and the author of *The Circadian Code*, studied this issue, he found some surprising results. For three weeks Panda had adults use a smartphone app to track their food intake. He found that the least frequent eaters ate an average of 3.3 times per day, while the most frequent eaters ate on average a whopping 10.5 times per day.⁷⁰

Most importantly, less than 10 percent of the participants in Panda's study ate all their food within a 12-hour window, and a staggering 85 percent had a window of eating (the time from your first to your last bite of food) of a whopping 13 to 16 hours per day.

This means that the body clocks in your organs, tissues, and muscles are constantly getting signals to stay active and digest food. Let's imagine that you start eating at 7:00 A.M. and you continue until shortly before bed at 11 P.M. Remember that your body clocks constantly communicate with our brain

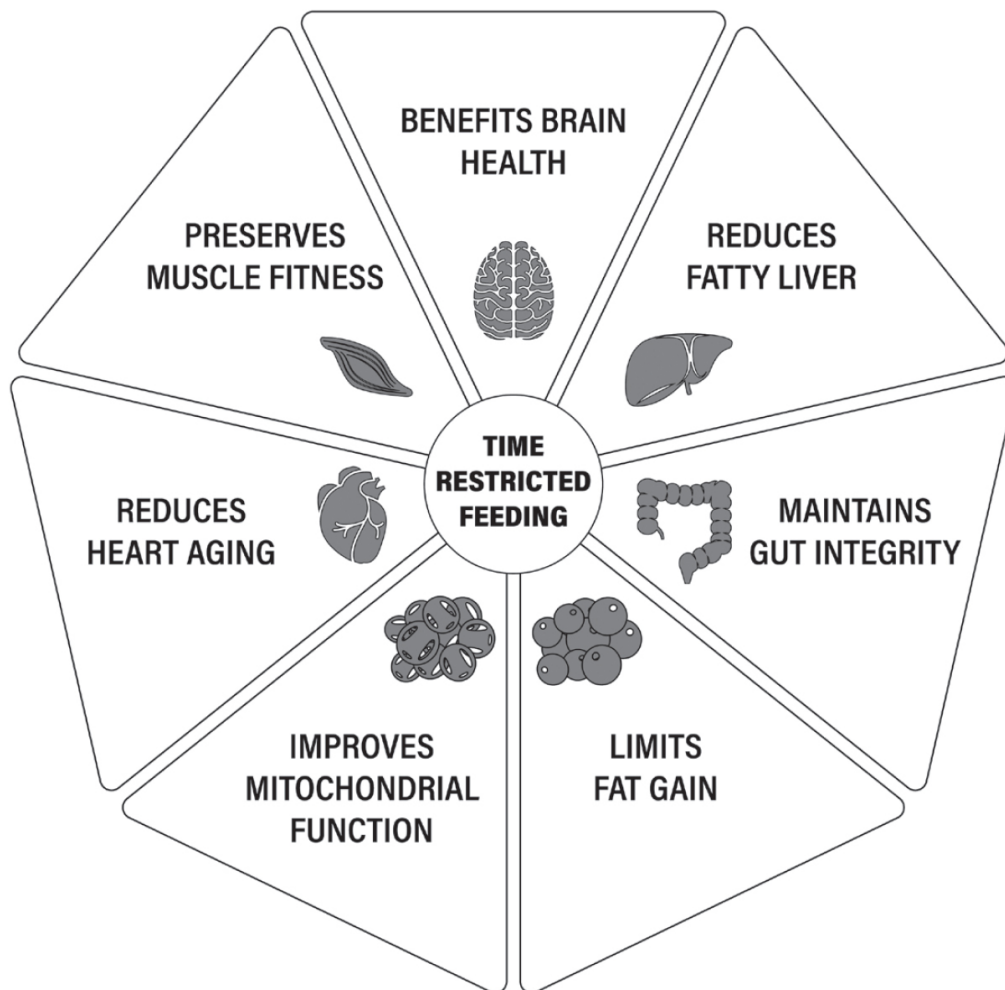
clock, so our brain clock will also get the signal that our bodies need to stay awake.

When I had Megan track her eating windows for one week, we discovered that most days, she ate for 14 to 16 hours. To reduce Megan's eating window, we used a tool called *time-restricted feeding* (TRF). This is an eating pattern that involves shortening the window to 10 hours or less every day and fasting for at least 14 hours before eating again.

By confining our food intake to only a portion of the day and allowing for a lengthened fasting period overnight, we allow for something vital to happen for optimizing our energy levels: we sync the body clocks and brain clock so that our circadian rhythm optimizes our metabolic health and produces abundant energy. This strategy is one of the fundamental aspects of a healthy circadian rhythm.⁷¹

We have a lot of data in animals showing that TRF prevents the development of cardiometabolic diseases,⁷² and an ever-growing body of research in humans is beginning to find similar benefits.^{73,74,75} There's also research showing that it helps keep mitochondria youthful in the face of nutrient overload (and remember: most of the population has constant nutrient overload).⁷⁶

In fact, several studies show that eating all our food within a 6- to 10-hour window regulates our circadian rhythms, which also leads to improvements in body composition, glycemic control, insulin sensitivity, oxidative stress, and energy levels.^{77,78,79,80} This is without changing any of the foods that we would normally eat.



With Megan, getting her to a 10-hour eating window was our goal, but I had her aim for a 12-hour TRF window first. I often recommend 12 hours with my coaching clients to start, because it's an attainable goal that most people can sustain over the long haul that doesn't require drastic adjustments.

I encouraged Megan to pick 7 A.M. to 7 P.M., 8 A.M. to 8 P.M., or 9 A.M. to 9 P.M. Megan chose 7 A.M. to 7 P.M. She was sure she did not want to eat past dinnertime, which was usually 6 to 7 P.M., so this would let her eat breakfast as early as 7 A.M. to stay on track but give her the option of pushing it back for an even tighter TRF window if she could manage that.

I suggested Megan try this for a month and if she felt great and wanted to try closing the window again, then she could. "There is no rush," I emphasized. "If you feel fantastic eating in a twelve-hour window, then stick with it."

I always encourage my clients to experiment with windows between 8 and 12 hours to see how their bodies feel and what

best fits into their lifestyles. Any variation works, so pick one that is relatively easy.

Some of the most popular eating windows my clients use include:

- 8 A.M. to 6 P.M.
- 9 A.M. to 6 P.M.
- 9 A.M. to 5 P.M.

However, there are cases where someone simply cannot eat breakfast early in the day and therefore opts to use a TRF window later in the day, such as 12 P.M. to 8 P.M. While not ideal, it is certainly a viable strategy for those who need to make the best of their situation. Stressing over morning meals is the last thing we want for those who have a tight morning schedule, so be sure to pick a TRF window that you can enjoy sticking with.

Finally, I want to be clear that TRF is not intermittent fasting and doesn't require anything extreme like eating just once per day. TRF is a daily practice rather than an intermittent one, and it doesn't restrict how much we eat, since we can still consume two to four meals in a 6- to 10-hour eating window. Comparatively, intermittent fasting involves going for more than a day (24-plus hours) without eating several times per week or month and thereby inherently involves dietary restriction.

2. Clock Time of Eating

In the United States, the average American eats less than 25 percent of their daily calories before noon, 37.5 percent after 6:00 P.M., and 12 percent after 9:00 P.M.⁸¹ This means we're consuming almost 50 percent of our calories at night, which is a problem because it kills our energy levels.

Our gastrointestinal tract is lined with enteroendocrine cells that provide an endless supply of neurotransmitters, peptides,

and hormones when we eat. Metabolic health and energy levels depend on these gastrointestinal signals being matched to the appropriate signals put out by the brain during the day.⁸²

At night, these signals change, and the later we eat, the more these signals become disrupted, our body clocks and brain clock misalign, and our sleep suffers. One study with animals showed that altering the timing of their food intake by having them eat when they should have been sleeping potentially decoupled the circadian rhythm of their liver and other body clocks from their brains.^{83,84}

We see similar detriments from inappropriate eating times in night shift workers, who demonstrate significantly greater rates of obesity and metabolic dysfunction than non-shift workers.^{85,86} This isn't the same as professions that involve carcinogen exposure, like asbestos workers or farmers who spray pesticides. Yet shift work is the *only* profession to be classified as a carcinogen in and of itself.⁸⁷

Research also shows that eating at night can cause fat gain, which affects our energy levels. When mice are fed diets that are meant to cause obesity, but their eating is confined only to hours when they are meant to be awake and active (versus giving them access to food day and night), they do not develop metabolic dysfunction (fat gain) and circadian dysregulation.^{88,89,90}

When it comes to regulating our circadian rhythm and improving our sleep, research reveals that altering when we eat makes a stark difference in realigning our circadian rhythm, improving sleep, maintaining a healthy weight, and boosting energy.

3. Stacking More Calories Earlier in the Day

On the flip side of killing your energy levels by eating too much at night, there may be energy benefits, such as improved metabolic health and flexibility, in eating most of your food earlier in the day, at breakfast and lunch.⁹¹

One study found that eating most of our calories in the morning with a big breakfast and lunch leads to greater fat oxidation and reduced appetite compared to a more even spread of calories throughout the day.⁹² Data also shows that eating a large breakfast and lunch, compared to a more even spread of food throughout the day, enhances circadian gene expression and amplifies the natural circadian rhythms of hormones like cortisol, making it have a higher peak in the morning and drop at night.⁹³

Eating more food earlier in the day primes your body to give you a natural energy boost upon waking each morning. I wanted Megan to consume more calories earlier in the day, so I challenged her to eat a bigger breakfast and lunch, a small snack midafternoon, and then a light dinner.

Because Megan had a hectic life and kids who needed wrangling, I didn't want to overwhelm her with a strict "you must do this seven days a week, forever" approach. Instead, I suggested she aim to eat like this three times a week, for a month, and then reassess.

While ideally we want to aim to eat most of our food every day at breakfast and lunch, I also know that life stresses and daily schedules can get in the way of our best intentions. If eating most of your food early in the day is too stressful, then don't worry about it for now. Focus on the other, less stressful changes that are within your reach.

4. Consistency of Eating

The last piece of our chrono-nutrition puzzle is to practice consistency with our eating schedule. Our circadian system works to predict events, learns to anticipate mealtimes, and adjusts the body's metabolic responses and hormones accordingly.⁹⁴

For instance, one study found that regular breakfast eaters who skipped breakfast had worse glycemic control at lunch, while those who habitually skipped breakfast had no metabolic issues.⁹⁵

Like many working parents, Megan often grabbed food when she could, typically on the go and without a set schedule. I challenged her to create a traditional schedule with three meals and a snack. She put mealtimes into her calendar to remind her to eat, and also to help her prioritize and shift how she thought about meals.

Again, I know that it's not always easy sticking to a schedule. Life does get in the way. Still, bringing more consistency to eating at the same time every day can go a long way in helping optimize our circadian rhythm. The goal isn't to be perfect, but to establish new habits.

Targeted Nutrient Mix

There's an ever-growing body of evidence investigating how different macronutrients (protein, carbohydrate, and fat) impact sleep. Dr. Marie-Pierre St-Onge from the Institute of Human Nutrition and Department of Medicine at Columbia University reviewed 11 clinical studies regarding how different diets impacted sleep and made several important observations:⁹⁶

- Higher-carbohydrate diets tend to shift slow-wave (deep) sleep toward REM and reduce the amount of time it takes to fall asleep each night.
- Higher-protein diets tend to reduce nightly awakenings.
- Eating digestible carbohydrates within an hour of going to sleep disrupts sleep quality compared to eating those carbohydrates four hours before.
- Skipping dinner or eating earlier in the day doesn't negatively impact sleep.

These findings show us the importance of blending when we eat with what we eat for our sleep quality and circadian rhythms. Generally, eating a higher-protein diet with slow-digesting carbohydrates like whole grains, legumes, and vegetables around lunch or dinner, but not within several hours

of going to sleep, should allow for the deepest and most rejuvenating sleep.

Megan regularly consumed proteins such as chicken and ground turkey, and fish like salmon and cod. The biggest change for her was ensuring she ate protein at every meal, especially dinner. With three kids, sometimes dinners were quick and easy—pasta or cheese quesadillas with flour tortillas. I encouraged Megan to see her nutrient mix as a fun challenge rather than a frustrating one. For lunches and dinners, I suggested she try quick, easy, and light recipes that were also kid-friendly, including steak, baked fries, and tomato salad; Mexican-style chicken soup; pulled chicken and curry-roasted mixed vegetables served over baby spinach with raisins, cilantro, and a mint-lime yogurt dressing; and chicken sausage, veggies, and creamy polenta.

Finally, Megan and I also talked about alcohol. While not a huge drinker, she would have a glass, sometimes two, after the kids went to bed a few times a week. While alcohol can help us unwind, it can mess with our sleep. Both acute and chronic consumption of alcohol, even at “social drinking” amounts (about two to seven drinks per day, whether each beverage is 12 ounces of beer, 5 ounces of wine, 1.5 shots, or some combination), reduces melatonin levels by 15 to 40 percent, with higher doses of alcohol having a stronger inhibitory effect.^{97,98,99} Alcohol also greatly reduces sleep quality and increases sleep disruptions.¹⁰⁰

I recommended to Megan that she should remove alcohol entirely, but if she didn’t want such a sharp cutoff, she should try to keep it to one drink, two tops, once a week. I would recommend the same to you. If you’re struggling with sleep and circadian rhythm dysregulation, then I recommend removing alcohol entirely. If you are going to have a drink, try to have it earlier in the evening.

Kicking the Caffeine Dependency

In our brain there’s a molecule called *adenosine* that makes us tired. It binds to its own (adenosine) receptors in the brain, which transmits a signaling of sleepiness that builds up as

more and more adenosine binds throughout the day. When we ingest caffeine, it binds to the receptors and blocks adenosine from binding and doing its job,¹⁰¹ which causes us to feel more awake, alert, and energized.¹⁰² Caffeine works because it prolongs the time until we become tired. The caffeine needs to wear off before adenosine can start binding its receptors again.

Caffeine provides a short-term energy boost that can be useful under the right circumstances, such as when you want to increase your physical strength and improve your endurance for a workout session.^{103,104,105,106}

But caffeine's effects can turn problematic when used in the afternoon and evening because it interferes with sleep quality. In one study, sleep disturbances were increased when caffeine was ingested as far out as six hours before going to sleep, with the detriments growing the closer to bedtime caffeine was ingested.¹⁰⁷ Studies have found that caffeine's half-life—which is how long it remains active in our systems—ranges from three and one-half to eight hours, depending on the person.¹⁰⁸

In addition, it takes only several days of caffeine use to build up a tolerance to its effects,^{109,110} meaning that you will gradually need to consume more caffeine to get the same energy boost. This also means your energy levels dip without caffeine and your mental and physical performance declines.

As Megan and I worked together, we dramatically curtailed her caffeine use. Typically, she would have a cup as soon as she finished her morning jog, then two more before lunch, and then she'd have a fourth and sometimes a fifth in the afternoon, sometimes as late as 4 to 4:30 P.M. I had Megan slowly kick the caffeine habit by first stopping its consumption by 2 P.M. She did this for a week, and then over the following two weeks, I had her slowly cut back from four to five cups down to two to three. Then I had her attempt taking days off from drinking it, beginning on the weekend. Caffeine withdrawal and the accompanying headaches are a real thing, so you want to slowly wean yourself from any dependency.

My best advice based on the science: use caffeine sporadically for targeted purposes like just before a workout session several times per week or if you have an important meeting or project that depends on mental alertness. If you enjoy caffeine, it is important that you also pay attention to when you have your last cup. The worse your sleep, the earlier I recommend you stop consuming caffeine. Typically, I recommend stopping between noon and 4 P.M. The more fatigue you feel and the more severe your sleep issues, the sooner you should halt the caffeine intake.

MAKING THE CHANGES STICK

Megan spent two months implementing these nutritional strategies. Some days she didn't hit her goals, but she did notice her sleep improving little by little, and she started stringing together better nights with more consistency. As a result, Megan felt like she had energy to show up with more vitality, clarity, and focus of mind, and she had an increased capacity to connect with her kids, husband, and coworkers.

For many of my clients, it only took a week for them to start realizing benefits, but for others, it took up to a month, sometimes two. This is not set-it-and-forget-it. It's about adopting new patterns and ways of eating, and different nutritional habits that will rewire your brain and body clocks to support your circadian rhythm alignment throughout your life. And not only will these strategies boost energy levels but they will have the widespread positive side effects of lowering your risk of dozens of diseases, including heart disease, diabetes, obesity, neurological disease, and cancer.

ACTION LIST

It's time to rewire your brain and body clocks so you enjoy better sleep and more energy. The action items I've gathered will help you start this journey. I've ranked the nutritional strategies in the order that has produced the most effective results for my clients. If you want to start at the first nutritional

strategy and work your way through the others one at a time, do it. You can also choose where to start, so if you want to work on limiting your caffeine intake first, then do that.

To help you more easily incorporate new strategies into your daily life, I've divided each action into multiple steps. Stay on each step for *at least two weeks*. But if the step or the strategy still feels uncomfortable, or you want to continue integrating it into your daily routine, then stay until it feels comfortable and you're ready to progress. Once you've reached your desired level of progress with one strategy, move on to the next. Keep repeating this process for as long as you need.

Whatever nutritional strategy you start with, keep a journal and note your sleep patterns. Each morning, grade your sleep quality and morning energy levels on a scale from 1 to 10. Track any changes and use these daily sleep and energy grades to help analyze your progress.

- **Confine your food and caloric beverage intake to a time-restricted window.**
 - Consume all your calories within 12 to 14 hours.
 - Consume all your calories within 10 to 12 hours.
 - Consume all your calories within 6 to 10 hours.

- **Do not eat or consume caloric beverages at night or close to bed.**
 - Stop eating before 10 P.M.
 - Stop eating before 9 P.M.
 - Stop eating before 8 P.M.
 - Stop eating before 7 P.M.

- **Consume most of your calories in the morning and afternoon (e.g., breakfast and lunch).**

- Consume roughly 30 percent of your calories before 3 P.M.
- Consume roughly 50 percent of your calories before 3 P.M.
- Consume roughly 70 percent of your calories before 3 P.M.

- **Be consistent with your mealtimes.**
 - Eat 1 meal at the same time each day.
 - Eat 2 meals at the same time each day.
 - Eat all meals at the same time each day.

- **Limit your intake of rapidly digestible carbohydrates at dinner.**
 - Do not consume rapidly digested carbohydrates at dinner 2 to 3 days per week.
 - Do not consume rapidly digested carbohydrates at dinner 4 to 5 days per week.
 - Do not consume rapidly digested carbohydrates at dinner more than once per week.

- **Limit your intake of alcohol.**
 - Drink no more than one drink per night 2 to 3 days per week.
 - Drink no more than one drink per night 4 to 5 days per week.
 - Drink no more than one drink per night 6-plus days per week.

- **Reduce caffeine consumption in the afternoon and evening.**
 - Stop drinking caffeine past 4 P.M.
 - Stop drinking caffeine past 2 P.M.
 - Stop drinking caffeine past 12 P.M.

CHAPTER 3

BURN FAT, BUILD MUSCLE, BOOST ENERGY

Talking about weight is hard.

It leaves many people feeling ashamed, frustrated, and uncomfortable. When we carry extra fat—whether that’s a little or a lot—we know it. We feel it.

One of the most discouraging realizations that I often hear from my clients is that they have diet hopped for years, going from paleo to calorie counting to low fat to low carb. They see results at first, but nothing lasts. They have no idea what to do next, and they *still* struggle with extra fat and feeling fatigued.

This was Christina’s story. When I first met her, she had just turned 38 and had spent the past year trying to regain her health and energy. She was working through food addiction recovery, and on managing anxiety and depression with a therapist. She had lost about 10 pounds through counting calories.

Christina knew she had made many positive strides in one year, and she had improved her overall health and well-being, but she hadn’t solved the mystery of her fatigue and energy crashes. She would have unlimited energy and feel upbeat and happy for a day or two, but then she would crash and be in a slump for a week, sometimes two or more.

“There are days that are so oppressive that I am pretty much non-functioning and bedridden—or at least, I want to be, but I can’t because of work and my family obligations,” she told me.

She felt the most frustration with her weight and its effect on her moods. She wanted to lose about 30 pounds, but it was hard.

After her first child was born, Christina gained about 20 pounds but took it off relatively quickly through diet and exercise. Her struggles really began after the birth of her second child. Not only did she put on about 25 pounds during the pregnancy, but after the birth, she began yo-yoing.

“I tried every diet from calorie counting to low carb, and I would lose the weight, but then I’d add it back with an extra five or ten, once fifteen pounds,” Christina said. “I want to lose more weight, but I’m also terrified that if I do, I won’t keep it off. I’m also so tired that I don’t feel like I have the energy to stay the course, but deep down, I really do want to feel better in my body and have more energy.”

Christina paused, taking a deep breath. “I just don’t know how to do this.”

UNLOCKING THE MYSTERIES OF YOUR BODY COMPOSITION

Christina articulated so well the weight issue that challenges millions of us today. In the United States, it’s estimated that *one in three* adults is obese while another *one in three* is overweight, meaning that two of every three adults do not have a healthy body weight.¹ (The World Health Organization and most other health authorities define obesity as having a body mass index (BMI) greater than or equal to 30 and being overweight as greater than or equal to 25.)

I knew the key to addressing Christina’s low energy rested with improving her *body composition*, which consists of two things:

- **Lean mass** (our muscle tissue, bones, and water)
- **Fat mass** (fat stored in our bodies)

While there is no clear-cut definition on what represents a healthy balance between lean mass and fat mass, we know that carrying too much fat and having low muscle mass are both harmful to our overall health and energy levels.

Body composition is the real issue facing our world. If we combine more accurate measurements of body composition with markers of metabolic health, then some researchers have proposed that *90 percent* of adults in the U.S. are “overfat,” meaning they carry enough fat that it is harming them.²

Before we go further, I want to be clear: if you’re struggling with excess body fat, please know there is nothing *wrong* with you.

Our world is fundamentally *obesogenic*, meaning that just by existing today, the default destiny for most people (over 70 percent) is to be overweight. It is more typical to carry more body fat than it is to live at one’s optimal body composition. In our modern obesogenic environment, carrying around extra fat is a natural by-product of the way our environment overrides our evolutionary programming.

At the same time, our society also has a propensity to shame and judge people who carry more body fat. That is the last thing I want to do. My aim is to help you *shift* your perspective around your body, fat, and muscle mass. This is about *empowering* you with easy-to-implement nutritional strategies that will help you lose body fat, gain lean muscle, and maintain an optimal and healthy body composition so you feel energized instead of chronically slow and fatigued.

As you read this chapter, I want you hold this thought:

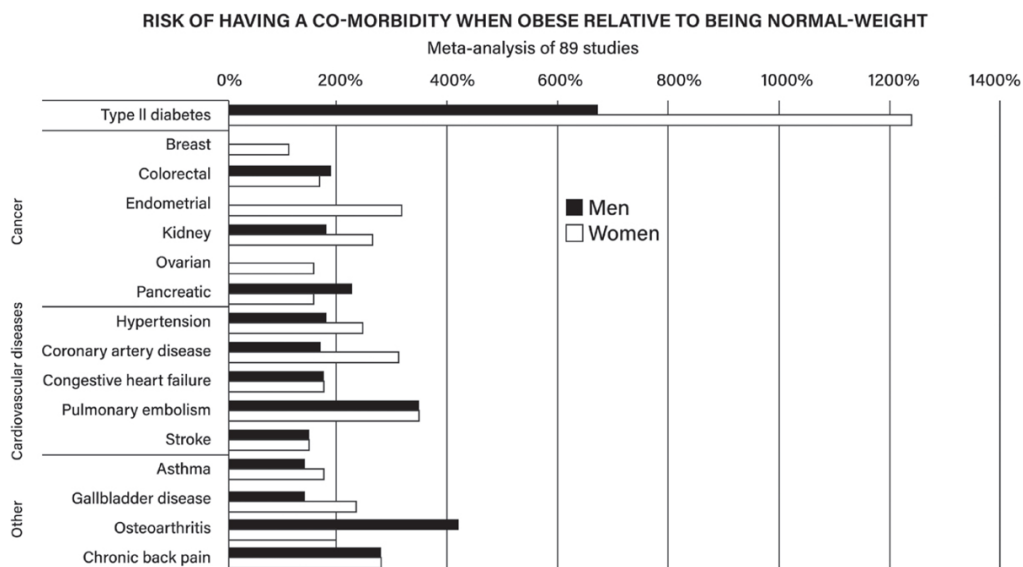
You are not fighting some enemy that is your current body. Rather, you are healing the temple that your body represents.

THE BODY COMPOSITION–ENERGY LINK

While there is absolutely nothing wrong with you if your body composition is off, there are health risks in addition to low energy levels that come from carrying excess fat and/or too little lean muscle mass.

Obesity is associated with an increased risk for having 18 comorbid diseases, including:³

- Type 2 diabetes
- High blood pressure
- Strokes
- Heart failure
- Osteoarthritis
- A variety of cancers



Globally, obesity accounts for 5 percent of all deaths, and nearly half of people who are obese die directly from it.⁴ The top killer is cardiovascular disease, accounting for 40 percent of all obesity deaths, followed by type 2 diabetes at 10 percent, cancer at 5 percent, and chronic kidney disease at 5 percent.

There are also heavy financial costs to obesity. The growing health burden of carrying excess fat is one of the most well recognized in the world, estimated to cost about \$2 trillion, or

2.8 percent of the global gross domestic product.⁵ That's equivalent to the global impact from smoking; or armed violence, war, and terrorism; or the combined costs of drug use, workplace risks, household air pollution, child and mother undernutrition, and unsafe sex.

If we look at just the U.S., the annual health care cost for obesity is \$340 billion, which represents 28 percent of all health care spending,⁶ and people dealing with obesity often spend 42 percent more on direct health care costs than normal-weight adults.⁷

There are also numerous studies that have looked at how quality of life changes with body composition. One meta-analysis of eight studies and over 43,000 adults found that as weight goes up, physical health-related quality of life goes down.⁸

And when it comes to energy levels, research has found that obesity is associated with a *40 percent greater* chance of being fatigued and 7 to 12 percent less vitality than being at a normal weight.^{9,10}

None of these stats are shared with disdain, disgust, or dislike. "Fighting obesity"—as many in the health and wellness sector have called it—has led to extensive collateral damage, like unhealthy preoccupations with food, eating disorders, self-hatred, stress, and all the health consequences that result.

But that's why we aren't fighting obesity; we are nourishing our temple by returning it to a healthy body composition.

There is an enormous difference between self-hate and simply acknowledging that your body composition is increasing your risk of disease, lowering your quality of life, and negatively affecting your energy levels. It's just a fact because there are real changes happening within your body that have led you away from optimal health and energy.

Chronic Low-Grade Inflammation

We evolved the ability to store fat as a protective mechanism against “energy poisoning” during times of overeating and to provide us with an energy reservoir that could be used during times of fasting and famine. However, there are limits on our ability to store fat safely.

As the fat cells take in more energy, they expand in size. But much as a balloon can hold only so much air before it pops, so too can fat cells hold only so much fat before they die. When you carry around too much body fat, your fat cells become overwhelmed, dysfunctional, and inflammatory—all effects caused by fat cells trying to prevent their deaths. This results in chronic, low-grade inflammation that can cause fatigue in three major ways:¹¹

1. Altering neurotransmitter and reward pathways in the brain
2. Causing mitochondrial dysfunction
3. Disrupting sleep and circadian rhythms

When there is inflammation in our body, it responds by lowering our energy levels so that we *rest and recover*. Inflammation is a sign that something isn’t right in our bodies and our bodies need to conserve energy so that everything goes into fighting that infection or healing that wound. Specific molecules are sent to stop neurotransmitters like dopamine and serotonin from doing their jobs, which include regulating our mood, physical activity, motivation, and anxiety.^{12,13,14} During our evolutionary history, we would only need to rest and recover from an illness or injury. Today, it occurs *around the clock*, thanks to the low-grade inflammation pervading much of modern society.^{15,16}

Think about what happens when you are sick. You feel tired, you lack motivation to do anything physical or mental, you may feel depressed, or your brain feels fuzzy or lacks focus; these symptoms are collectively called sickness behavior.¹⁷

A mountain of data also shows us that chronic, low-grade inflammation leads to mitochondrial dysfunction and reduced energy production,^{18,19,20} which is bad news, because our bodies need our mitochondria pumping out more energy to support the overactive immune system.^{21,22}

Dr. Tamara Lacourt of the University of Texas MD Anderson Cancer recently proposed that chronic fatigue is caused and maintained by this chronic inflammation-induced imbalance between cellular energy availability and the needs of the body.²³

Chronic low-grade
inflammation



Circadian
rhythms & sleep



Energy
expenditure



Metabolism



Cellular energy
availability



Persistent

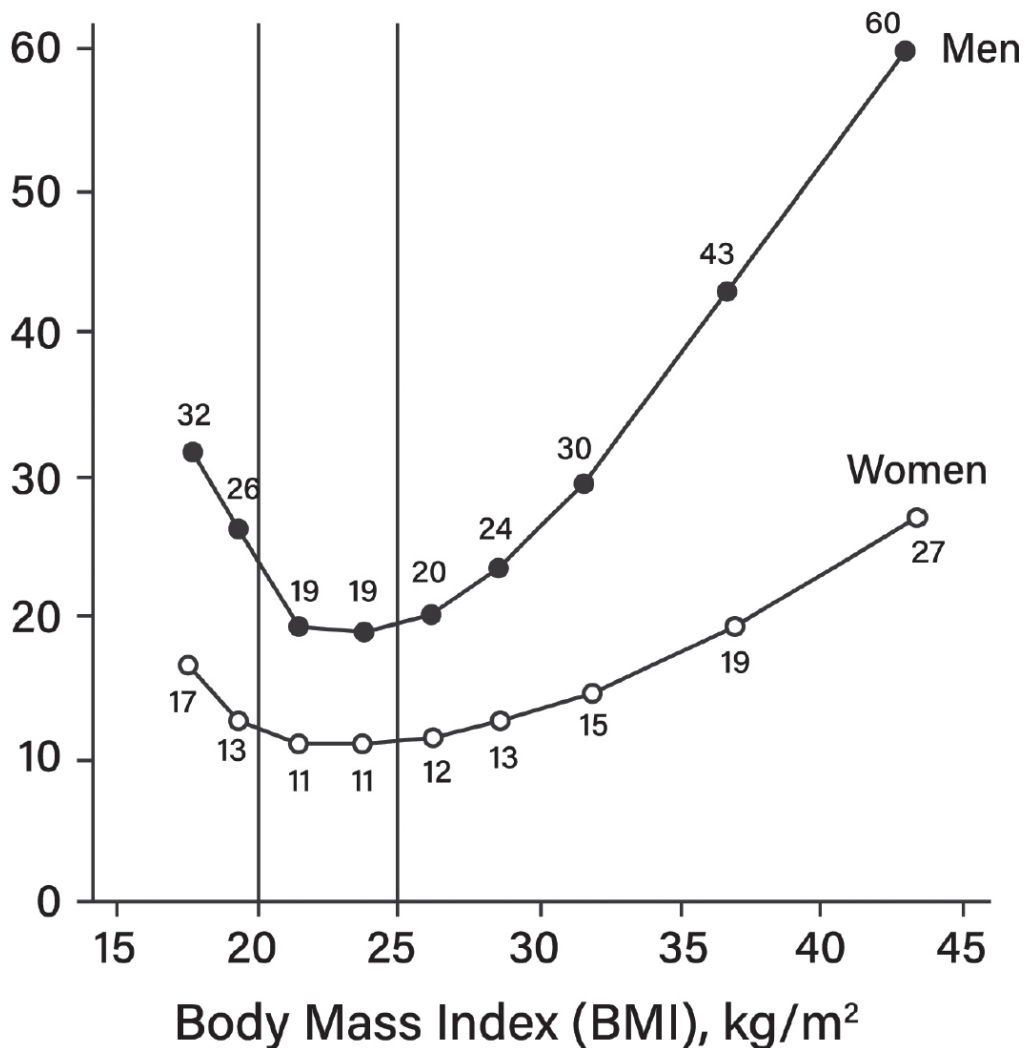
fatigue

Dr. Lacourt noted another contributing factor: circadian and sleep disruption. Excess body fat is related to poor-quality sleep, including greater sleep disturbances and shorter sleep durations.²⁴ Sleep loss and circadian disruption can also cause low-grade inflammation or amplify any inflammation that is already present in the body, thereby intensifying inflammation-induced fatigue.^{25,26}

Too Little Muscle Mass

Obesity and being overweight get the lion's share of attention when we talk about weight. However, being *too thin* and having *too little muscle mass* can be equally destructive for our bodies and energy. One of the largest studies ever conducted, which aggregated the data from 189 other studies across 32 countries, found that being too thin was associated with the same risk of dying as carrying around too much fat.²⁷ Specifically, as a person's BMI fell below 20, their risk of dying increased to the same extent as if their BMI increased to above 30.

ABSOLUTE RISK OF DYING IN THE NEXT 35 YEARS (%)

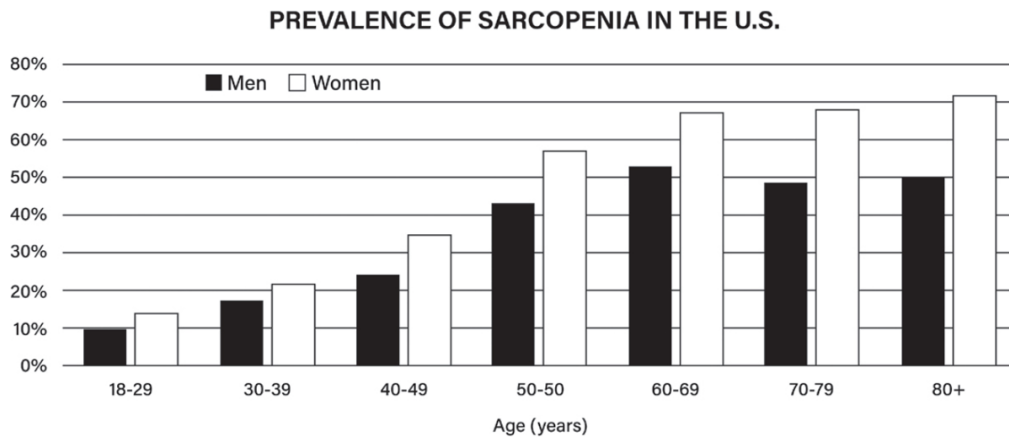


In the study the risk of death increased as BMI fell below 20, correlating to a body fat percentage of 15 percent in men and 25 percent in women.²⁸

To be clear, the risks associated with being too thin are owed to a lack of muscle mass, strength, and functionality, which increases our susceptibility to injury and death, and not to lower fat mass levels, which is why healthy athletes and active adults may have lower body fat levels.

Our muscles are a key regulator of metabolism and vital for the prevention of many chronic diseases.^{29,30} Yet a tremendous proportion of the population meets the definition for *sarcopenia*, a condition characterized by low levels of muscle mass that cause weakness and impaired physical function.³¹ In

the U.S., sarcopenia afflicts more than half of adults aged over 50 years, 20 to 35 percent of middle-aged adults, and roughly 1 in 10 young adults.³²

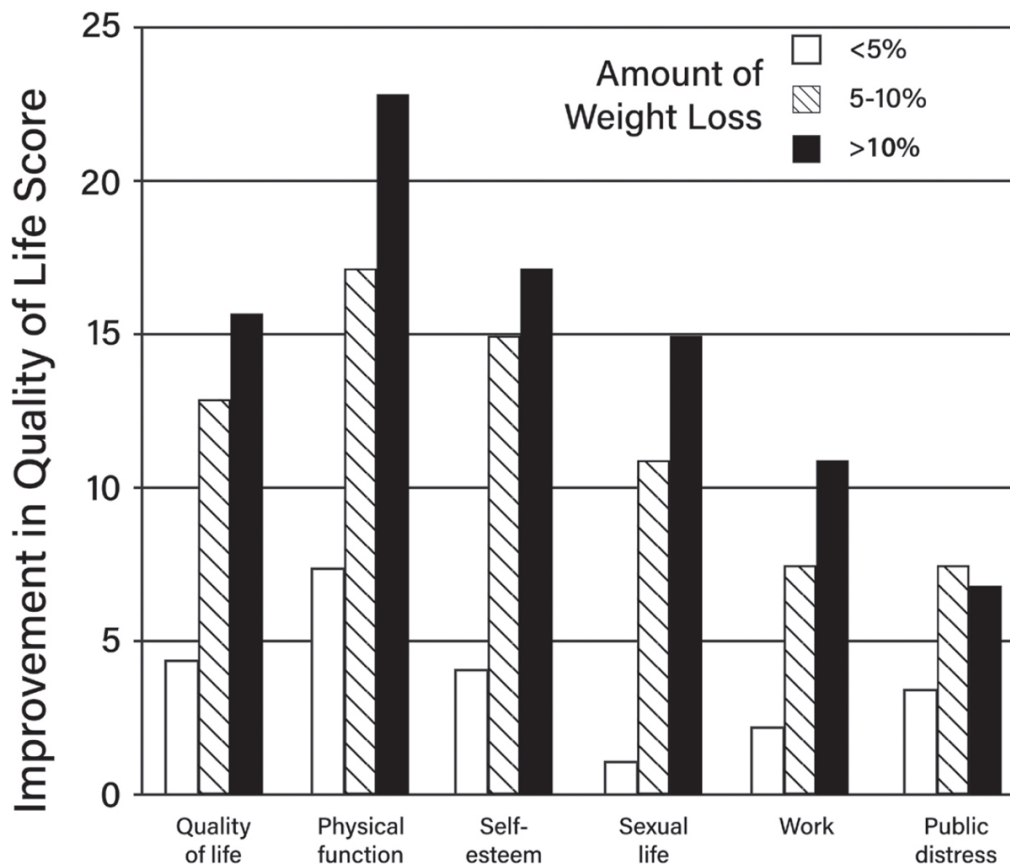


You need muscle to move your body and to sustain a healthy metabolism. If you have low amounts of muscle tissue, you're going to tire more quickly and have a harder time getting through the day because your mitochondria aren't producing the energy your body needs. Ultimately, impaired physical function and muscle weakness are strongly related to fatigue,³³ and having more muscle mass is associated with less fatigue severity.³⁴

NOURISHING THE TEMPLE

The path to a healthy body composition and regaining energy is straightforward: lose fat and build lean muscle.

Several studies have shown that modest weight loss improves quality of life and physical function.^{35,36,37} When researchers look at how the extent of weight loss impacts quality of life, improvements increase as the extent of weight loss increases.^{38,39}



When someone with obesity adheres to a 10-week weight loss diet, general and mental health, physical function, vitality, bodily pain, and social function all improve.⁴⁰

Many of my clients tell me they struggle to lose weight. But that's not entirely true. They know how to lose weight and have done it multiple times. It's maintaining the weight loss that's hard.

Most people who embark on fat loss journeys make it about six months before they reach a weight loss plateau and the weight starts returning.⁴¹ It doesn't matter whether they start exercising, begin a new diet, use meal replacements, drastically cut calories, or take advantage of weight loss drugs.

This was Christina's major struggle. "I think you do know how to lose excess fat," I gently told her. "Taking off ten pounds in a year ... that's a phenomenal start. Working with a food addiction therapist? Brilliant! And kudos to you for taking that step. Now we are going to build off that work and ultimately make the changes stick. We're not going to focus on weight loss, but on creating a new body composition that

centers on *fat loss and muscle gain*. This isn't about a fad or overly restrictive diet. It's about giving you the right nutritional tools that will help improve how you feel in your body, boost your energy levels, and yes, likely change the number on the scale too."

Before diving into the nutritional strategies that I wanted Christina to use daily, I also challenged her to reframe her weight loss journey to a *fat loss journey*.

The two words—weight and fat—often get used interchangeably, but there is a huge difference in what they represent. Your body weight, that number you see on the scale, includes all parts of you—fat, muscle, bone, water, etc. When you embark on a weight loss journey, what you really desire is fat loss. As you build muscle, especially if you are strength training, the number on the scale may not go down at all—it could even go up—but your body composition will be better and your health, well-being, and energy will improve. On the other hand, if your body weight goes down due to muscle loss, it's not healthy or desirable.

The focus should be on losing excess fat and gaining lean muscle. You can set a fat loss goal, say losing 25 or more pounds, and you can use a scale as a tool, checking in to ensure you're headed in the right direction toward a healthier body composition. I also encourage you to use other tools to help gauge your fat loss journey and body composition. When we lose fat, our body reshapes itself, so notice how your clothes fit around your waist, hips, arms, and legs. Also, pay attention to your energy levels like if you wake up feeling more energized and can go longer during the day without feeling like you need a nap. Note your moods and how you feel, including being happier, more patient, or more peaceful. These are all important indicators that you're moving toward a healthier body composition.

Eat Enough Protein

Want to kick-start fat loss and optimize energy? Then make protein your best friend. Protein is the *only* macronutrient

(carbs and fats are the others) that supports lean muscle growth, maintenance, and repair.

High-protein diets also tend to squash hunger better than carbs or fats.⁴² When our bodies digest or break down protein, amino acids are left, which get absorbed by different organs, muscles, and tissues throughout the body and are used for various functions, including the satiety centers of the brain that help regulate our appetites. Amino acids also help reduce the pleasure response (also found in the brain) that we get when we eat, leaving us less motivated to consume more food.

As a final benefit, protein requires the most energy of the three macronutrients to digest relative to the energy it provides.⁴³ We call this *diet-induced thermogenesis*.

When it comes to dropping excess fat, there have been numerous investigations on this subject and the role that protein plays. For example, in 2012 Thomas Wycherley from the University of South Australia published a meta-analysis aggregating data from 23 interventions. He found that consuming 1.1 to 1.6 g/kg (0.5 to 0.7 g/lb) of protein led to more fat loss, less muscle loss, greater satiety, and a lesser reduction in metabolic rate compared to eating less protein each day.⁴⁴ Furthermore, a meta-analysis was done of 20 studies looking exclusively at adults over 50 years old.⁴⁵ Again, consuming 1.1 to 1.6 g/kg (0.5 to 0.7 g/lb) of protein led to more fat loss and less muscle loss compared to eating less protein. In fact, 80 percent of the higher-protein group lost more than 70 percent of their weight as fat mass, compared to only 50 percent of the lower protein group.

Finally, a meta-analysis involving 74 studies found that eating a diet higher in protein has been found to significantly reduce several cardiometabolic risk factors, including waist circumference, blood pressure, and triglyceride levels, while also increasing satiety.⁴⁶

The Ultimate Protein Guide

When I talk about increasing your protein, I'm not suggesting throwing back pounds of fatty bacon or sausage.

At first, when you're just starting your fat loss journey, and if you aren't physically active (which is okay, for now), you want to aim to eat about 1.1 to 1.6 g/kg (0.5 to 0.7 g/lb) of protein every day. If you eat three meals per day, then this is obtainable by having 3 ounces of cooked meat at each meal plus 0.5 to 1 cup of cooked beans. Of course, dairy and soy products, eggs, and grains also supply protein. You want to aim for higher protein, not high fat. Options include chicken; turkey; grass-fed beef or bison; fish, including tuna, snapper, and salmon; dairy products like hard and soft cheeses (in moderation) or plain yogurt; seeds; nuts, including nut butters like peanut or almond; beans; and some grains.

Once you've reached a healthier body mass and weight, and are more physically active, then you'll want to up that protein intake to about 1.6 to 2.2 g/kg (0.7 to 1.0 g/lb) per day.^{47,48} This will help with repairing muscle damage from working out (this isn't a bad thing but what builds strength) and maintaining your muscles.⁴⁹

Eat Protein at Every Meal

It's not just that we want to eat enough protein every day; it's that we want to eat it at *every meal*. Eating protein at every meal is critical because it stimulates *muscle protein synthesis* (MPS), a naturally occurring process in which protein in our muscles is produced to help repair any tissue damage, which leads to stronger and leaner muscle mass.

To figure out how much protein we need to eat per meal, Dr. Stuart Phillips from McMaster University in Ontario, Canada, aggregated the data of six studies and found that most young adults could maximize MPS with 0.4 g/kg of whey protein, while older adults (50-plus years) required upward of 0.6 g/kg.⁵⁰ To put that in perspective, it equates to a 176 lb (or 80 kg) young adult eating 32 grams, or an older adult eating 48 grams of protein per meal.

As you consider how much protein to eat with each meal, a solid rule is to aim for a minimum of 0.4 to 0.6 g/kg. You can

certainly eat more protein, especially as you age.

Aging tends to cause our muscles to become less responsive to the anabolic effects of eating,⁵¹ which is why older adults need more protein to max out the MPS signal at every meal.

But even if we maximize muscle protein synthesis, we need additional protein so that protein synthesis in other areas of the body, like the gut and immune cells, will work properly.

For Christina, I knew upping her protein intake would be a huge factor in kick-starting more fat loss and building leaner muscle. Her initial weight was about 165 lbs (or 75 kg), so our goal was getting Christina to eat about 120 grams of protein per day (aiming for 1.6 g/kg).

To keep it simple, her target was to eat *at least 30 grams of protein with every meal.*

I didn't want Christina to be overly restrictive in her protein sources, but instead to choose foods she enjoyed eating. For breakfast, Christina would eat a pumpkin spirulina bowl with crunchy clove granola. Because she had young kids, she also often made egg bakes loaded with vegetables and topped with a little cheese that she could quickly reheat in the morning. Lunch was often a big salad with protein, and dinner would be snapper filets over cauliflower mash and crispy kale, wild salmon over brown rice, or pulled chicken with roasted vegetable salad, topped with raisins and cilantro.

Whether they are animal or plant-based, it doesn't matter what protein sources you use; just make sure you incorporate them into every meal. Pick ones that you know you'll eat, that are easy (and fun) to prepare, that fit into your budget and schedule, and that you're likely to stick with.

When cooking meats, poultry, and seafood, you want to use gentle cooking methods such as steaming, boiling, braising, baking, or pressure cooking. This is because potentially harmful chemicals form when these foods are cooked with more aggressive methods such as grilling over an open flame, broiling, and smoking.

Another trick—regardless of the cooking method you use—is to cook with spices, herbs, ginger, garlic, and turmeric, or to use marinades made with olive oil, lemon juice, and/or vinegar. These ingredients can inhibit harmful chemical compounds and sometimes prevent them from forming.

Protein for Vegetarians and Vegans

So far we've mostly discussed animal protein, but I know many people eat a vegetarian or vegan diet or rely more heavily on plant foods. This is not a judgment about what diet is better. I'm for the one that helps you feel the best and promotes optimal health.

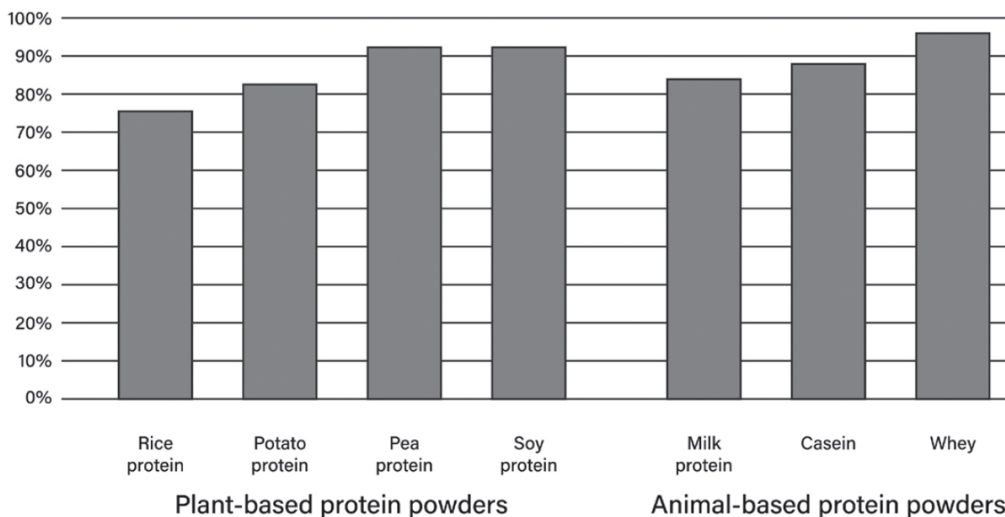
However, vegetarians and vegans still do need to pay attention to where they get their protein.⁵² Most plant sources of protein, such as legumes and grains, come with quite a few calories for the protein they provide. If you're trying to restrict calories (to some degree, not severely), then this can be problematic. You may overeat, thus destroying any fat loss benefits the higher protein can provide and possibly gaining more fat.

The other challenge facing plant-based diets is that humans simply don't digest protein nutrients from whole plants as well as we do from animals. Animal-based proteins consistently demonstrate a digestibility rate higher than 90 percent, whereas proteins from the best plant-based sources (legumes and grains) show a digestibility rate of 60 to 80 percent.⁵³

The lower digestibility in plants is due to compounds called *antinutrients* that prevent protein digestion and absorption, such as trypsin inhibitors, phytates, and tannins.⁵⁴ While cooking does reduce antinutrient concentrations, it doesn't eliminate them entirely. None of this means that antinutrients and the plants containing them are harmful (in fact, there is much research showing so-called "antinutrients" like phytic acid are actually very *beneficial* to health), only that the protein isn't as available for our bodies to digest as is the protein found in animal products.

If you are vegan, eat a heavily plant-based diet, or are struggling to eat enough protein while on a mixed diet that includes animal products, consider using plant-based protein powders.⁵⁵ In the case of plant-based protein powders, the protein is extracted from plants and doesn't supply a lot of extra calories from carbohydrates or fats that would occur in whole plants. Plus, the processing methods used to create plant-based protein powders destroy antinutrients and increase the protein's bioavailability to levels seen in animal products. They are easy to consume and can be mixed into smoothies or other foods like oatmeal or yogurt, or just taken straight with water.

DIGESTIBILITY OF PROTEIN FROM PLANT- AND ANIMAL-BASED PROTEIN POWDERS



However, if you're looking to get your protein from whole plants, then consider prioritizing high-protein sources like a variety of soy products (edamame, tempeh, tofu, etc.) and cooked legumes such as lentils, split peas, and your favorite type of bean. Other modest protein sources include cooked grains such as amaranth, quinoa, oat bran, wild rice, oatmeal, and buckwheat.

Load Up on Fibrous Vegetables

Now that we've increased your protein intake, it's time to talk about vegetables. Yes, you still need them. Not only are they a rich source of nutrition but they are also full of fiber and water, which can help keep your appetite in check⁵⁶ by stretching your stomach and delaying its emptying.⁵⁷

Research shows that simply eating a salad at the start of a meal can reduce caloric intake for the entire meal because people eat less of the higher-calorie foods.⁵⁸ It's not an insignificant amount either—11 percent fewer calories. Quite simply, the salad takes up room in the stomach, so you reach satiation more quickly.

The *volumetrics diet* is based on the satiating properties of high-fiber, high-water foods. When overweight women were told to follow this diet by eating more fruits and vegetables while reducing fat, they experienced less hunger and 23 percent more weight loss than the control group who had only been instructed to eat less fat-rich food.⁵⁹

| Fibrous Vegetables | | | |
|--------------------|------------------|----------------|---------------|
| Artichokes | Celery | Kale | |
| Arugula | Chard | Leek | Spinach |
| Asparagus | Chives | Mushrooms | Summer squash |
| Beet greens | Collard greens | Mustard greens | Tomatoes |
| Bok choy | Dandelion greens | Okra | Turnip greens |
| Broccoli | Eggplant | Onions | Watercress |
| Cabbage | Garlic | Pea sprouts | Zucchini |
| Cauliflower | Green beans | Peppers | |

Christina's diet already included lots of vegetables, and lunch was typically a big salad. For her, this was a simple shift. I suggested she just add more fibrous vegetables and not stress about the "right ones" but rather have fun trying some new ones. I suggested she pick vegetables that were easy to get at her local grocery store and that would be simple to prepare. None of these strategies need be expensive or time consuming, so opt for starting with the "low-hanging fruit," adding the sources that are easiest and affordable.

You want to eat a big helping of fibrous vegetables at each meal. You can make smoothies and juices too, but they can't be a replacement for the whole-food form.

Eat Whole Foods

A diet based around high-protein foods and vegetables feeds perfectly into the next dietary strategy for optimizing your body composition: eating a diet based around whole, minimally processed foods. I know: this idea has been around forever. But a tremendous amount of research supports its importance.

When it comes to the obesity epidemic, overeating is the biggest driver. And what do we tend to overeat? Processed foods like doughnuts, pastries, ice cream, and pizza. Why? Because they taste good. As they were designed to.

Every time we crunch a chip or pop a pretzel into our mouths, we're biting into hyper-palatable calorie bombs that are rich in sugar, refined grains, fat, salt, and flavorings. It isn't far-fetched to say that we no longer eat to live; we live to eat.

Of all the research on animals done to date, feeding them a cafeteria diet, where they have access to a seemingly endless variety of food flavors, has been proven the most surefire way to fatten them. The animals simply can't stop eating; they don't get full.

This diet promotes voluntary hyperphagia (aka overeating) that results in rapid weight gain, increased fat mass, and metabolic disturbances such as insulin resistance and glucose intolerance.⁶⁰ The cafeteria diet also engages hedonic feeding, or eating for pleasure, which produces long-lasting neuronal alterations that favor body fat gain.⁶¹

When researchers put overweight men and women on a bland liquid diet within the research center at Columbia University, they started losing weight rapidly.⁶² Even though they could eat as much as they wanted, they ate almost nothing, no more than 500 calories per day, on average—all without hunger.

A Word about “Processed”

The definition of “processed” food can be confusing. I’ve seen some people immediately default to “anything processed is bad,” but that’s not entirely true. For example, technically both doughnuts and spirulina are “processed.” However, they have vastly different effects on the body. Spirulina is a blue-green algae powder supplement that contains nutrients such as vitamins E and B, antioxidants, and beta-carotene, and it’s used to fight fatigue, stimulate the immune system, and help people lose weight. Doughnuts, on the other hand, are possibly one of the worst foods you could regularly eat.

Almost all beneficial supplements are highly “processed,” but they may be—and often are—perfectly compatible with health or even extremely beneficial to improving our well-being.

In another study, for two weeks participants ate a diet based on processed foods and then for two weeks ate unprocessed foods, or vice versa, with each diet divided across three daily meals plus snacks. The diets were matched for their calorie density and macronutrient content, and the participants were instructed to eat as much as they wanted. When the researchers looked at what occurred during each diet period for both groups, they found that participants eating the processed diet gained two pounds, while participants on the unprocessed diet lost two pounds. The researchers determined calorie intake to be the determining factor in the differences. When folks were on the processed diet, they ate significantly more calories—about 500 extra per day, on average—than when they were on the unprocessed diet.

Yet despite this difference in calorie intake, there weren’t any differences between the diets in feelings of hunger or fullness, meaning that the processed diet required more food and calories to achieve the same level of satiety as the unprocessed group.⁶³

To get an accurate read on what Christina was eating, I had her track what she ate for a week. She was already using a restricted-calorie diet, so this was easy information to collect. While she did not rely heavily on processed foods, Christina

did turn to quick, mostly processed, zero or 100-calorie snack foods once or twice per day.

Although these foods were technically low in calories, they weren't high in nutritious value either, so I wanted to flip that. On Christina's next shopping trip, I suggested that she stock up on snack-size vegetable packs of carrots, celery, cauliflower, broccoli, or snap peas and experiment with different dips like hummus, guacamole, black or white bean spread, tomato salsa, or nut butters. I also suggested she start using one cup of Greek yogurt or cottage cheese topped with some berries or other fruit as snacks. Both yogurt and cottage cheese offer protein punches that would help her meet her goals and satiate her between meals. Protein bars and jerky can also be viable alternatives, as long as they are not loaded with sugar or additives.

Stop Grazing

When it comes to shedding excess fat and building lean muscle, science tells us that eating two to three, or three to four meals per day (depending on your eating window) offers you the most benefit. That's because eating meals with a break in between stimulates muscle growth.

Research has shown that consuming protein every three hours is better at stimulating muscle protein synthesis throughout the day than consuming smaller amounts of protein every hour and a half or larger amounts every six hours.⁶⁴

This is contrary to the belief in some health, fitness, and wellness circles that the best way to eat for fat loss or muscle gain is five to seven small meals per day.

It can take up to five hours for us to digest a large meal, so a good goal is to try to eat every three to five hours depending on your eating window. This works out to two to three meals in a six- to eight-hour eating window, or three to four meals within an eight- to ten-hour window.

Christina tended to eat smaller meals throughout the day, often on the run. Wanting to get her into more structured

meals, we started with a ten-hour time-restricted feeding window that had four meals every three to four hours.

This took some getting used to for Christina, so I suggested that if she got hungry between meals, she should add an extra snack in the morning and/or afternoon. This will vary from person to person. If you're used to grazing, it can take a couple of weeks for your body to acclimate to a different schedule, so just be consistent, stick with it, and gradually move yourself toward eating just meals.

If you're eating enough protein at every meal and loading up on fibrous vegetables, then that should also help get you from meal to meal. If you're still ravenous a couple of hours after a meal, then review your meals to make sure you're getting adequate nutrients, especially protein.

Increase Your Energy Flux

You've probably heard the saying *eat less, move more*.

But eating less food can be hard, especially if you're inactive or have a small physique and are already working with a reduced calorie budget. In this instance, eating less food means that you run a greater risk of not getting all the nutrients you need to be healthy and energized.

So let's change the saying to: *eat more, move more*.

This is the basis of *energy flux*, which is the sum of the energy we burn daily, plus the energy we get from food. Studies show that the people who are best able to maintain significant amounts of fat loss do so by maintaining a higher energy flux.⁶⁵

Consider these scenarios:

- 3,000 calories out – 2,500 calories in = 500-calorie deficit
- 2,000 calories out – 1,500 calories in = 500-calorie deficit

Both scenarios have the same daily energy deficit of 500 calories, but the first scenario has a *higher* energy flux (5,500

vs. 3,500 calories). Maintaining a high energy flux does wonders for fat loss because it increases your resting metabolic rate (RMR), reduces your appetite, and lowers the chances that you will overconsume food.

When we start losing fat, hormone concentrations change, as do gut peptides, body weight, and nervous system activity. Although you want to lose fat, your body reads the loss as something “bad,” so it slows down your RMR. As your body attempts to regain the weight you lost, your appetite will increase while your energy level will decrease. However, several studies have shown that increasing energy flux can help stop your RMR from slowing down in response to dieting.^{66,67,68,69} In one study, obese adults lost 7 percent of their body weight over several months and then spent three weeks staying at their reduced body weight while in either a high- or low-flux state.⁷⁰ Participants in the high-flux condition burned an extra 500 calories each day through exercise while also eating an extra 500 calories to make up for it. Not only were their RMR and fat oxidation greater but hunger was lower too.

I know that moving more can be difficult when you don't have a lot of energy. This was a challenge for Christina, who had very little “extra” to give in her life. At first we worked on Christina keeping it simple, adding a 20- to 30-minute walk three to four times per week. Christina found it easier to split her time, so she would go for a 15-minute walk at lunch and then another when she got home or after dinner. Sometimes Christina's husband would watch the kids while she got some “Christina time,” but it soon became a family outing, with her husband and kids joining.

For Christina, walking was the perfect activity, but you may decide you want to add more physical activity like strength or resistance training, yoga, hiking, biking, swimming, or jogging to your daily routine (if you haven't already). Research also shows exercise boosts our energy levels.⁷¹ And when you take individuals with chronic pain and have them start a resistance training program, they fatigue less easily, their strength increases, they have less pain, and they feel healthier.⁷²

Because increasing our energy flux and being physically active can boost fat loss and improve lean muscle mass, it's something I strongly support for your overall health benefits—physical, mental, and emotional. However, if you're extremely fatigued and/or your schedule or life keeps you hopping from the moment you wake to the time you close your eyes, adding physical activity may be difficult. That's okay. You can look for small areas where you can add extra steps, like parking farther away from a store entrance or walking up and down your stairs more often at home.

And if reaching high energy flux doesn't work now, then focus on supplying your body with the right nutrients—that's something anyone can do at any time in their lives and at any fatigue level on their energy-enhancing journey. It's all about gradually building up the *eat more, move more* mindset.

Ditch the “Perfect” Diet

Christina was committed to increasing her protein intake and believed it was achievable. But she also wanted to know what the best diet was for losing fat.

Like many people, Christina had tried all the top diets and found early success with each, but nothing stuck. I told Christina what I told everyone: “I don't care what diet you follow. You can use keto, paleo, a mixed balance of animal protein and plants, Mediterranean, low-fat omnivorous, low glycemic, vegetarian, or vegan—they all work as long as you stick with making sure you're eating enough protein, and at every meal, and you're eating minimally processed, real food, mostly plants.”

My advice isn't based on anecdotal evidence but actual findings from Dr. David Katz and his colleagues at Yale School of Medicine. Dr. Katz conducted one of the most important studies in the history of nutritional science, noteworthy for its breadth, depth, diversity of methods, and consistency of findings.

In “Can We Say What Diet Is Best for Health?” Dr. Katz and his team reviewed hundreds of scientific studies on the

health effects of different dietary patterns, including mixed balance, low fat, low carb, low glycemic, Mediterranean, paleo, and vegetarian and vegan.⁷³ While they concluded there are not enough head-to-head dietary trials comparing the different diets to make any determination of what is the healthiest, they did find that the healthiest diets consisted of:

- Minimally processed foods and foods direct from nature
- Mostly plants
- Animal products from animals that ate as natural a diet as possible, as would be found in wild settings (e.g., wild caught fish, pastured cattle and poultry, and milk and eggs from pastured animals)

I could tell Christina was taken aback by what I said. When you're used to following a specific diet, it can feel scary to have fewer restrictions. But once you eat this way for a few weeks, and then a few months, you can gradually retrain your mind to not fear food.

MAKING THE CHANGES STICK

After about two months of using these nutritional strategies, Christina lost about 1.5 pounds per week, for a total of 12 pounds. She had exceeded her initial movement goal and was walking five to six times per week for 30 to 45 minutes. Then she was ready to add resistance training into weekly movement. She didn't have much experience in this area, so I encouraged her to join a local gym that was welcoming, encouraging, and inclusive of people at all stages of their body composition journey and experience, and to work with a professional who would help create a program and teach her the proper form.

Overall Christina found incorporating the nutritional strategies easy, but she wasn't used to eating as much protein, nor was she used to eating three to four times per day. It took more meal planning and prep to ensure Christina ate enough

protein. For her, it helped to pick one night to plan all her meals for the week rather than decide what she was eating each day.

There was also a psychological shift she had to make as she increased her food intake. “Slow and steady, that is the secret,” I told Christina. “I know you want to see the number on the scale continue going down, *and* this is about creating healthier eating habits that will stay with you for the long haul.”

As you incorporate some of the nutritional strategies in this chapter, keep in mind that you are not a victim of the circumstances that have led to an unhealthy body composition. You can choose to change at any moment.

You have the power.

Your health and body composition are in your hands. You have the control over how your life plays out from this moment forward.

Meet yourself where you are. Give yourself time. Fuel your temple with lots of protein, minimally processed whole foods, and fibrous vegetables, and add physical activity into your daily life as you can. You can implement positive, lasting change, and it will affect your energy levels for the better.

ACTION LIST

The following checklist will help you start on your energy healing journey through losing fat and building muscle. Like last time, pick one to two items to work into your life today that you feel you can start implementing immediately. After a couple of weeks, or when those actions become habitual, level up or pick one or two more.

If you find you can work more than two into your lifestyle, that's fine. Just don't overwhelm yourself. Your body composition can't change in a day. Take your time.

Each task has a primary goal with three to four smaller steppingstone goals beneath it. Establishing new habits often requires baby steps in the right direction. Start with the first

stepping-stone and work your way down before checking off the primary goal box.

- **Ensure that your diet is providing you with adequate protein daily.**
 - Calculate your ideal protein intake and eat it 1 to 2 days per week.
 - Eat sufficient protein 3 to 4 days per week.
 - Eat sufficient protein 5 to 6 days per week.
 - Eat sufficient protein every day.

- **Eat sufficient protein at every meal.**
 - Calculate your ideal protein intake per meal and eat at least that amount at 1 meal per day.
 - Eat sufficient protein at 2 meals per day.
 - Eat sufficient protein at every meal.

- **Minimize snacking and reduce your meal frequency.**
 - Eat 2 to 4 meals per day plus 2 to 3 snacks (including caloric beverages).
 - Eat 2 to 4 meals per day plus 1 to 2 snacks (including caloric beverages).
 - Eat 2 to 4 meals per day with zero snacking (including caloric beverages).

- **Eat a diet based on mostly whole foods.**
 - Eat 1 meal per day that is prepared from scratch and/or contains only minimally processed ingredients that you could find in nature.

- Eat 2 meals per day that are prepared from scratch and/or contain only minimally processed ingredients that you could find in nature.
 - On 3 to 4 days per week, eat only meals that are prepared from scratch and/or contain only minimally processed ingredients that you could find in nature.
 - On 5 to 6 days per week, eat only meals that are prepared from scratch and/or contain only minimally processed ingredients that you could find in nature.
- **Eat a diet based on fibrous vegetables.**
 - Consume fibrous vegetables with 1 meal per day.
 - Consume fibrous vegetables with 2 meals per day.
 - Consume fibrous vegetables with every meal.

CHAPTER 4

REBUILDING THE GUT BARRIER TO KEEP FATIGUE AT BAY

Think about how your stomach feels.

Do you struggle with diarrhea? Constipation? Nausea? Do certain foods send it screeching?

If you said yes to any of these questions, welcome to the world of poor gut health. It's a world most of us live in but few people think about, yet the connection between odd stomach ailments and fatigue is very real.

When Nick first joined my program, he told me, “After I hit my thirties, my health started to decline precipitously. I had energy problems, joint issues, depression, and skin problems, to name a few. I relied on caffeine strategically spaced throughout the day just to keep going, but even that isn't working any longer.”

Nick said he had made every reasonable effort to improve his health—a variety of diets, supplements, and exercise strategies. He got some results from each, but he confessed, “I feel less sick, but I'm nowhere near feeling optimal or healthy.”

When I dug more deeply into Nick's background, I discovered that throughout his life he had cycled through bouts of constipation and loose stools, felt bloated and became gassy after most meals, and most days, had a low-level stomach

discomfort. He had assumed these issues were normal, but in fact they were a sign that his gut had been compromised and needed healing.

UNLOCKING THE MYSTERIES OF YOUR GUT MICROBIOME

“All disease begins in the gut,” said the ancient Greek physician and philosopher Hippocrates 2,500 years ago. While I don’t 100 percent agree with this statement—disease can begin in other places and then can cause gut issues, thus creating a vicious cycle of dysfunction—Hippocrates was onto something.

Today we have a large body of research demonstrating a link between our gut health and the health of various organ systems throughout the body, including:

- Brain¹
- Liver²
- Muscles³
- Fat cells⁴
- Bones⁵
- Joints⁶
- Lungs⁷

Studies also show that when our gut health becomes compromised, it can lead to other serious chronic issues,⁸ such as:

- Obesity⁹
- Diabetes^{10,11}
- Cardiovascular diseases¹²

- Neurodegenerative diseases¹³
- Frailty with aging¹⁴

The health of your gut has everything to do with the health of your *gut microbiome*, which is made up of trillions of microorganisms—viruses, microbes, and (mostly) bacteria—living in your digestive system. Within your large intestine alone exist about 40 trillion microorganisms—a number roughly equal to every cell in your body—most of which are bacteria.¹⁵

A healthy microbiome provides for three primary functions:¹⁶

1. Providing an abundance of metabolic pathways that ultimately foster a stable, mutually beneficial relationship (i.e., does a bunch of biochemistry that benefits us)
2. Self-regulating its growth and preventing the colonization of pathogens (i.e., lots of different bacteria don't let any one group outgrow the others and develop a stronghold)
3. Resisting harm and returning to a healthy state after exposure to harm (i.e., isn't excessively perturbed in response to pathogen or toxicant exposure and recovers to its previous healthy state after antibiotic exposure)

Although everyone has their own personal blend of bacteria due to genetics, lifestyle, and the environment,¹⁷ it's the microbial *diversity* that determines the health of our microbiome. We categorize the organisms as good (beneficial) or bad (pathogenic).

The beneficial organisms play critical roles in helping us remain healthy, improving our metabolism and nutrient production, and educating our immune system. These bacteria help us break down the food we eat into the vitamins, minerals, and macronutrients that our mitochondria use to create the ATP that fuels our organs, muscles, and tissues. Everyone has some harmful pathogens (bacterial and viral)

living in their microbiome. As long as the microbiome stays healthy, the harmful pathogens are kept in check by the beneficial bacteria that compete for resources.

But when something upsets the wondrous microbiome diversity—whether a toxin or toxicant (such as most pollutants, endocrine disruptors, heavy metal contaminants, etc.), life stress, antibiotics, or not enough fiber—that balance can become disrupted and the bad bacteria can multiply in number beyond what the beneficial bacteria can keep in check. As the bad bacteria increase in number, they take over, colonizing the microbiome and leading to a cascade of health issues and fatigue.

THE GUT-MITOCHONDRIA LINK

Researchers are finding links between the health of our microbiomes and energy levels, particularly with regard to chronic fatigue syndrome.¹⁸ And it has become clear that people with chronic fatigue have:

- Lower microbial diversity
- Fewer bacteria known to pump out beneficial metabolites like short-chain fatty acids (SCFAs), needed to make ATP
- More bacteria known to release harmful inflammatory metabolites like endotoxins

In fact, the researchers found that a computer program could predict *with 90 percent accuracy* whether someone had chronic fatigue syndrome based exclusively on their microbiome composition and the concentration of inflammatory molecules in their blood.

Leaky Gut and Inflammation

Gut dysbiosis is the state of bacteria imbalance in our microbiome that has been linked to a very problematic condition known as *leaky gut* (intestinal permeability).

When healthy bacteria decrease and harmful bacteria surge, the harmful ones produce more inflammatory, carcinogenic, and genotoxic molecules than the microbiome and immune system can handle, which creates inflammation and dysfunction of our intestinal lining^{19,20}—the barrier between our gut, bloodstream, and the rest of our body.

Our digestive system works synergistically with our microbiome to break down the food we eat into the nutrients we need to function, like vitamins and minerals. When those molecules are small enough, they pass through our gut lining and get absorbed into our bloodstream. These molecules then get delivered to the trillions of cells where our mitochondria are waiting for them.

Our gut lining acts as a protective barrier to keep foreign molecules out of our bloodstream: those harmful bacteria, viruses, microbes, undigested food molecules, toxic by-products generated by harmful bacteria, and other compounds that live in the gut and should stay in the gut (or get sent on for elimination).

When we lose microbial diversity, our gut lining can develop holes or cracks: hence the name leaky gut. When this happens, foreign molecules can leak through the gut lining, get absorbed into our bloodstream, and be carried to various organs, tissues, and cells in our body.

Our immune system—our threat detector and bodily defender—then kicks into high gear to try to eliminate them. A natural by-product of this immune response is inflammation, meaning that having a leaky gut becomes another source of chronic low-grade inflammation,^{21,22} damaging your mitochondria and leading to their dysfunction and reduced energy output.

The riled-up immune system also explains why leaky gut has been so strongly linked to the development and perpetuation of autoimmune diseases including:^{23,24,25}

- Crohn's disease
- Ulcerative colitis

- Type 1 diabetes
- Celiac disease
- Multiple sclerosis
- Hashimoto's thyroiditis

Autoimmunity involves an overactive immune system. So if you have a leaky gut and foreign molecules have been passing through your gut lining and getting absorbed into your bloodstream causing constant inflammation for years, then the link between poor gut health and autoimmune disease becomes very clear to see.

Intestinal Mucosal Barrier Breakdown

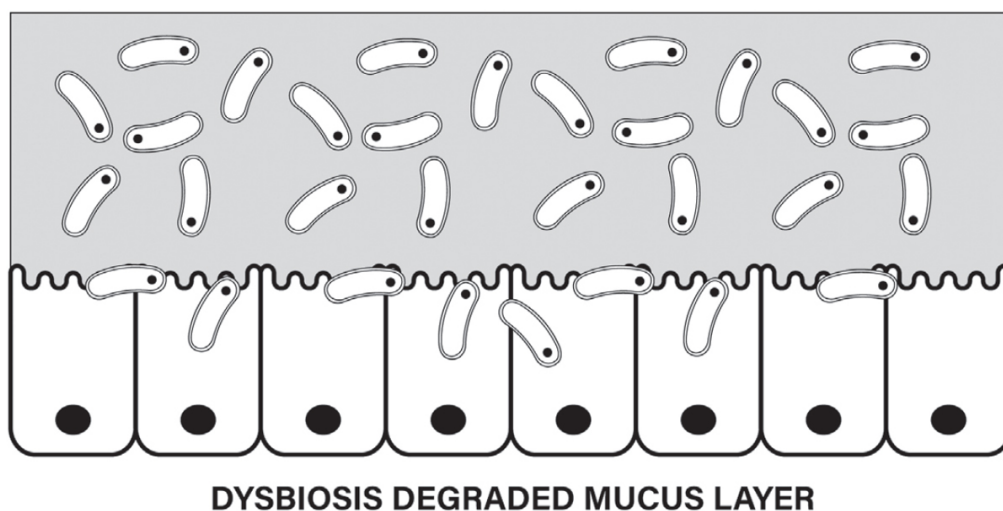
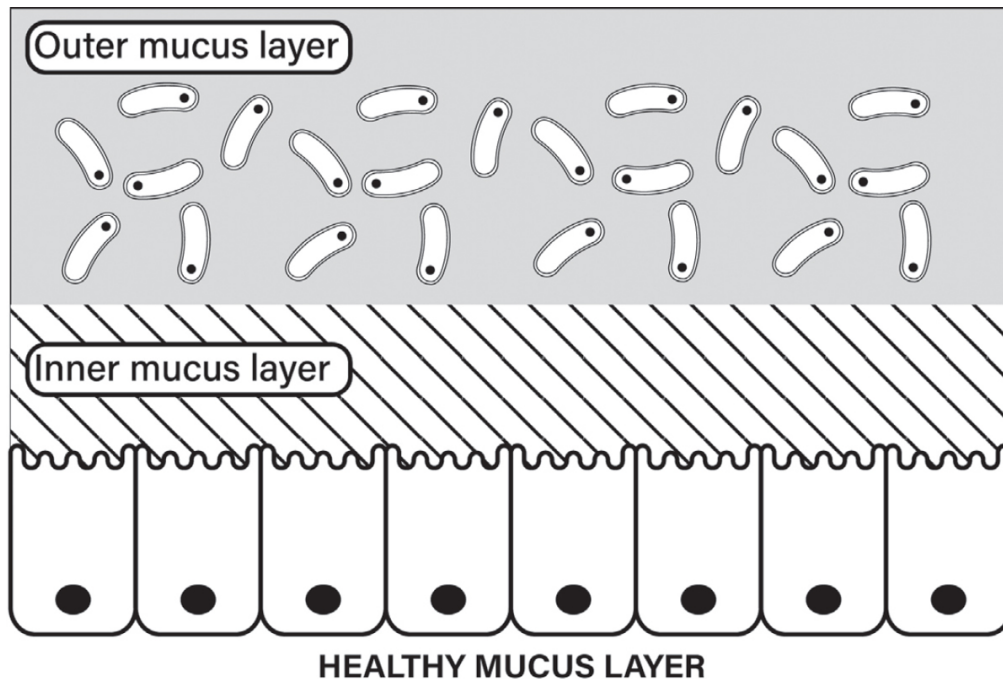
One of the most important components of the gut barrier is a thick layer of mucus rich in immune cells and antimicrobial peptides, which help protect against bacteria, fungi, viruses, and parasites. This mucus layer acts as a barrier between our gut bacteria and gut lining, and it prevents the uncontrolled absorption of pro-inflammatory endotoxins and antigens^{26,27}—which stimulate harmful inflammatory responses.

Despite being a barrier against gut microbes, the mucosal layer relies quite heavily on them for proper development. For example, sterilization of the gut (e.g., killing off the microbiome) leads to a thinned and weakened mucus lining,²⁸ which can be reversed upon colonization with a healthy microbiome.²⁹

A similar observation has been made when, instead of no microbiome, one has the wrong type of microbiome. The carbohydrate-rich mucus lining provides a valuable food source for many types of bacteria that exist within our microbiome.^{30,31} Normally, bacteria eating the mucus layer isn't problematic—our body replenishes any lost mucus throughout the day.

But this becomes an issue when the microbes eat the mucus layer at a faster rate than our body can produce it. When our

microbiome is unbalanced, or if we're not eating the right foods to sustain our microbes, they will turn to this mucus membrane to fortify themselves. This contributes to intestinal inflammation and leaky gut.^{32,33} It also reduces the abundance of bacteria like *Bifidobacterium*, which help build up a strong mucus lining.³⁴



Short-Chain Fatty Acids Shortage

When we lack beneficial bacteria, our gut cannot produce important energy-related metabolites such as acetate, propionate, and butyrate (all short-chain fatty acids) or urolithin A.

SCFAs help regulate a variety of processes and systems in the body that have beneficial effects on our metabolism, appetite, body composition, and immune function.³⁵ They are some of the best sources for energy production, better than other fatty acids.³⁶ SCFAs such as butyrate can freely enter mitochondria without the need for chaperone proteins or transporters. They simply waltz into the mitochondria and stimulate the processes necessary for energy production.³⁷ This is particularly helpful when the mitochondria are dysfunctional, which is often the case with chronic fatigue. In particular, butyrate increases mitochondrial energy production and the ability to use fat as an energy source within the liver and skeletal muscle, leading to protection against the development of fatty liver and insulin resistance.^{38,39,40}

Within the gut SCFAs also nourish our intestinal cells, regulate the activation of anticancer genes and cell death signals, and help maintain the integrity of our intestinal barrier. Studies show that without a microbiome, intestinal cells suffer from mitochondrial dysfunction and are starved of energy, but when cells are provided with only pure butyrate, mitochondria are restored to near-normal function.⁴¹

The microbiome produces an abundance of molecules, and while SCFAs are the most plentiful and important for our health and energy, urolithin A also deserves special mention. Urolithin A is produced by beneficial bacteria in the gut when they metabolize ellagitannin phytochemicals present in certain fruits, berries, and nuts, particularly pomegranates.⁴²

Urolithin A is a powerful inducer of mitophagy, helping prevent the accumulation of old and damaged mitochondria that contribute to oxidative stress, metabolic disease, and reduced energy levels.

Excessive Endotoxin Absorption

When certain bacteria die, they release endotoxins, which are incredibly inflammatory molecules. When endotoxins seep through your gut lining and get absorbed into your bloodstream, they cause a ton of damage. For example, the

endotoxin lipopolysaccharide (LPS) is the most prominent “alarm molecule” sensed by our immune system as an early warning for infection. When LPS gets into the bloodstream, it causes a powerful immune response, even if an infection never materializes.^{43,44} This results in a lot of inflammation—and if it’s happening constantly, then you’re getting hit by massive amounts of it.

Endotoxins are also powerful disrupters of mitochondrial function.⁴⁵ When mitochondria get exposed to endotoxins like LPS, it increases oxidative stress, disrupts mitochondrial membrane stability, causes DNA fragmentation and cell death, and strongly inhibits energy production.^{46,47,48,49} One study showed that chronic fatigue patients have significantly elevated blood concentrations of bacterial endotoxins.⁵⁰

GUT HEALTH ISSUES

- Increased gut permeability
- Dysbiosis in the gut

LEAD TO...

MINOR PHYSIOLOGICAL CHANGES

- Increased endotoxin absorption
- Leaky gut
- Immune over-activation and elevated markers of inflammation

RESULTING IN...

MAJOR PHYSIOLOGICAL CHANGES

- Mitochondrial dysfunction/shut down
- Toxin accumulation
- Cellular damage
- Leaky blood-brain barrier
- Hormonal disruption
- Neurotransmitter imbalances

WHICH ULTIMATELY CAUSE...

EXTERNAL SYMPTOMS

AND EFFECTS

- Lethargy and fatigue
- Brain fog and poor cognitive function
- Mood changes
- Heightened anxiety
- Increased risk of depression
- Poor sleep

Essential Nutrient Deficiencies

Food is fuel. Literally. Our digestive system breaks down what we eat into the vitamins, minerals, and macronutrients we need to survive, and our mitochondria need them to make energy. But when we're struggling with dysbiosis and leaky gut, it can predispose us to nutrient deficiencies through several ways:⁵¹

- Avoidance of certain foods or food groups because they cause discomfort
- Increased nutrient losses from conditions such as diarrhea
- Reduced nutrient absorption from a damaged or inflamed intestinal tract
- Increased nutrient requirements for intestinal repair
- Increased nutrient excretion from medications used to alleviate intestinal discomfort and symptoms

Studies have found that adults with chronic fatigue syndrome tend to have lower levels of vitamins and minerals including vitamin D, vitamin E, and magnesium⁵²—all critically important for optimal cellular energy production. None of this is to say that you personally have nutrient absorption problems, only that it is a possible (and common) link between poor gut health and fatigue.

REBUILDING YOUR GUT WITH NUTRITION

In my experience, everyone with severe chronic fatigue has some gut rebuilding to do. Gut issues are that prevalent. The good news is that what you eat, along with other nutritional strategies, can help you make significant strides toward repairing and restoring your microbiome diversity. In fact, studies have shown that using nutrition and supplementation to repair the gut of chronic fatigue patients often results in dramatically improved energy levels.⁵³

As you incorporate new foods, pay close attention to how your body responds to certain foods. Notice if what you eat makes you feel bloated or gassy, gives you an upset stomach, or causes any gastrointestinal upset. If you can, release any expectation as to how your body will react and adopt an experimental attitude where you're open to trying new foods, assessing the results, and tweaking, as necessary.

Enjoy More Prebiotic Fibers

Fiber is your friend.

It's not that your organs or tissues need it; it's for your beneficial bacteria. They feast on it. Fiber is what strengthens them, multiplies their numbers, and allows them to do the hard work of digesting food and eliminating waste.

But most of us, especially in the Western world, are not feeding our beneficial bacteria—we're starving them, and in turn destroying the rich diversity we need in our microbiome. The average American barely consumes *16 grams* of fiber on a typical day.⁵⁴ This is a dramatic drop from the fiber consumption of our Paleolithic ancestors, who are estimated to have eaten a daily average of *45 grams* (with variations depending on season and geographical location).⁵⁵

In modern times, indigenous societies have vastly more microbial diversity than other human cultures, where there is a clear trend toward reduced microbiome diversity as diets become more and more Westernized. This is due in large part to the drastically different intake of plants.⁵⁶

The Western diet is abysmally low in the fruits and vegetables that provide the *prebiotic fibers* and *phytochemicals* that are key to growing beneficial bacteria. This has massive consequences for our gut health, our risk of numerous diseases, and our energy levels.

The solution is clear: eat more fiber, especially prebiotic fibers.

These are most beneficial for the gut, stimulating the growth and proliferation of exclusively beneficial bacteria that produce energy-enhancing SCFAs and other molecules critically important for mitochondrial health like urolithin A. One study found that men and women who increased their fiber intake from an average of 18 grams per day up to 30 grams per day for two weeks saw an increased concentration of the beneficial bacteria genus *Bifidobacterium* by over threefold.⁵⁷ While different kinds of prebiotic fibers stimulate the growth of different beneficial bacteria, most offer similar health benefits, like improving metabolic health, stimulating satiety, enhancing immune function, and strengthening gut barrier integrity.^{58,59,60}

Best Sources of Prebiotic Fiber

| Absolute Best | Great | Good |
|----------------------|---------|------------------|
| Artichokes | Cardoon | Endive |
| Jerusalem artichokes | Leeks | Spaghetti squash |
| Salsify | Peppers | Pumpkin |
| Onions | Carrots | Zucchini |
| | | Brussels sprouts |
| | | Cauliflower |

Common food sources of inulin and FOS prebiotics.⁶¹

Because of their high-water, high-fiber content and low calorie density, you should be able to incorporate a generous serving of fibrous vegetables into your diet no matter what diet you're following.

If you have poor gut health and currently eat a low-fiber diet, then you may only see a modest improvement in the beginning. As you introduce more fiber into your microbiome, it can result in gastrointestinal discomfort including gas and bloating. But as your beneficial bacteria begin multiplying and growing stronger, those symptoms should gradually diminish.

With Nick, we first looked at how much fiber he was eating daily. He tracked it for five days and found that on average he ate between 14 and 20 grams. While that was well in line with what typical Americans consume, he needed to significantly increase it. The current Dietary Reference Intake guideline for fiber is 30 to 38 grams per day for men and 21 to 26 grams per day for women.⁶²

I wanted Nick to gradually work up to his target intake over the course of the month. Nick was a meat-and-potatoes guy who went light on the greens, so we focused on finding easy and palate-pleasing ways to incorporate more fiber into his diet. Often, Nick skipped breakfast, but I advised that he add egg casseroles or egg scrambles into the mix. This would allow him to throw in lots of prebiotic-rich vegetables like

onions, peppers, leeks, and zucchini. For lunches and dinners, we added giant salads, stir-fries, and sheet-pan meals. Nick would roast chicken, onions, broccoli, carrots, cauliflower, brussels sprouts, and parsnips in the oven. It was a simple, healthy, and quick way for him to prep multiple meals for the week.

Resistant Starches

When you think about starch and starchy foods, you may think about carbohydrates and higher blood sugar. However, not all starch is created equal. One of the best prebiotic fibers are *resistant starches*, which resist digestion.

This incredibly beneficial type of prebiotic fiber has been linked to greater microbial diversity in the gut, enhanced butyrate production, and improved bowel function.^{63,64} A meta-analysis of studies in animals and humans with inflammatory bowel disease reported that supplementing with resistant starch significantly improved gut integrity and reduced clinical symptom severity.⁶⁵

There are currently five known types of resistant starch, and all can be found in nature or made through cooking except for resistant starch type IV, which is synthetically created.

Resistant starch type I escapes absorption simply because our digestive enzymes can't reach it, usually because it's trapped within a fibrous cell wall. The best source is minimally processed whole grains, particularly if eaten raw or toasted rather than boiled or simmered since the combination of heat and moisture breaks down the fibrous cell walls.

For example, the resistant starch content of uncooked oats is around 7 percent, or 7 grams per 100 grams of uncooked oats.⁶⁶ Yet with cooking, it drops down to just 1 percent due to the swelling of starch granules and destruction of the fibrous cell walls that were preventing digestive enzymes from reaching the starch. To enjoy the benefits of resistant starch in oatmeal, consider eating it in its raw form as muesli or sprinkled over yogurt.

Resistant Starches

| Resistant Starch | Description | Food Sources |
|------------------|-------------------------|--|
| Type I | Physically inaccessible | Minimally processed whole grains |
| Type II | Uncooked amylose | Raw potatoes and green bananas |
| Type III | Retrograde | Cooked and cooled starches like potatoes and rice |
| Type IV | Chemically modified | Synthetic; not found in nature |
| Type V | Amylose-lipid complex | High-amylose starches cooked in the presence of fat, such as stir-fried rice |

Resistant starch type II is similar to type I, except that instead of being confined within a cell wall, it's packed together so tightly that our digestive enzymes can't penetrate it to break it down. Foods high in this type of resistant starch tend to be high in amylose (a type of starch molecule) and uncooked since cooking causes the starch to alter structure and become more digestible. The best examples are raw potatoes and green bananas, which are almost entirely composed of resistant starch type 2 (as you can tell from that distinctive "chalky" taste).

While we certainly don't expect you to eat raw potatoes and green bananas, numerous studies have documented gut and health benefits from adding a couple of tablespoons of green banana starch or potato starch to the diet.^{67,68,69,70} Specifically, there were consistent increases in butyrate-producing bacteria, reductions in pathogenic bacteria, and increases in SCFA production. Try experimenting by adding these starch powders into a smoothie or yogurt, or sprinkle them on anything you will not then cook.

Resistant starch type III is the saving grace of cooking. While cooking destroys certain types of resistant starch and makes most of it accessible for digestion and absorption by our enzymes, if you let cooked starch cool in the fridge, it will form resistant starch type III, also called *retrograde starch*.

The cooled starch molecules will rearrange back into a type that our enzymes cannot access.

Retrograde starch will form in nearly every carbohydrate-rich food you cook and cool, but the best example is the humble spud. A cooked and cooled potato is roughly 4 to 5 percent resistant starch by weight,⁷¹ so if you let a medium baked russet potato cool in the fridge overnight, the next day it will give you nearly 10 grams of prebiotic fiber. (Just don't reheat it too much, as that causes the resistant starch to break back down into normal digestible starch.)

Resistant starch type IV is a synthetic starch that can't be obtained naturally in the diet. Still, if you find and use it as a supplement, just 10 grams per day has been shown to increase the concentration of numerous beneficial butyrate-producing gut bacteria, as well as improve glycemic control, blood lipids, and inflammatory markers.⁷²

Resistant starch type V forms when starch is cooked in the presence of fatty acids, especially saturated fatty acids, and then allowed to cool.⁷³ One study found that cooking a half cup of rice with just a teaspoon of coconut oil and then letting it chill in the fridge for 12 hours overnight increased the resistant starch content tenfold.⁷⁴ In fact, so much of its starch became resistant to digestion that its calorie content was cut in half!

In addition to having Nick add more prebiotic vegetables to his diet, we focused on resistant starches. For those stir-fries Nick made, I advised him to make the rice the night before. Nick liked cooking in batches, so he would make 3 to 4 cups of white rice and toss in 1 to 2 teaspoons of coconut oil. Then the next day, he would sauté a vegetable medley, add an animal protein, and then mix it with the premade rice.

Nick loved potatoes, so the only change we made was in preparation. I had him bake them and let them cool in the refrigerator overnight to bump the resistant starch content.

Lean into Fermented Foods

Natural probiotics supply millions to billions of beneficial bacteria (such as *Lactobacillus* and *Bifidobacterium*) that colonize our gut, produce SCFAs, stop harmful pathogenic bacteria from taking over, and interact with our immune system to enhance its ability to fight infections.^{75,76,77}

You can introduce an assortment of beneficial microbes into your gut by eating and drinking fermented foods including:

- Yogurt
- Cheese
- Kimchi
- Sauerkraut
- Tempeh
- Miso
- Kefir
- Kombucha

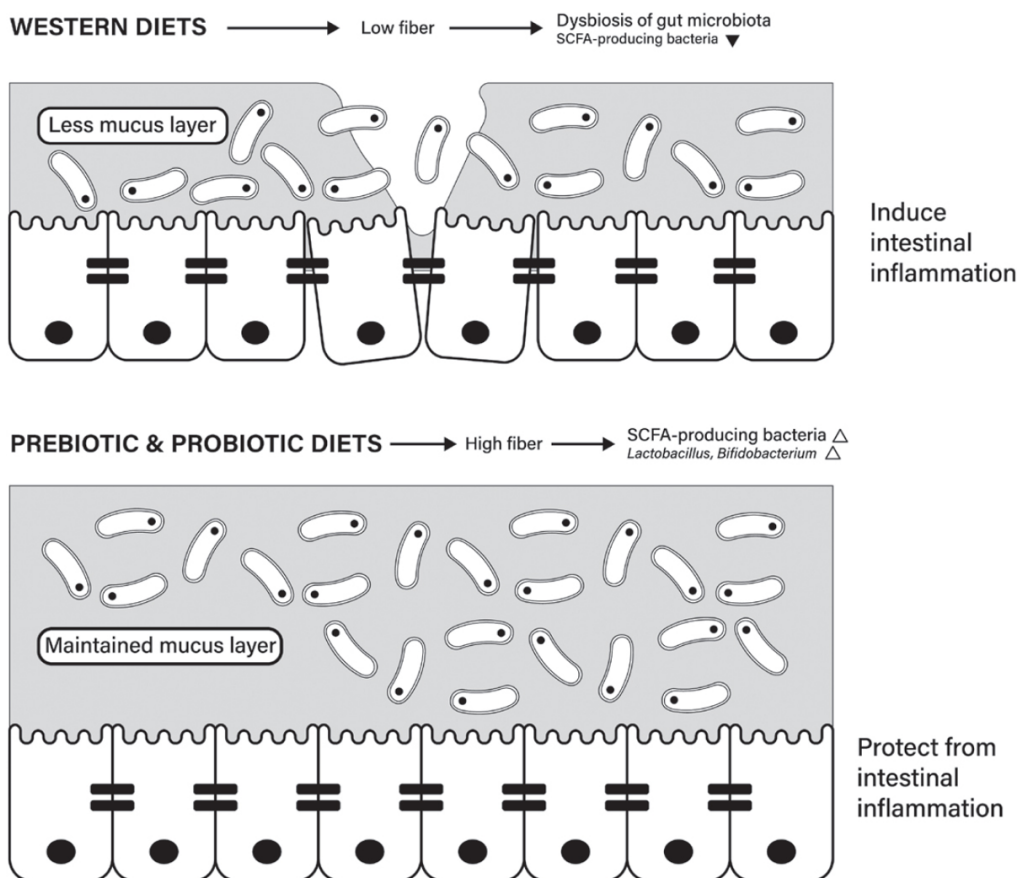
If you don't want to eat fermented foods, you can consider a supplement. Numerous studies have shown that supplementing with probiotics can help turn a dysregulated microbiome into a healthy one.⁷⁸ These probiotic supplements are no different from what we would obtain with a generous serving of fermented food.

For Nick, we looked at ways he could add fermented foods into his diet. Yogurt and cheese became staple snacks, and Nick experimented with kimchi and sauerkraut too. For the first couple of weeks, the fermented foods mixed with the higher prebiotic vegetable intake proved too much for Nick's system, so we took out the fermented foods and focused only on upping his prebiotic and resistant starches.

I love fermented foods and my digestive system processes them fine, but some of my clients report a lot of discomfort

and negative reactions to them. Let me be clear: you *do not* need to eat fermented foods for optimal gut health.

My best advice is to try them for a week and monitor how you feel. Start with smaller servings, like $\frac{1}{4}$ to $\frac{1}{2}$ cup, and see how your body reacts. If you experience a lot of discomfort—gas, bloating—then reduce the amount for a few days and see if that makes a difference. If you still have negative reactions, then take fermented foods out entirely and focus on eating more prebiotic fruits and vegetables. It could be that you need to rebuild more microbiome diversity before you can add fermented foods into the mix.



When More Fiber Isn't Enough

In a perfect world, you would increase your fiber and within a couple of months, your gut microbiome would be healthier, your mitochondria stronger, and your energy levels improved.

But life isn't always perfect.

For some people, switching to a high-fiber diet worsens their gastrointestinal symptoms, including gas, bloating, stomach pain, constipation, or diarrhea. This is because some of the fiber-rich foods like garlic, onions, fruits, leeks, cauliflower, brussels sprouts, wheat, legumes, and grains are FODMAPs (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols).

When some bacteria feed on FODMAPs, they produce a gas that leads to stomach discomfort and many other uncomfortable symptoms. Therefore many people go on an elimination or low-carbohydrate diet⁷⁹—also known as a low-FODMAP diet.

However, a low-FODMAP diet doesn't address the root cause of dysbiosis; it simply starves the bacteria of food so they can't produce gas. In the short term, people may feel better on a low-FODMAP diet, but they are likely doing long-term damage to the health of their microbiome.⁸⁰

To reverse dysbiosis, we need to eat a diversity of fiber-rich plants—possibly supplementing with fermented foods—which will create a robust and healthy microbiome. This is the only solution to digestive issues that treats the root cause of the problems rather than simply masking symptoms of discomfort.

For some people, this may be difficult to achieve given the digestive distress this strategy causes. If this is your situation, please don't give up. It may be tempting to opt for a low-fiber diet, but instead I encourage you to seek out a health care professional who may offer you more guidance and assistance.

Most people in this situation need a personalized protocol to repair, regrow, and restore their gut health. This may include needing to use short-term antibiotics or herbal antimicrobials to first kill off some of the harmful, pathogenic bacteria before repopulating the gut by eating more prebiotic fibers and fermented and other probiotic foods, and/or taking a probiotic supplement.

MAKING THE CHANGES STICK

When I spoke with Nick about six weeks after his initial diet adjustments, he was surprised that adding more fiber to his diet was easier than he had expected. As I had recommended, he focused on just increasing his prebiotic vegetable and fruit intake for the first two weeks. Initially Nick noticed an increase in gas, bloating, and stomach cramps, but he experienced a significant reduction around week two.

At this time, he added about $\frac{1}{2}$ to $\frac{3}{4}$ cup of fermented foods—mostly kimchi or sauerkraut—or yogurt mixed with blueberries, raspberries, strawberries, or an apple (with the peel since that's where the most fiber is). Again, he noticed an uptick in gas, bloating, and cramps, but since he'd been through it before, he had expected this. After another week, the stomach discomfort was still there, so he reduced his serving size, figuring that he just needed to give his microbiome more time to regrow.

Nick was spot-on in playing with portion sizes, listening to his gut, and taking a very thoughtful approach to rebuilding his microbiome. Six weeks in, he was eating about 45 to 50 grams of fiber daily, and he noticed an increase in energy and a dramatic decrease in his stomach conditions. “You don't realize how bad you really feel until you start feeling better,” Nick said. “I have regular bowel movements and a lot less gastric distress, and I didn't realize how self-conscious those conditions had made me.”

In our last coaching session, I left Nick with a final message: “Fiber is your lifelong friend. This is not a strategy that you want to kick to the curb now that your symptoms are improving. You need to constantly feed your microbiome. Those beneficial bacteria depend on you. Feed them the right nutrients, and they will help feed your mitochondria.”

Gut issues are some of the most pervasive health challenges facing people living in our modern world, especially in the West. We must be diligent about taking care of our microbiomes and supporting their diversity. No matter how long you've lived with gut issues, you can course correct, and when you do, your overall health and energy will improve.

ACTION LIST

The following checklist will help you start on your energy healing journey through healing your gut and building a strong microbiome. I recommend that you pick one or two items that feel attainable and try them for at least two weeks or until it feels comfortable.

You may find you are able to implement more than two challenges. That's perfectly fine, but do not overwhelm yourself. Your microbiome won't get rebuilt in a night, so take your time and make sure these changes stick before moving on to the next.

As in other chapters, you'll notice that each challenge has a primary goal with three to four smaller stepping-stones. That's intentional, as establishing new habits often requires baby steps in the right direction. Start with the first stepping-stone and work your way down before checking off the primary goal.

During this time you may notice an increase in gastrointestinal discomfort, but that should subside as your microbiome becomes repopulated again. If the symptoms become too uncomfortable, then reduce the portion size, return to the previous level, or drop one of the challenges.

- **Eat a diet based on fibrous vegetables.**
 - Consume fibrous vegetables with 1 meal per day.
 - Consume fibrous vegetables with 2 meals per day.
 - Consume fibrous vegetables with every meal.

- **Incorporate prebiotic vegetables into your diet.**
 - Eat “great” or “good” sources of prebiotic vegetables with 1 meal per day.
 - Eat “great” or “good” sources with 2 meals per day.

- Eat “great” or “good” sources with every meal.
- The above, plus adding an “absolute best” source at 1 or more meals.
- **Incorporate resistant starch into your diet (Note: you do not need to use all of these; pick whichever is most convenient for you given your dietary preferences).**
 - Consume raw, minimally processed whole grains at 1 or more meals.
 - Consume green banana or potato starch at 1 or more meals.
 - Consume cooked and cooled starches at 1 or more meals.
 - Consume cooked and cooled rice that was cooked with coconut oil.
- **Repopulate your gut with natural probiotics (Note: most important if you are coming from a historically low-fiber diet).**
 - Consume fermented foods with 1 meal per day.
 - Consume fermented foods with 2 meals per day.
 - Consume fermented foods with every meal.

CHAPTER 5

CONTROLLING BLOOD SUGAR SWINGS TO STABILIZE ENERGY

“How did this happen and why now?” Bill said, sounding confused. During our first session, Bill told me that his doctor had just diagnosed him as prediabetic and suggested he take a prescription drug to help control his blood sugar levels—otherwise, Bill was on the fast track to developing type 2 diabetes.

In his mid-60s, Bill had recently become a grandfather for the first time. “I want to be around for my granddaughter and do fun things with her, and I’m scared that this is a sign that I’m on the downhill slope of life.”

Adding to Bill’s fears was the fact that his father had also developed type 2 diabetes later in his life and eventually died from heart disease. (Type 2 diabetes significantly increases the risk of developing heart conditions.)

Bill didn’t want to become his father, but he wasn’t sure he wanted to take the medication his doctor had prescribed either.

While Bill’s prediabetes diagnosis was his greatest health concern, he had additional worries that drove him to seek me out. “I get so tired after a meal that I want to lie down, and all day long I feel like I go from being energized to fighting to stay awake,” Bill explained.

I sympathized with Bill. Anytime we receive a major diagnosis or the medical community doesn't have a label for what's happening to us, it's frightening. It's also discouraging when we don't know what's causing our fatigue or medical condition. However, in Bill's case we knew exactly what needed fixing: his blood sugar levels.

UNLOCKING THE MYSTERIES OF BLOOD SUGAR

The human body needs blood sugar, specifically glucose, to survive.

Our mitochondria use it (along with fats, and amino acids from protein) to make ATP for our cells. However, some organs, such as your brain, use glucose as the main fuel source and need a steady supply of it to properly function. Glucose comes from carbohydrates. When carbs are digested, they break down into glucose, which then passes through your gut lining, gets absorbed into your bloodstream, and is delivered to the cells throughout your body for energy production or for storage and use later.

After you eat, blood sugar levels naturally rise. Then they fall and reach their lowest marks right before your next meal. This rising and falling is normal, but there is a range that is tightly regulated and controlled. If glucose levels fall too low, you may slip into a coma and die. If levels rise too high for too long, then you can damage blood vessels, nerves, and organs.

We need glucose, just not too much and not too little.

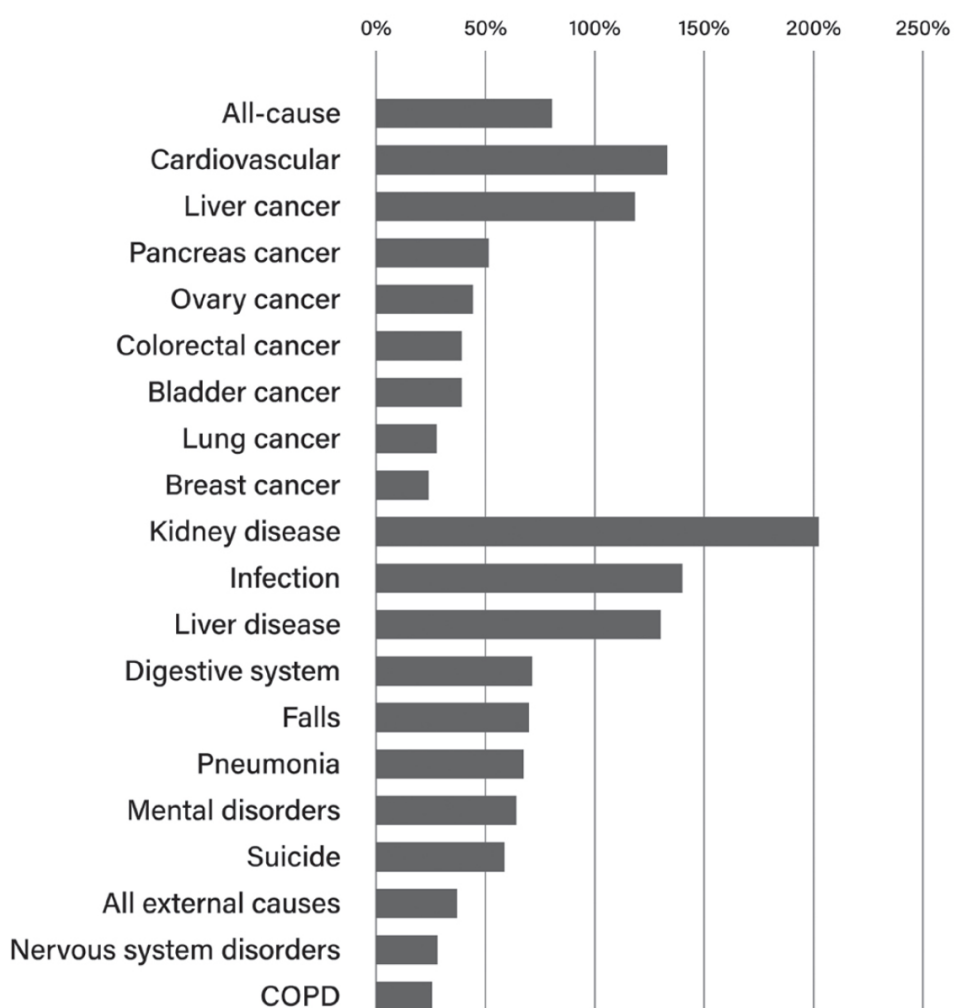
Millions of people, however, have what's called *poor glycemic control*, meaning their bodies have lost the ability to stabilize their blood sugar levels, which causes serious ramifications for their health, wellness, and energy levels.

In the United States, about *42 percent of adults* have been diagnosed as prediabetic or diabetic; roughly 30 percent are diagnosed as prediabetic while another 12 percent have full-blown diabetes, most of which is type 2 diabetes.¹ Type 2 diabetes occurs when the body has chronically high blood

sugar levels that never decline into a healthy range. This is called *hyperglycemia*.

Prediabetes or diabetes is a serious health condition that goes beyond feeling fatigue. A meta-analysis of 97 studies involving over 820,000 adults shows that having diabetes increases your risk of dying from *any cause by 80 percent* and by a variety of other causes by upward of threefold, even after adjusting for other risk factors such as blood lipids, inflammation, age, and BMI.²

RISK OF DYING FROM VARIOUS CAUSES IF YOU HAVE TYPE 2 DIABETES
(% increase compared to not having diabetes)



A diabetic diagnosis is also expensive, costing the U.S. about \$327 billion every year, or roughly \$1 for every \$7 spent on health care.³ On a personal level, if you have diabetes, you can expect to pay more than double for health care than what

someone without diabetes pays yearly: \$16,752 for someone with diabetes and \$7,151 for someone without.⁴

And for people who would not be considered diabetic based on established diagnostic criteria, having glucose levels that elevate too much after eating is still a health risk. The risk of developing or dying from cardiovascular diseases increases as glycemic control worsens, even within ranges that are considered normal within the medical community.⁵

The last and most critical issue around blood glucose control is *glycemic variability*, which refers to swings from high to low throughout the day. Studies show glycemic variability is a primary determinant of daily glucose average in those with and without diabetes,⁶ and it is a significant risk factor for diabetes complications independent of traditional risk factors.^{7,8}

UNDERSTANDING THE BLOOD SUGAR–MITOCHONDRIA LINK

Since your cells use glucose as fuel, if your blood sugar levels swing up and down, drop too low, or stay too high for too long, you will feel fatigue. But you will also get hit with exhaustion because unstable blood sugar levels affect your mitochondria too.

Hypoglycemia

When blood sugar levels fall too low, it's called *hypoglycemia*. This condition can hit rather quickly and is an established cause of sudden death through seizures, respiratory arrest (inability to breathe), and heart attacks.⁹

Since dying isn't advantageous for survival as a species, evolution put in some powerful stopgaps to keep hypoglycemia from happening. The liver, for example, constantly pumps out glucose to keep our blood levels stable throughout the day, and our adrenal glands are quick to hit us with an adrenaline rush if our blood glucose falls too low.

While clinical hypoglycemia that requires medical attention doesn't occur often, don't let this fool you into thinking low blood glucose problems don't exist. Roughly one in three adults experience symptoms of hypoglycemia after eating,¹⁰ and this number can be as high as three out of four adults with diabetes, usually because of their antidiabetic medications.^{11,12}

This is called *reactive hypoglycemia*, when your blood sugar drops too low two to five hours after eating. It's caused by a variety of factors such as accelerated emptying of the stomach, exaggerated gut hormone secretion, a delayed and exaggerated insulin response, insulin resistance that leads to compensatory hyperinsulinemia, or hypothyroidism.^{13,14}

If you're still running low on blood sugar after eating, the amount of available energy for muscles, tissues, and organs such as the brain is reduced. Neurons in the human brain have the highest energy demand, requiring continuous delivery of glucose from the blood.¹⁵ But while the brain only accounts for 2 percent of our body weight, it consumes *20 percent of glucose-derived energy*, making it the main consumer of glucose.

If your blood sugar dips too low, particularly after eating, then you may feel:

- Fatigue
- Shakiness
- Dizziness
- Confusion
- Moodiness
- Anxiety

Some people experience the symptoms of reactive hypoglycemia without having hypoglycemia.¹⁶ This is called *idiopathic postprandial syndrome*, and there is currently no

established reason why it occurs (*idiopathic* means “unknown cause”).

The best explanation is that all the hormones involved in regulating blood glucose are successful in maintaining normal glucose levels but require exaggerated concentrations to do so.¹⁷ For example, a delayed insulin response that would typically result in hypoglycemia is met with a powerful adrenaline rush that prevents hypoglycemia but still causes sweats and shakiness.

Not only will you feel fatigue because your cells literally do not have the fuel they need to burn but your mitochondria will also take a beating. When you have a hypoglycemic episode or hypoglycemic symptoms, it causes mitochondrial dysfunction. When blood sugar levels fall too low, this increases oxidative stress, which sends our mitochondria into cellular defense mode, thus reducing energy production even further.¹⁸

Hyperglycemia

Just as we don't want blood sugar levels to fall too low, we don't want them to remain too high for too long either. That's called hyperglycemia, and symptoms include:

- Fatigue
- Increased thirst and/or hunger
- Blurred vision
- Frequent urination
- Headache

Not only can chronic hyperglycemia lead to prediabetes and then full-blown diabetes, but hyperglycemia is a potent source of oxidative stress within the body, even when occurring only intermittently, like after meals.^{19,20} This damages the mitochondria and causes deficits in energy production.^{21,22,23}

In another blow to our energy levels, the oxidative stress caused by post-meal glucose spikes stimulates the immune system to secrete inflammatory signaling molecules.²⁴ This not only causes fatigue through the “sickness behavior” mentioned earlier but also leads to neuroinflammation that can ultimately cause neurodegenerative disorders and cognitive dysfunction.²⁵

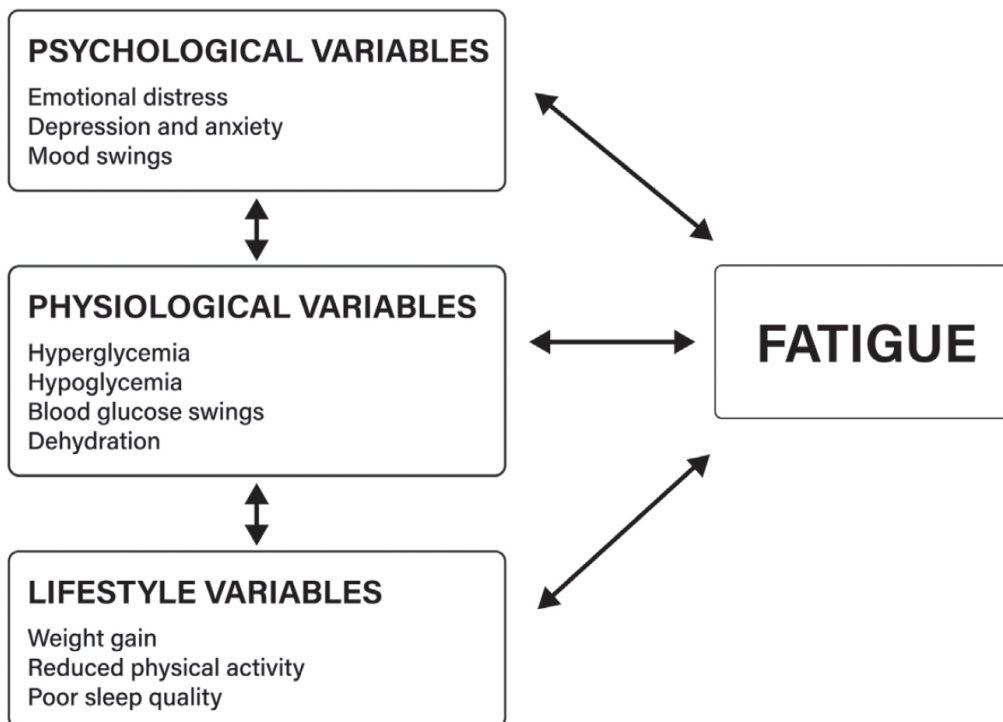
Blood sugar spikes also suppress orexin signaling within the brain.²⁶ Orexin is a neurotransmitter involved in wakefulness and the desire to be physically active. If you have low orexin levels due to poor glycemic control, you’re going to be much more tired and fatigued.

So regardless of your personal health, having poor glycemic control can sap your energy levels. Both post-meal glucose spikes and reactive hypoglycemia cause oxidative stress and mitochondrial dysfunction, particularly within the brain.

If you have diabetes, where elevated blood glucose is chronic, then your energy levels will only continue dwindling. Chronic fatigue is a common problem in those with type 2 diabetes, affecting roughly *two out of every three* adults with the condition and being the second-most regularly complained about symptom.²⁷

Even for diabetics who have adequately controlled their blood glucose levels, fatigue persists—that’s understandable given that mitochondrial dysfunction is an intrinsic component of type 2 diabetes.^{28,29}

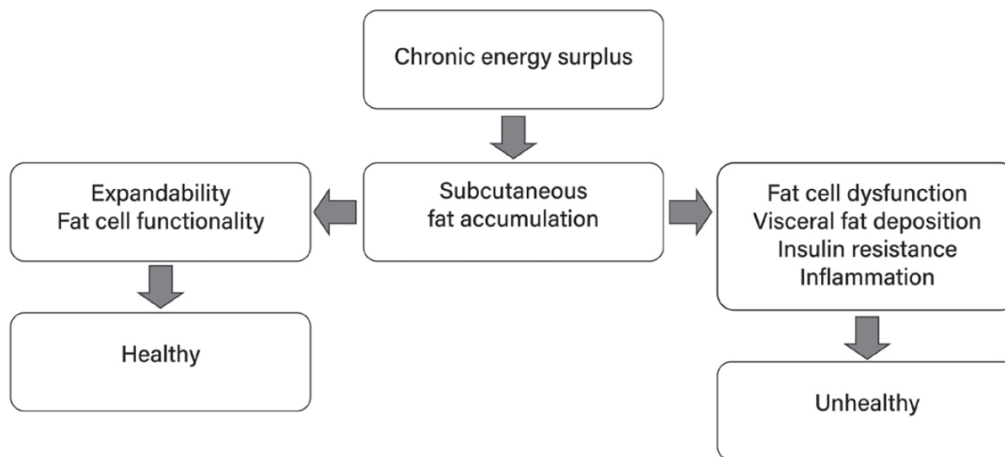
If you’re living with type 2 diabetes, it tanks energy levels not only through its physiological effects but also through psychological and lifestyle factors.³⁰ Some practitioners have coined the phrase *diabetes fatigue syndrome* as a means of establishing diabetes-induced fatigue as its own entity separate from other causes of chronic fatigue.³¹



Exceeding Your Personal Fat Threshold

We all have an optimal range of body fat mass that we need to stay within for our metabolic systems to function normally. Once we've exceeded the upper range of what's called our *personal fat threshold*, our metabolic system can become dysfunctional, which can lead to type 2 diabetes.³²

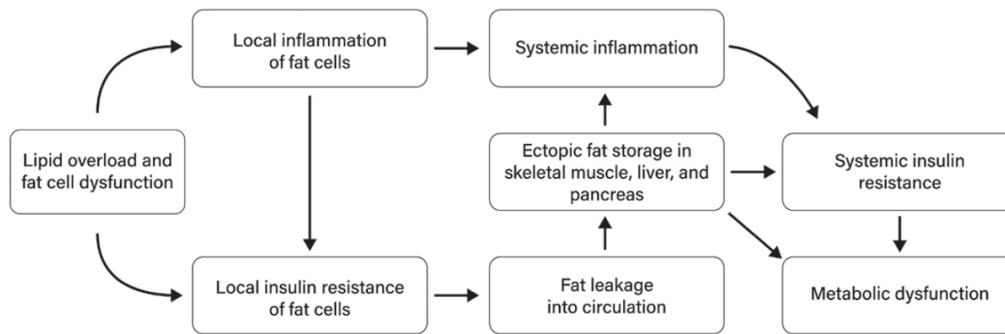
To keep safe, our bodies store fat underneath the skin. This subcutaneous fat sucks up the excess glucose and fat that aren't needed by our organs and muscles and gives them a safe place of storage for later use during times of fasting and famine. As the fat cells take in more energy, they expand in size like a balloon filling with air. But balloons can hold only so much air before they pop. When the fat cells reach a "critical threshold" in their size, they shut themselves off from the energy supply to preserve their own life and secrete molecules that lead to the formation of new fat cells that can take up more energy.³³



The ability to create new fat cells and distribute the energy burden is heavily influenced by our genetics and serves as one of the fundamental characteristics of the personal fat threshold. The more fat cells we have, the more fat we can gain before metabolic abnormalities occur.^{34,35,36} This is why some overweight people are metabolically healthy, while others are not. This also explains why some people can have a “normal” body weight but still develop type 2 diabetes—it’s because they have exceeded their personal fat threshold.

Metabolic dysfunction occurs when fat cells become too large and become insulin resistant in order to preserve their own life.³⁷ If no other fat cells can be recruited to take up the excess glucose, then the body tries to overcome the fat cells’ insulin resistance by pumping out more insulin. It works, but it causes a damaging amount of fat storage in fat cells that results in oxidative stress, inflammation, and insurmountable insulin resistance.

At this point, the fat cells are dysfunctional.³⁸ The oxidative stress and inflammation of the fat cells lead to the secretion of pro-inflammatory signaling molecules that give rise to systemic inflammation. The insurmountable insulin resistance leads to the leakage of fatty acids into circulation that are inappropriately stored in our skeletal muscles, liver, and pancreas (ectopic fat).³⁹ Both systemic inflammation and ectopic fat can each lead to systemic insulin resistance, which causes metabolic dysfunction.



Insulin resistance and metabolic dysfunction ultimately leave the body immensely fatigued, and if allowed to persist for prolonged periods of time, can ultimately reach the apex—developing into type 2 diabetes.

STRATEGIES FOR STABILIZING BLOOD SUGAR LEVELS

If you want optimal energy and good health, then you want stable blood sugar levels throughout the day and night. That means minimizing huge blood sugar spikes, preventing large dips after a meal, and avoiding chronic hyperglycemia, which can put you on the path toward type 2 diabetes.

When it comes to improving your blood sugar levels and glycemic control, it's all about food. Blood sugar levels are directly connected to two things: (1) what you choose to eat and (2) your body fat.

As you learn about the following nutritional strategies, I want you to focus on regaining your power to control your blood sugar levels. It does reside with you and the choices you make for your diet. Diet alone can reregulate your levels and can even reverse prediabetes and type 2 diabetes diagnoses. (Yes, you really can change the course of this disease.)

Some of the nutritional strategies I detail in this chapter will probably be familiar to you—that's because they are the same strategies that help rewire your energy clocks and induce fat loss. In this chapter, I share the science-backed evidence on why you want to consider deploying these tactics to control blood sugar spikes and drops.

Don't hesitate to revisit previous chapters, especially [Chapters 2](#) and [3](#). Circadian dysregulation and excess fat mass often go hand in hand with blood sugar issues, so embarking on a sleep recovery and/or fat loss journey will likely improve your glycemic control, especially if you have prediabetes, type 2 diabetes, or some other form of metabolic dysfunction.

For those people in the non-diabetic category, blood sugar issues may still be the cause of your fatigue. My best advice is to always stay regular on your blood work. When working with your doctor, make sure to check your fasting glucose, HbA1c, and fasting insulin. The glucose/insulin response to an oral glucose tolerance test can also be helpful for determining glycemic control.

Finally, pay attention to how you feel after a meal. Food is energy, so ideally you should feel energized after eating instead of lethargic or sleepy. While post-meal energy levels are connected to more than just blood sugar levels, blood sugar is one of the primary determinants and influences. And if you often feel fatigued post-meal, then you will want to pay close attention to this chapter.

Reversing Type 2 Diabetes

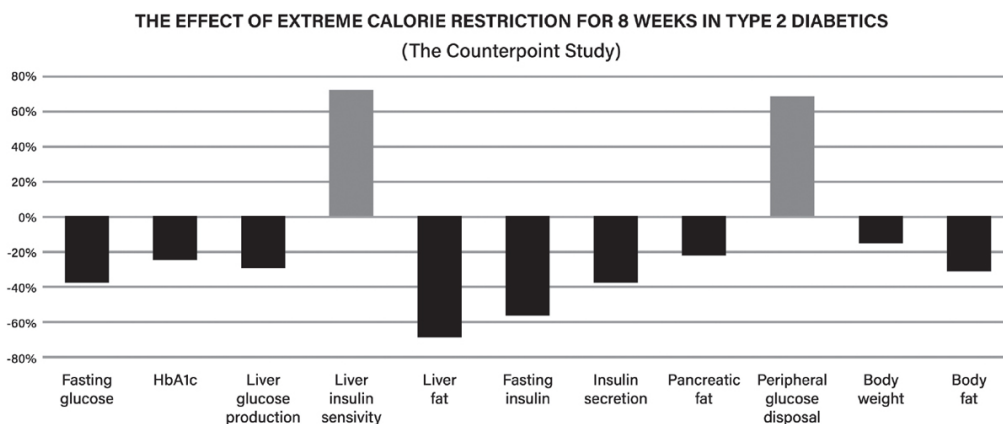
Did you know that it is possible to reverse type 2 diabetes in just a *few weeks*?

Over the last decade, numerous studies have shown that diet alone can reverse type 2 diabetes. It all comes down to losing enough body fat so you no longer exceed your personal fat threshold.

Roy Taylor, the man who first developed the personal fat threshold concept, has spearheaded these investigations.^{40,41,42} In his proof-of-concept Counterpoint study,⁴³ a group of overweight and obese individuals who had type 2 diabetes for less than four years were fed a 600-calorie liquid diet for eight weeks while they simultaneously stopped taking all their diabetes medications.

The results were as follows:

- The participants lost an average of 34 pounds, or roughly 15 percent of their starting body weight, with 83 percent coming from their body fat.
- Skeletal muscle insulin sensitivity and ability to uptake glucose from the bloodstream was increased by 68 percent.
- Liver fat declined by 70 percent, completely resolving those who had a fatty liver diagnosis when the study began. This was accompanied by a 72 percent increase in the liver's insulin sensitivity and a 34 percent reduction in the liver's glucose output.
- Pancreatic fat dropped by 23 percent, leading to a normalization of the insulin response when eating carbohydrates.
- Fasting glucose levels fell by 40 percent, fasting insulin was cut in half, and HbA1c was reduced from 7.4 percent to 6 percent.

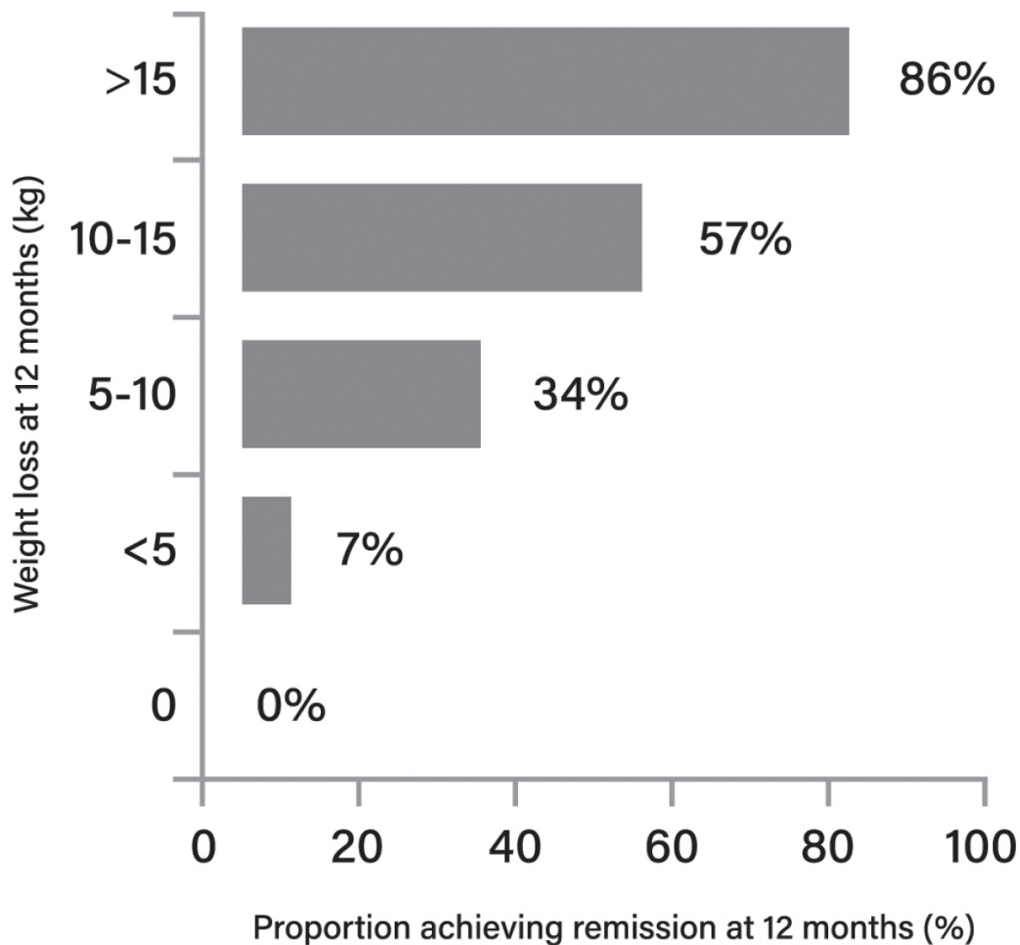


In eight weeks of extreme dieting, participants reversed their diagnosis of type 2 diabetes. In a follow-up study, Taylor had participants diagnosed with type 2 diabetes again do a 600-calorie diet for eight weeks, which was followed by a slow reintroduction of regular food over the course of six months.⁴⁴ Taylor found that as long as participants kept off the weight they had lost, the type 2 diabetes reversal persisted. These individuals also ate more calories and carbohydrates without any problems.

However, not everyone reversed their diabetes despite losing significant amounts of weight. While 87 percent of those who had type 2 diabetes for less than four years responded well to the fat loss intervention, only 50 percent of those who had diabetes for longer than four years were successful. One possible reason is that the longer you live with diabetes, the more pancreatic damage is likely to occur. Too much pancreatic damage and dysfunction may prevent reversal of diabetes despite fat loss. Furthermore, if you've had diabetes (or other diseases) for years and it's caused substantial damage (e.g., cell death) in certain tissues and organs or glands of your body like the pancreas, then it's likely that you will not *completely* reverse a type 2 diabetes diagnosis.

Whether or not they were able to reverse their type 2 diabetes diagnoses, by losing fat and keeping it off, all of the participants in the study still experienced marked health improvements, including healthier body compositions, the restoration of insulin sensitivity, and liver fat and functioning normalization.

Taylor confirmed his findings in his later, yearlong DiRECT study,⁴⁵ which showed that the chances of reversing diabetes increased proportionally to the amount of fat loss—only 7 percent of participants who lost fewer than 12 pounds successfully reversed their type 2 diabetes compared to a staggering 86 percent of participants who lost more than 33 pounds.



Some people reversed their diabetes when losing as little as 10 pounds because they had less weight to lose than others. Remember that type 2 diabetes is connected to exceeding our personal fat threshold, which is unique to each person. The amount of fat loss required for reversing type 2 diabetes will depend on the starting point, assuming that one's pancreas can resume normal functionality and insulin secretion.⁴⁶

I'm not sharing this because I want to discourage or disappoint you. Losing fat will always have health benefits, and it's a journey that I encourage all my clients to take if they need to. However, I'm also not in the business of overhyping strategies. My goal is to provide you with the information you need to make the best choices for your health.

If you have type 2 diabetes, the takeaway is one of hope and optimism. You can reverse this diagnosis through fat loss. And for those people who have lived with this disease for many years, while you may not reverse it entirely, you can still make

huge improvements in your overall health and well-being by reducing fat mass.

And no, you do not need to go to the extreme the Counterbalance participants did to kick-start the process. The only factor that matters is fat loss. You don't need to starve yourself on very-low-calorie diets or follow any specific diet to reverse diabetes.

You just need to lose fat.

And for those of you who may have pancreatic damage, there is hope. Studies show that the pancreas can heal and regenerate if given some time and the opportunity to do so by maintaining fat loss over the long haul.^{47,48}

Switch to a Low-Carb Diet

It's normal and expected to have your blood glucose increase after eating carbohydrates, just as it's normal and expected to see blood increases in lipids after eating dietary fat and in amino acids after eating dietary protein.

However, if you are struggling to keep your blood glucose levels low, then eating fewer carbohydrates can be incredibly therapeutic—especially for prediabetic and diabetic people. Numerous studies and meta-analyses suggest that low-carbohydrate diets are more effective than moderate- or high-carbohydrate diets at lowering average blood glucose levels (HbA1c), reducing diabetes medication requirements, and putting type 2 diabetes into remission.^{49,50}

The American Diabetes Association and the European Association for the Study of Diabetes endorse low-carbohydrate diets for addressing the elevated blood glucose levels seen in type 2 diabetes.^{51,52} However, they rightly point out that overall diet quality still matters.

In particular, these organizations acknowledge that reducing overall carbohydrate intake is most effective for improving glycemic control and blood sugar levels, no matter the eating pattern or diet. Ketogenic, vegetarian, Mediterranean, or paleo diets can all work, provided you eat enough fibrous

vegetables, fermented foods, and prebiotic fibers to maintain gut health.

If you opt for a low-carb diet, you will want to cut out carbohydrates and starches that cause blood sugar levels to spike, including cereal grains, breads, breakfast cereals, rice, pasta, most fruit, starchy tubers like potatoes and carrots, corn, and most beans and legumes.

Other foods, like cow's milk and most dairy, berries, and soy products, can be eaten in moderation, while meats, seafood, eggs, Greek yogurt, nuts and seeds, and fibrous, non-starchy vegetables such as tomatoes, eggplant, cabbage, and spinach can be eaten without restrictions.

Low-Carbohydrate Diet

| No Restrictions | Monitor Intake | Avoid |
|---|--|---|
| Meats and seafood Eggs Cheese Greek yogurt Nuts and seeds Fats and oils Fibrous vegetables Protein powders | Milk and most dairy Berries Soy products | Cereal grains Starchy tubers Most fruit Most beans and legumes |

Bill's prediabetes diagnosis told me that he was at a weight that was over his personal fat threshold. While I didn't know for certain what Bill's magic number was, I could look at how much extra fat mass he carried and direct him to reduce that number.

Bill was a big guy. A former football linebacker who had played college ball, he had spent his career working as a construction foreman. It was a physically demanding job, so Bill figured that he burned enough daily calories to be lenient with his diet. A few times a week, he would have a burger and fries, pizza, a ham sandwich with chips, or spaghetti and meatballs with garlic bread on the side. He was also prone to late-night snacking.

Bill had about 25 to 35 pounds of excess fat mass, and just looking at his diet, I knew he would see marked and fast changes just by moving to a low-carb diet. But I also knew that given Bill's typical eating patterns, some of these changes might be hard for him to sustain.

Wanting to set up Bill for success, I suggested he start by eating one meal that replaces foods on the "avoid" list with those from the "no restriction" list. "Do this for two weeks, and then I want you to aim for two meals per day that contain only foods from the 'no restriction' list," I told Bill. "Then in a month, we're going for three meals."

My hope was that by gradually transitioning him to a low-carb diet, Bill would stop craving the carb-laden foods, start seeing progress with losing fat, and see some—albeit a little—energy improvement. These small steps in the right direction

were aimed at motivating Bill and priming his body and mind to embrace these small, relatively easy changes.

I'm also very realistic and know that psychologically when we tell ourselves we can't have a certain food, it's all we focus on and crave. Switching to a low-carb diet can feel shocking to our system, and not always in a good way. A gradual change can make the difference between weight regain and a sustainable fat mass reduction that lasts.

“Remember, this isn't calorie counting, so you can eat as much as you need to satisfy your hunger from the ‘no restriction’ list,” I told Bill.

Low-carb diets may seem restrictive, but the choices you have are endless. You get to eat as much animal protein and fish, fresh vegetables, healthy fats, Greek yogurt, and certain other dairy as you like. If your diet contains a lot of carbohydrates and starchy vegetables, then you will likely see some fast results from going low carb in terms of fat loss and energy improvement. Your blood sugar levels will also improve quite drastically in a matter of weeks.

But as important as low-carbohydrate diets can be, they do not inherently address the cause of type 2 diabetes, which is excess fat mass. If someone isn't actively losing fat mass, then a low-carbohydrate diet can reduce blood sugar levels, but it will not reverse the disease processes. Some people may lose fat mass through a low-carbohydrate diet, but if that isn't happening, then other fat loss tools will need to be added.

Embrace Time-Restricted Feeding

If you're struggling with glycemic control, then you'll want to look closely at how late you eat and how you sleep. There are often links between circadian misalignment and dysregulation and poor glycemic control.⁵³ Circadian dysregulation disrupts glucose metabolism, which occurs through direct mechanisms, such as impaired pancreatic and fat cell functioning, and indirect mechanisms including dysregulation of the gut microbiome, immune and endocrine systems, and satiety signaling.^{54,55,56}

If you're not getting seven to eight hours of sleep each night, it can affect your body's ability to use insulin and absorb glucose. For instance, getting just five hours of sleep reduces insulin sensitivity—which decreases the body's ability to absorb and use glucose for energy—by 23 percent. That number doubles to 47 percent for people who sleep in short bursts combined with staying up all night and going to sleep around 9:00 A.M.⁵⁷

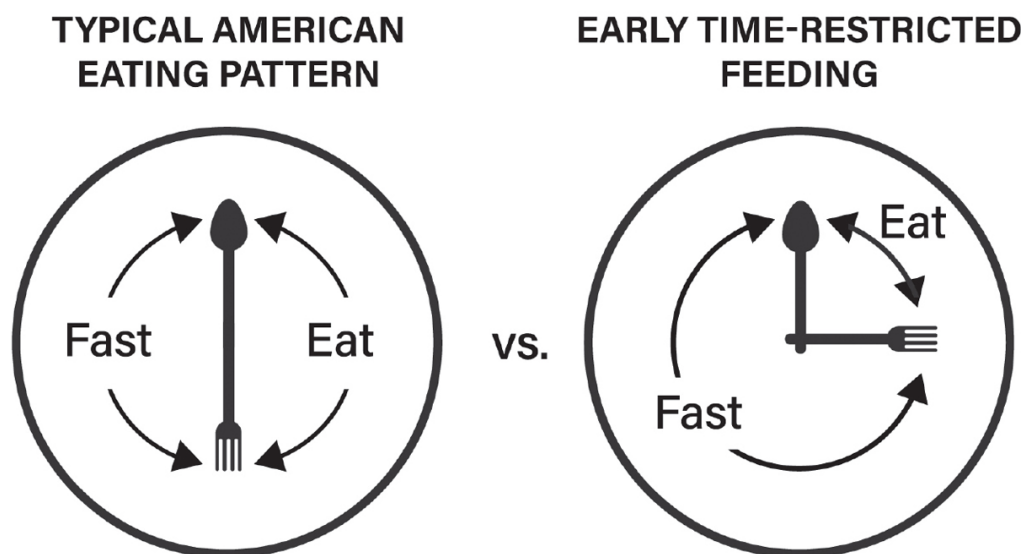
Numerous studies have found that sleeping for less than five to six hours per night is also associated with an increased risk of developing type 2 diabetes and that these short sleep durations reduce glycemic control and insulin sensitivity.⁵⁸ Poor sleep quality can be due to actual sleep duration, as well as fragmented sleep, sleep apnea, and circadian rhythm disruption.

In fact, one meta-analysis found that difficulty initiating sleep was associated with a 55 percent increased risk of developing type 2 diabetes, while difficulty maintaining sleep was linked to a 72 percent increased risk.⁵⁹ The risk of developing diabetes associated with getting too little sleep (\leq five hours per day) or having poor sleep quality was greater than that of being sedentary.

One driver that keeps people awake is when they eat. In humans, a plethora of evidence shows that many anabolic rhythms—when the body uses the energy our mitochondria produce—peak in the morning or early afternoon, and that glucose tolerance is worse in the evening and at night, which is when most people consume a high percentage of their daily food.⁶⁰ We've known since at least the 1970s that if you have normal glucose tolerance in the morning, you're likely to be metabolically equivalent to someone with prediabetes in the evening.^{61,62}

In healthy men and women, eating a meal at 8:00 P.M. leads to a 29 percent greater peak glucose response, 86 percent larger total glucose response, and 66 percent more time spent in hyperglycemia than eating the exact same meal at 8:00 A.M., even after both meals are preceded by a 12-hour fast.⁶³

If you're struggling with a disrupted circadian rhythm and/or you typically eat late into the evening, then you'll want to consider using time-restricted feeding (TRF). This will help you better control your blood sugar levels. One study involving men with prediabetes found that eating three meals within a six-hour TRF window benefited glycemic control, insulin sensitivity, blood pressure, and oxidative stress compared to eating those same three meals within a 12-hour window.⁶⁴



Similarly, a study in people with type 2 diabetes reported that eating two meals within a 10-hour TRF window resulted in significant reductions in body weight and improvements in glycemic control and insulin sensitivity compared to eating six meals per day across a longer eating window.⁶⁵

Whether you choose to eat most of your food in the morning or evening will depend on your preferences. Although there's data showing that people with type 2 diabetes have better blood sugar control with a big breakfast compared to a big dinner,⁶⁶ there's also data showing that blood sugar control improves with skipping breakfast over several weeks.⁶⁷

The body's circadian rhythms are heavily influenced by the timing of food intake, so it makes sense that it will "learn" about our regular mealtimes and adjust its internal clocks accordingly. That's why regular breakfast skippers don't show the same negative effects of skipping breakfast that we see in regular breakfast eaters who skip.⁶⁸

If you're using TRF, just make sure you stay consistent with mealtimes throughout the day, whether you start your window of eating at 8 A.M. or at 11 A.M. Having erratic and spontaneous eating times is a surefire way to cause blood glucose swings, insulin resistance, and poor energy levels throughout the day.^{69,70}

Bill often fell asleep quickly, but he woke up a couple of times each night. I knew that improving his sleep could also help him attain better glycemic control, so we gradually worked to get him to a 10-hour TRF. For one month, Bill tried to eat in a 12-hour window between 7 A.M. and 7 P.M. He started slowly, doing this about three times per week for two weeks, then moving to four times per week for a week, then five to six times per week. Then he used the same pattern to close his eating window to 10 hours, aiming for 8 A.M. to 6 P.M.

Drink Vinegar before Meals

Better blood sugar control can be yours in as little as 10 seconds. The trick? Start every meal with a shot of vinegar.

A meta-analysis of studies looking at how vinegar impacts blood glucose control found that having 1 to 2 tablespoons before eating reduced the overall post-meal blood glucose response by 11 percent and the overall insulin response by 16 percent.⁷¹ What's more, it didn't matter if you had diabetes or were otherwise healthy—vinegar benefited glycemic control in everyone.

These benefits are likely owed to the defining characteristic of vinegar that makes it tart and acidic: its acetic acid content.⁷² Studies have shown that acetic acid slows digestion and inhibits our digestive enzymes that break down starch and sugar.^{73,74,75,76} These effects will cause a slower and less pronounced increase in blood sugar levels after eating.

More importantly, acetic acid increases the expression of AMPK (AMP-activated protein kinase) and GLUT4 (glucose transporter type 4), which are proteins that increase glucose uptake and use in the body.^{77,78} Consuming vinegar increases carbohydrate storage in our muscles as glycogen,⁷⁹ even in

people with type 2 diabetes.⁸⁰ Additionally, vinegar has been shown to stimulate vasodilation (the dilation of blood vessels, which decreases blood pressure) and increase blood flow to skeletal muscle,^{81,82} both of which are considered important components of insulin-mediated glucose uptake.⁸³

If you are going to eat a meal that contains some carbohydrates, then consuming 1 to 2 tablespoons of vinegar is an easy way to increase your insulin sensitivity to the incoming glucose load.

Any vinegar will work, although apple cider and red wine vinegars tend to taste better. You will often see apple cider vinegars advertised as raw (unpasteurized) and unfiltered, thereby preserving “the mother.” This is simply a nontoxic slime composed of yeast and acetic acid bacteria that forms during the fermentation process that creates vinegar.

The mother of vinegar appears to be a major source of bioactive compounds and antioxidant activity in vinegar, as well as minerals such as potassium, magnesium, calcium, and iron.⁸⁴ It remains to be determined whether consuming the mother has any discernible effect on health, but if you have the choice, it seems prudent to opt for it.

This doesn't have to be a literal shot of vinegar. You can mix it with water to dilute it, or you can use it as a salad dressing. Mix 1 to 2 tablespoons of vinegar such as red wine or apple cider with olive oil and toss it over a salad or over vegetables. This is how I had Bill incorporate vinegar into his diet. Admittedly, he didn't use it before every meal, but he aimed to have a salad one to two times per day and chose to eat it first to get that vinegar into his system.

Eat Your Veggies First

We can make a huge impact on our blood glucose control by changing the order in which we eat our food during a meal. Several studies in people with type 2 diabetes or prediabetes,^{85,86,87,88} as well as healthy folk,⁸⁹ have found that eating fibrous vegetables at the beginning of a meal, before eating starchy carbohydrates, reduces blood glucose and

insulin levels by 20 to 70 percent and 25 to 50 percent, respectively.

And if life gets in the way and prevents you from eating them with every meal, the same benefits are observed with just eating protein before any carbohydrates.⁹⁰ The theme is to simply eat your sources of carbohydrate (grains, legumes, tubers, etc.) last in the meal.

These glycemic benefits can also have a long-term effect. In one randomized, controlled trial involving adults with type 2 diabetes, taking the advice to eat veggies first and carbohydrates last in each meal was significantly more effective at lowering HbA1c than having them follow the standard American Diabetes Association advice of using a diabetic exchange food list.⁹¹

The benefits were seen in as little as one month and lasted for at least two years, when the researchers stopped collecting data. Overall, HbA1c from this little trick was slashed from 8.3 percent to 6.8 percent—just from altering the order in which the same foods within a meal were eaten. Essentially, the participants moved from full-blown diabetes to the lower cutoff of a diagnosis (>6.5 percent is diabetes, 5.7 to 6.4 percent is prediabetes, and 4 to 5.6 percent is considered healthy).

Another study, in elderly adults with type 2 diabetes, reported similar findings: eating high-carbohydrate foods last within a meal significantly lowers post-meal blood glucose levels, blood glucose swings throughout the day (meaning more stable energy levels), HbA1c, and fasting glucose.⁹²

I wanted Bill to keep it simple. Whenever he could, he was to eat his fibrous vegetables first, and if he didn't have any in a meal, which sometimes happened during breakfast, then he was to go for the protein, always leaving the carbohydrates like rice and bread for last (that is, if he were eating them, because we still had him focused on eating a low-carbohydrate diet).

Cinnamon

There are approximately 250 species of cinnamon, but cassia cinnamon is probably what you have in your cabinet. It is the most common cinnamon in the world, and studies have shown it can benefit glycemic control. For example, a meta-analysis of those with type 2 diabetes reported that eating 1 to 6 grams ($\frac{1}{4}$ to 1 teaspoon) of cinnamon per day significantly lowered fasting blood glucose by an average of 24 mg/dL (1.3 mmol/L), which corresponded to 12 to 17 percent for the group.⁹³ Even if you don't have type 2 diabetes, you can benefit from some cinnamon. In overweight adults, adding a teaspoon of cassia cinnamon to oatmeal or farina porridge was shown to lower the glycemic and insulin responses, suggesting enhanced insulin sensitivity.^{94,95}

In healthy adults, consuming 1, 3, and 6 grams per day of cassia cinnamon over 40 days has been shown to reduce post-meal blood glucose levels, with the greatest effect seen with 3 and 6 grams (an 11 to 13 percent reduction).⁹⁶ Another study reported that 5 grams of cinnamon taken during a glucose tolerance test reduced the post-meal glucose response by 13 percent and improved insulin sensitivity compared to a placebo.⁹⁷

The reason cinnamon works to control blood sugar is that it facilitates glucose uptake from the blood into tissues like our muscles.⁹⁸

Bill wasn't a huge cinnamon fan, so I didn't push this for him. When working with clients, I seek the path of least resistance and find what nutritional approaches, including specific foods, resonate the most. This is a great reminder that not all the strategies you come across will be right for you, and that's okay. Take the ones that excite you, and when you're feeling adventurous, I urge you to go outside your comfort zone to try something new. If you try something and it doesn't work, then let it go and move on. There are plenty of strategies to experiment with, and you will find the best ones that work well for you.

If, unlike Bill, you like cinnamon, then I urge you to incorporate it into your diet. Use it as a spice for your chicken

or ground beef or sprinkle it onto Greek yogurt—about a teaspoon (5 grams) per day should do it.

MAKING THE CHANGES STICK

Bill had just been diagnosed as prediabetic, so I knew there was a strong chance that he could reverse it simply by moving to a low-carb diet, incorporating a salad with vinegar before each meal, and eating his vegetables first followed by his protein.

“Our focus will be on helping you shed some fat mass so you can move back into your personal fat threshold,” I told Bill. “You don’t need to count calories. Just focus on removing carbs—especially breads, pastas, and rice—while increasing your healthy, wholesome vegetables, and let’s cut out the late-night snacking.”

The last thing I ever want to do is to overwhelm my clients with too many nutritional strategies, so I held off on introducing other tips on improving body composition. Incorporating too many changes can make them unsustainable, and sometimes our bodies don’t welcome or respond well to multiple changes. Minor changes really do add up over time.

In one month, Bill was down about 10 pounds, and he was excited. He felt his energy levels were rebounding, although he still got fatigued, especially in the afternoon. At this point it seemed that Bill was ready to add more nutritional strategies, especially on fat loss and returning to a healthier body composition, so I had him increase his protein per meal and ideally add a 15-minute walk after every meal. Knowing that sometimes it wouldn’t be possible, I told Bill to at least walk after his heaviest meal.

Three months later, Bill was down another 25 pounds, for a total fat loss of 35 pounds in four months. Overall, Bill said he hadn’t felt this good or energized since he was in his 20s. He felt less irritable and moody. He was sleeping better, and when he went for a follow-up exam with his doctor, his blood results showed that he no longer met the diagnosis for prediabetes. This was fantastic news for Bill and what I hope for with all

my clients struggling with blood sugar and/or a prediabetes/diabetes diagnosis.

Bill reached his goal, but his race wasn't done; it was just starting.

Bill now had to maintain his fat loss to stay within his personal fat threshold if he wanted to keep diabetes at bay. While he had gone on a rather restrictive low-carb diet, he wanted to slowly reintroduce some foods like the occasional bread or pasta. I tell my clients that reintroducing foods is a personal preference. Some people can eat certain foods in moderation, while for others, it's all or nothing and that "all" can tip the scales into an unhealthy place.

There's no right answer other than to be aware of your habits. If you can eat the occasional slice of bread or serving of pasta or ice cream, have it. But if that one serving is the entire loaf, box, or carton, then perhaps removing it from your diet is the healthier choice. Overall, though, I support a balanced diet that you can sustain over the long haul that keeps your blood sugar in check and your energy strong.

Poor glycemic control and unstable blood sugar levels are often caused by having excess fat, so embarking on a fat loss journey can lead to better blood sugar levels. If your diet got you into this mess, then it can get you out. The choice and power to change are yours.

ACTION LIST

To kick off better glycemic control, I encourage you to pick one to three items you can implement today. Stick with them for at least three to four weeks, or until they become habitual, and then add another one to three to your daily routine.

As in other chapters, you may find that you can incorporate more than three. That's fine if it's sustainable, but don't overwhelm yourself. Restoring better glycemic control takes time, so make sure you can perform each task effortlessly and efficiently before moving on to another.

Also, you'll notice that each task except the last has a primary goal with three to four smaller stepping-stone goals beneath it. That's intentional, as establishing new habits often requires baby steps in the right direction. I urge you to start with the first stepping-stone and then work your way down before checking off the primary goal box.

- **Reduce your intake of digestible carbohydrates.**
(Note: this may not be necessary depending on your personal needs and dietary preferences.)
 - Replace “avoid” foods with “no restriction” foods at 1 meal.
 - Replace “avoid” foods with “no restriction” foods at 2 meals.
 - Replace “avoid” foods with “no restriction” foods at every meal.
- **Confine your food and caloric beverage intake to a time-restricted window.**
 - Consume all your calories within 12 to 14 hours.
 - Consume all your calories within 10 to 12 hours.
 - Consume all your calories within 6 to 10 hours.
- **Eat sources of protein and fibrous vegetables before sources of digestible carbohydrate.**
 - At 1 meal.
 - At 2 meals.
 - At every meal.
- **Consume at least 5 grams of cinnamon per day, preferably spread across carbohydrate-containing meals.**

- At 1 meal.
 - At 2 meals.
 - At every meal.
- **Drink 1 to 2 tablespoons of vinegar (diluted in water or used as a dressing over salad) before eating your meals.**
 - At 1 meal.
 - At 2 meals.
 - At every meal.
- **Obtain a healthy body composition by losing fat mass and building muscle mass. (Note: this may not be applicable to you if you're already at a healthy body composition.)**
 - Follow the recommendations put forth in [Chapter 3](#).

CHAPTER 6

BOOSTING YOUR BRAIN FOR ENERGY PERFORMANCE

Stephanie had gone from climbing mountains to barely walking two blocks. “My energy levels are so low, all I do is mope around my apartment, and my brain function has been affected severely,” she told me the first time we met. “My doctor told me that my cognitive decline is accelerating and I’m beginning to show signs of early-onset dementia.”

In her early 50s, Stephanie felt miserable and lacked any motivation. “Socializing is an extreme effort, and I’ve started avoiding most situations because they become too overwhelming too quickly.”

Stephanie felt like her brain had broken right along with her energy levels. She suffered from memory issues and brain fog—these symptoms, combined with her extreme fatigue, had exacerbated her anxiety and depression. “My life is intolerable. I’m existing in chronic pain, unhappiness, and exhaustion.”

UNLOCKING THE MYSTERIES OF YOUR BRAIN

Most people I work with never suffer from just fatigue—it’s usually multiple health conditions that leave them feeling worn out, desperate, and hopeless. It’s been decades since I

experienced the devastating impacts of mono, but I can still remember that feeling of despair and fear—fear because not only does getting to the underlying cause take time but there’s never a silver pill or one Holy Grail switch that turns your life around.

And when your brain health is affected, it can feel more terrifying because you don’t recognize yourself. You can’t think clearly. Sometimes the most mundane daily tasks leave your brain fuzzy and confused. Your moods can quickly shift from irritable to anxious to depressed.

Your brain is the central hub of your life. It determines virtually all bodily commands and behaviors, from breathing to what you think to what you feel. If your brain isn’t working at capacity, not only does it have grave consequences for your health but it also reduces your energy levels.

People struggling with energy and fatigue problems, especially in the more severe stages of chronic fatigue, often experience brain-related symptoms, including:

- Brain-related fatigue (feeling fatigued, exhausted, or sleepy, almost as if your brain turns off after a mentally demanding task such as working at your job, reading a book, studying, or driving a car)
- Brain fog (a type of cognitive dysfunction that involves memory problems, lack of ability to concentrate, lack of mental clarity, clouded thoughts, slow thought processes, and poor focus)
- Loss of resilience (to stress, fragility, and even relatively minor psychological stress or physical activity)
- Depression or anxiety
- Fibromyalgia or migraines
- Psychological conditions or psychiatric conditions

People often think of these conditions as separate and unrelated; however, they’re intertwined.

Even if you have mild to moderate fatigue, it's likely that you also suffer from brain-related symptoms. Why? Because these health conditions and fatigue are connected at the cellular level in the brain.

UNDERSTANDING THE BRAIN HEALTH–MITOCHONDRIA LINK

Your brain is a complex organ, and two primary components of it that keep your body properly functioning are *neurons* and *neurotransmitters*. Neurons are information messengers, or the buildings in your brain's city. Neurons are responsible for generating signals and communicating within the brain and nervous system what is happening—or needs to happen—in the body.

Neurotransmitters are the chemical messengers carrying the signals and information from the neurons throughout the brain and nervous system. If neuronal buildings generate messages to be communicated, neurotransmitters are the people who carry messages from building to building.

You need both neurons and neurotransmitters—the signal and the unimpeded transmission—for optimal brain health, overall wellness, and strong energy levels. If your neurons get damaged or become dysfunctional, or if your neurotransmitters become disrupted and imbalanced, then your brain can't send or deliver the right signals for energy production.

There's a strong connection between chronic fatigue and widespread changes in brain structure and function. If you are battling with chronically low energy levels, then there is a good chance that poor brain health is at least partly responsible.

A systematic review of 55 studies involving chronically fatigued patients found widespread changes in brain structure and function compared to those without chronic fatigue, including:¹

- Disrupted autonomic nervous system activity
- White matter volume loss and brain shrinkage
- Functional connectivity deficits between brain regions
- Impaired cognition and memory
- Reduced cerebral blood flow and nutrient delivery
- Predisposition to depression and anxiety

One of the biggest reasons for worsening brain health and mood disturbances is mitochondrial dysfunction. The brain is rich in mitochondria that are vital for proper neuronal firing and neurotransmission,² and the brain is a highly energy-dependent organ. As we discussed in [Chapter 5](#), while making up only 2 percent of the body's weight, the brain uses 20 percent of the body's oxygen at rest.³ We know that mitochondrial dysfunction is the keystone of chronic fatigue, and it may also be the keystone of neuroinflammation, cognitive decline, and neurodegeneration⁴—all of which can lead to fatigue.

Many of our brain-related health and energy issues can be traced back to *neuroinflammation* and a *leaky blood-brain barrier*.

You have more than 370 miles (600 kilometers) of blood vessels that deliver oxygen and nutrients to, and remove metabolic wastes from, your brain. To prevent unwanted molecules from getting into the brain, this vast expanse of blood vessels is coated with a *blood-brain barrier* (BBB) that serves as the gatekeeper to your brain,⁵ much as the gut barrier serves as the gatekeeper to your body.

The blood-brain barrier plays an integral role in protecting your brain from all the things that shouldn't be allowed to enter, including toxins, pathogens, errant immune cells, foreign particles in the bloodstream, and so on. At the same time, the blood-brain barrier needs to let in materials such as glucose, carbohydrates, proteins, amino acids, ketones, vitamins and minerals, immune cells and cytokines, and

hormones. The problem is that over time, due to things like toxins in the environment, chronic stress, or a poor diet, the blood-brain barrier can become dysfunctional or “leaky,” allowing in particles that shouldn’t be getting through. It’s been shown that individuals with chronic fatigue have signatures of BBB dysfunction,⁶ which could explain the predisposition to brain fog, cognitive decline, and mood disturbances.

When the BBB is leaky, our brain is hit with a one-two punch: (1) neurotoxic molecules enter the brain, causing neuroinflammation and neuronal injury, while (2) clearance of metabolic and toxic waste products becomes impaired, exacerbating harm to the brain.⁷ It has been unequivocally established that BBB disruption is both necessary and sufficient to cause neurodegeneration and cognitive impairment.^{8,9}

Neuroinflammation causes neurons to fire more slowly, or potentially to fire too much, which can slow down and disrupt brain cell communication and cognitive performance. Your brain cells become either sluggish or exhausted from firing excessively.

This causes mitochondrial dysfunction, and it alters other critical energy-related controls in the body.

Brain Signals Misread

Your brain and body constantly communicate with each other on a subconscious level. You don’t have to consciously remind your lungs to breathe oxygen in and carbon dioxide out. Many of our subconscious biological and chemical processes are evolutionary designs to keep our body healthy, safe, and properly functioning.

The signals between our brain and body have a lot to do with our energy levels. Take “sickness behavior,” which we looked at in [Chapter 3](#). Sickness behavior occurs when your body must fight off a virus or bacteria or has suffered a trauma, or you have inflammatory cytokines flowing. Your brain picks up on these signals and “chooses” to cause fatigue

by reducing neurotransmitters and hormones that would typically motivate you to feel awake, alert, and active. Your brain—as the central controller—recognizes the body needs rest and recovery, so it slows you down.

This is an incredible evolutionary adaptation that allowed the human body to overcome illness and injury. Yet we face an evolutionary mismatch in the modern day, where *chronic neuroinflammation* tricks the brain into making us feel sick and tired all the time.

If you're chronically inflamed from a poor diet, stress, or exposure to toxins—or some combination of these factors—your brain could be, and most likely is, intentionally sending your body into a fatigue state as it attempts to heal.

Another example of your brain “choosing” to make you feel tired and exhausted is something often related to sports performance: *central nervous system fatigue (central fatigue)*.

Central fatigue is a state of altered neurotransmitter signaling—particularly of the neurotransmitters noradrenaline, serotonin, and dopamine—that impedes muscle function independent from the state of the muscles themselves.^{10,11,12,13} So even if your muscles could keep going, your brain will say no because the neurotransmitter signaling is off.

It's like your body is a car and your brain is the driver. If your car is out of oil, out of gas, or otherwise damaged, its ability to drive will be impaired regardless of how hard you push the gas pedal. Similarly, if your muscles are out of energy or injured, your physical performance will suffer regardless of the brain's commands. The reverse is also true. Even if your car (muscles) is in perfect shape, you won't go anywhere if the driver (brain) has their foot on the brakes.

As with sickness behavior, this is an evolutionary mechanism designed to protect us. Since our brain and body constantly communicate, if our brain perceives continued physical activity as a threat to our survival, it'll take action to prevent it.^{14,15} As a result, our brains are on high alert for threats like dehydration, overheating, and insufficient nutrition and will reduce motor commands and increase perceived effort

in the hopes of exhausting our body and causing it to stop moving.

With central and chronic fatigue, the brain misreads signals from the body and inappropriately slams on the energy brakes. Individuals with chronic fatigue are unable to fully activate (contract) their muscles despite the absence of any abnormalities preventing total use, but they are able to increase muscle contraction by directly stimulating the muscle, indicating that the issue is with the brain signal rather than the muscle.¹⁶

When electrodes were used to directly measure the strength of the brain signal coming into the muscles of women with chronic fatigue as they physically exerted themselves, their muscles could contract as forcefully as those of healthy, non-fatigued adults when locally stimulated with electricity, but this was only 40 percent as powerful as if the muscles had been stimulated by their own accord (from the brain). Confirming the role of central fatigue, the electrical signal from the brain reaching the muscle tissue was equivalently reduced as well.¹⁷

Mood and Perception Changes

Do you feel more energized when you feel happy or when you feel sad? What about when you are focused and mentally sharp compared to having brain fog and difficulty concentrating?

Our perceptions about the world around us and our overall mental state play subtle but paramount roles in determining our daily energy levels. If we have poor brain health, it will impact our perceptions about the world, ourselves, and our feelings and desires around physically moving our body and acting.

Our mood plays a tremendous role in determining our energy levels. Having an unhealthy brain can predispose us to mood disorders like anxiety and depression, which can take a huge toll on our vitality and livelihood.

Greater fatigue has been linked to both worsening depression and higher anxiety, with fatigue increasing the economic burden of depression by 45 percent.¹⁸ Yet one of the effects of resolving people's depression is a reduction in fatigue severity,¹⁹ clearly showing that depression can lead to fatigue.

Neurotransmitter Deficits

For your body to have the energy it needs, the neurons in your brain must signal that it's time for abundant energy, to be awake and alert, and to feel happy. And once those neurons fire, you need enough neurotransmitters to transmit those signals.

But if you don't have enough neurotransmitters, or if they cannot properly bind to the neurons to communicate with them, then you may not think clearly, remember at capacity, be fully emotionally stable, or have the energy you need to go about your day.

Yet for many people, this is everyday life—and they have no idea why they can't focus, why their memory is fading, why their anxiety or depression is flaring, or why they feel tired all the time.

There are numerous neurotransmitters in the body, but the five most important for energy levels include:

- Acetylcholine
- Dopamine
- Serotonin
- Orexin
- GABA

Acetylcholine

When it comes to fatigue, acetylcholine is the neurotransmitter that our brain uses to tell our body to move. Studies have linked chronic fatigue to disturbed acetylcholine signaling, particularly an overreactive acetylcholinergic system that ultimately reduces the body's ability to appropriately respond to its signal.^{20,21}

Acetylcholine is one of the most prevalent neurotransmitters in the body, involved in regulating muscle contractions of the heart, blood vessels, and skeletal muscle, as well as the ability to learn and remember. Disturbances in acetylcholine signaling can have widespread consequences for cognitive function, cardiovascular health, and physical function.²²

For example, young adults whose acetylcholine signaling is inhibited by drugs demonstrate similar impairments in long-term and working memory as elderly adults suffering from cognitive decline.²³ Moreover, reductions in acetylcholine signaling set up the brain to be less plastic and more vulnerable from other insults like oxidative stress, inflammation, and injury.²⁴

Dopamine

Dopamine is a tiny molecule with a big job: motivation and reward. Whenever you do something pleasurable, like eat cake, orgasm, or accomplish a goal, dopamine is released to help reinforce that behavior. It makes us feel good and motivates us to continue engaging in behaviors that bring us pleasure.

Addiction is probably the best-known example of dopamine involvement.²⁵ Whether it's a drug, food, or behavior, the dopamine burst we experience leads us to crave more of that experience. With regular exposure, we form habits or routines whereby the experience is expected to give us that pleasurable dopamine reward.

Yet there's a downside as well: regular exposure leads to tolerance. Tolerance means that we need more of the experience to get the same effect we once enjoyed in the

beginning. This is why drug use tends to escalate with time. Tolerance also means that ceasing to use a drug or engage in a behavior causes a dopamine withdrawal, leading to agitation, irritability, difficulty concentrating, and excessive preoccupation of our thoughts with the pleasurable experience.

The reason we want to ensure that our dopamine system is functioning optimally is that low levels of dopamine can lead to apathy, a lack of motivation, an inability to complete or follow through with tasks, mood swings, and addictive tendencies.

If you're struggling with a maladaptive habit that you can't seem to kick, optimizing your dopamine system can help make establishing healthier habits easier, including those we've discussed for building up energy and overcoming fatigue. Plus, structural and functional neuroimaging studies have strongly supported the role of dopamine dysregulation in chronic fatigue patients.²⁶ In fact, giving chronically fatigued adults a dopamine-mimetic drug leads to significant increases in dopamine signaling and reductions in their fatigue.²⁷

Serotonin

Serotonin is possibly the most diverse neurotransmitter in our body, regulating how we both think and behave, as well as numerous physiological processes involved in digestion and bowel motility, breathing, cardiovascular function, and sexual function.²⁸ Serotonin also modulates all behavioral and psychological processes, including mood, perception, reward, anger, aggression, appetite, memory, and attention.²⁹

This ties into psychedelics. No matter what psychedelic you talk about—magic mushrooms, ayahuasca, LSD—all cause altered states of consciousness and hallucinations through potently binding with and activating serotonin receptors within the brain.³⁰

On the flip side, many mood disorders are related to too little serotonin activity, a common example being depression.^{31,32} While low levels of serotonin don't outright

cause depression, they do alter the way in which we perceive and process information, predisposing us to negative thought patterns, apathy, and an inability to enjoy pleasurable things.³³

If you aren't optimizing your serotonin levels, then you can expect to be moody, lose interest in things that once brought you pleasure, and worry needlessly. Plus, several studies have documented reductions in serotonin levels in chronically fatigued adults.^{34,35,36}

Orexin

Orexin is one of the newest and least-known kids on the block, with its discovery occurring in 1998.³⁷ Prior to this, we didn't have a good understanding of what regulated sleep and wakefulness. But now we know that orexin is one of the most important players in our sleep-wake cycle.

Studies have shown that an orexin deficiency is the cause of narcolepsy, likely as the result of an autoimmune attack on orexin-producing neurons.³⁸ We have discovered that drugs inhibiting orexin signaling are an effective treatment for insomnia,³⁹ and that orexin signaling causes arousal and wakefulness.

In the decades since its discovery, orexin has been shown to play a significant role in regulating emotions, energy balance, and addictive tendencies.^{40,41} Low levels of orexin are associated with lower levels of physical activity and obesity,⁴² and orexin injections cause spontaneous increases in physical activity.⁴³ If you have low orexin levels, then it will reduce your desire to be active, reduce your energy expenditure, and increase your propensity for weight gain.

GABA

GABA (gamma aminobutyric acid) is the most potent depressive neurotransmitter in the brain and regulates many of the sedative actions required for relaxation.^{44,45} It is also

critical for the regulation of neuronal communication, cognition, emotion, and memory.^{46,47,48}

Studies have suggested that higher GABA levels help reduce distraction in the brain,⁴⁹ which makes it possible to react and make decisions more quickly, and supplementing with GABA has been shown to improve attention and task switching in healthy young adults.^{50,51}

Other research has documented a relationship between lower levels of GABA in the brain and a variety of cognitive deficits in humans including:

- Worse memory⁵²
- Self-reported cognitive failures (e.g., inability to attend to relevant details while being distracted by irrelevant details)⁵³
- Lower visuospatial IQ⁵⁴
- Less empathy⁵⁵
- Reduced resilience to stress and greater susceptibility to depression and anxiety⁵⁶
- Susceptibility to addiction⁵⁷

If you aren't supporting your GABA system, then you can expect to have difficulty concentrating, feelings of anxiety, a lower resilience to stress, and trouble sleeping, all of which can contribute to fatigue.

STRATEGIES FOR BETTER BRAIN HEALTH

Poor brain health can result from any of several factors, including neurodegeneration, neuroinflammation, oxidative stress, impaired synaptic connections, and neurotransmitter deficits. These issues can stem from stressors such as circadian dysregulation and sleep disruption, carrying too much fat mass, gut dysbiosis and systemic inflammation, and even poor

glycemic control—all factors that can interfere with proper neuronal communication.

When it comes to improving brain health, we've already discussed multiple strategies, including:

- Fixing your circadian rhythm and getting deeper, more rejuvenating sleep
- Maintaining a healthy body composition and reducing excess fat mass
- Fostering a healthy microbiome and repairing your gut
- Stabilizing your blood sugar levels, eliminating big spikes and swings

Additionally, there are brain-specific nutritional strategies that you can use to directly boost your brain's performance, reduce cellular dysfunction, and improve your neurotransmitter levels and functioning. You'll notice that these recommendations are designed to improve your brain health and its ability to properly work, which will indirectly improve your energy levels.

Whole Foods, Mostly Plants

A healthy brain doesn't require any single diet. In fact, most research linking diet to brain health and better outcomes, including reducing risks of cognitive decline and mood disorders, recommends many of the tenets we've already mentioned, most particularly:

Eat a diet abundant in nutrient-dense, whole foods, mostly plants.

If you're looking for a slightly more specific approach, then consider the *MIND diet*, developed by Dr. Martha Morris and her colleagues from Rush University Medical Center and based on the most compelling evidence in the diet-dementia field. The MIND diet is a blend of the Mediterranean diet and DASH diet, which is rich in fruits, vegetables, whole grains,

and low-fat dairy foods and promoted by the National Heart, Lung, and Blood Institute to prevent and control high blood pressure.

The MIND diet promotes the consumption of 10 brain-healthy food groups:

- Green leafy vegetables—at least six servings per day
- Other fibrous vegetables—at least one serving per day
- Berries—at least two servings per week
- Nuts—at least one serving per day
- Beans—at least three servings per week
- Whole grains—at least three servings per day
- Seafood—at least once per week
- Poultry—at least twice per week
- Olive oil—primary added oil (if any)
- Wine—one glass per day (no more, no less)

Studies investigating the relationship between the MIND diet and cognitive function with aging have found that those with the highest adherence to this diet have a cognitive function equivalent to being roughly 7.5 years younger than those with the lowest score.⁵⁸ Adherence to the MIND diet has also been associated with 53 percent reduction in the odds of developing Alzheimer's disease over five years of follow-up.⁵⁹

When I reviewed Stephanie's diet, I knew she wasn't eating enough and was possibly malnourished. She had almost no appetite, and most days she existed on chicken broth with some chopped vegetables like carrots and celery, baked or grilled chicken tossed with a salad, sometimes a baked potato, maybe an apple or banana, the occasional granola bar, and some eggs.

When we don't eat enough food or a variety of foods, we don't get the essential nutrients our bodies need to flourish. Also, undernourishment can send our bodies into a stress response in which we conserve energy since we lack fuel.

Stephanie needed a nutrition overhaul, but I didn't want to override her body's natural responses by having her eat when she really wasn't hungry. My plan was to have her eat three meals per day, with a snack. The meals could be on the small side (at least to start), and she had to eat most of her foods from the MIND diet list. Because Stephanie was fatigued and struggled with mental capacity, I wanted to keep the recipes simple and limit how much time she had to spend in the kitchen. This meant going with easy-to-prepare meals and ingredients. For instance, Stephanie would have sunny-side-up eggs over bok choy and kale with a cup of blueberries or strawberries for breakfast. To get grains into her diet, Stephanie would make a big batch of oatmeal that she could eat for a few days, which she topped with berries and/or walnuts or sunflower seeds.

Typically lunch was a big salad with different leafy greens such as spinach, kale, watercress, chard, arugula, or lettuce; an animal protein like fish or chicken; and fibrous vegetables like green beans, asparagus, broccoli, celery, cauliflower, garlic, and tomatoes. A few times per week, I had her toss in some beans—Stephanie's favorites were black beans and chickpeas. Her dressings were olive oil based.

For dinner, I wanted Stephanie to up her seafood intake, anything from a ginger shrimp stir-fry to snapper filets to Asian-style wild salmon served with mixed vegetables or salad.

Consume More Seafood (or Supplement with DHA and EPA)

All the food groups listed in the MIND diet play a critical role in brain health by supplying essential vitamins and minerals, fats and proteins, and phytochemicals (beneficial but nonessential nutrients originating in plants) that help your

brain function better, but one that deserves special attention is the omega-3 fatty acid *docosahexaenoic acid*, or DHA.

The brain is the most lipid-dense organ in the body, second only to body fat, being 40 to 80 percent fat by weight depending on which part of the brain you're looking at.⁶⁰ Of that fat content, DHA is one of the most important molecules, increasing rapidly during early life and leveling off at approximately 14 percent of total brain mass or 20 to 30 percent of total brain fat content during adulthood.^{61,62}

There are brain benefits from having sufficient DHA in our noggin, including the maintenance of neuronal membrane fluidity, potentiation of cell signaling, and use in the synthesis of anti-inflammatory docosanoid molecules.⁶³ Collectively these functions work to ensure our neurons aren't inflamed and can communicate with ease. These functions simply can't be maintained with other types of fats, leading to a widely accepted belief that an abundant intake of DHA in the diet was necessary for the evolution of the large human brain.⁶⁴

Today most of us are doing dietary disservice to our brain by not getting enough DHA. The only populations that maintain an evolutionarily appropriate intake of DHA are Japan, Scandinavian countries, and areas of indigenous societies not yet influenced by the Western diet,⁶⁵ likely due to their high intake of fish and other seafood—the best natural sources of DHA.

The consequences of inadequate DHA intake may include increased risk for cognitive decline or dementia⁶⁶ and mental health conditions such as schizophrenia, bipolar disorder, anxiety, and depression.^{67,68} In addition, individuals with Alzheimer's disease have shown lower brain concentrations of DHA.⁶⁹

Importantly, DHA is not a magic pill for improving brain health but rather an essential nutrient that needs to be supplied regularly for its benefits to be realized. While there may be a memory benefit of DHA supplementation in those with cognitive impairment,⁷⁰ the greatest benefits of preventing neurodegeneration are seen when intake is adequate

throughout one's lifespan.^{71,72} It's also important to note that DHA, along with EPA—another “fish oil” omega-3—have potent anti-inflammatory effects both in the brain and throughout the body.^{73,74}

In those with chronic fatigue, low omega-3 status is common.⁷⁵ The extent to which one is low in EPA and DHA also correlates with greater fatigue severity,⁷⁶ meaning that ensuring adequate DHA intake will not just help optimize brain health but also help optimize energy levels.

You don't need a lot of DHA; often 500 to 1000 mg per day is sufficient. This can be easily obtained by eating a couple of ounces of fatty fish or taking a supplement. But fish is the preferred choice for greater incorporation of EPA and DHA into blood lipids. For example, salmon is twice as efficient as supplements at increasing EPA status and ninefold more efficient at increasing DHA status.⁷⁷

Nonetheless, not everyone likes eating seafood, so the next best option is supplements. If you want to go this road, there are several options on the market, including:

- Fish oil
- Krill oil
- Algae oil

Now, if you are vegan, fish and krill oils are out, so going with algae oil is your best bet. It won't supply as much EPA, but it does supply ample amounts of DHA.

In one study comparing algae oil supplements to salmon, both equivalently increased plasma DHA concentrations, although salmon was superior at simultaneously increasing plasma EPA concentrations.⁷⁸ Now, it is important to keep in mind that fish supplies vastly more nutrients than algae oil, which supplies only DHA, but when the goal is getting in your omega-3s, algae oil definitely serves its purpose.

As for fish oil and krill oil, each supplies EPA and DHA in a couple of different forms. Fish oil can come as an ethyl ester

or a triglyceride, while krill oil comes as a combination of phospholipid and triglyceride. By far, most fish oil supplements on the market are triglyceride based, which makes sense, considering that 95 percent of all dietary fat and most of the storage fat on the body are triglycerides.

And that's okay, because standard triglyceride fish oil is likely to be the most affordable option. In a study comparing all three, four weeks of supplementing with EPA and DHA from a triglyceride-based fish oil was similar at raising EPA and DHA status compared to supplementing with equivalent amounts of EPA and DHA from both the ethyl ester fish oil and phospholipid krill oil.⁷⁹

Lastly, the reason I haven't mentioned any vegan-friendly sources of EPA or DHA other than algae oil is that they don't exist. Plants do not contain EPA or DHA, but rather their parent fatty acid that our body must turn into EPA and DHA: alpha-linolenic acid (ALA). So when you see plants like flaxseed or chia seeds being advertised as having omega-3 fatty acids, they are supplying exclusively alpha-linolenic acid, not EPA or DHA.

Not only does alpha-linolenic acid lack the anti-inflammatory effects of EPA and DHA⁸⁰ but its conversion into EPA and DHA is inefficient. Studies show that less than 10 percent of alpha-linolenic acid is converted to EPA and less than 1 percent to DHA.⁸¹ In addition, the enzymes required to make this conversion are shared between omega-3 and omega-6 fatty acids, so it's further reduced when the diet is high in omega-6 fatty acids, as is the case with the majority of the U.S. population, whose current ratio of omega-6 to omega-3 fatty acids is about 10 to 1.⁸²

EPA and DHA Content of Common Seafoods

| Food Source (100 Grams or 3.5 Ounces) | EPA (grams) | DHA (grams) | Amount of Food Source Needed to Obtain 1 gram of EPA + DHA |
|---------------------------------------|-------------|-------------|--|
| Herring, Pacific | 1.24 | 0.88 | 1.7 ounces |
| Salmon, Chinook | 1.01 | 0.94 | 1.8 ounces |
| Mackerel, Pacific | 0.65 | 1.20 | 1.9 ounces |
| Oysters, Pacific | 0.88 | 0.50 | 2.5 ounces |
| Salmon, coho | 0.54 | 0.83 | 2.5 ounces |
| Trout, rainbow | 0.47 | 0.52 | 3.5 ounces |
| Salmon, sockeye | 0.42 | 0.66 | 3.5 ounces |
| Tuna, canned White | 0.23 | 0.63 | 4.0 ounces |
| Bass, freshwater | 0.30 | 0.46 | 4.6 ounces |
| Salmon, pink | 0.22 | 0.40 | 5.6 ounces |
| Lobster | 0.34 | 0.14 | 7.0 ounces |
| Crab, Alaskan king | 0.29 | 0.12 | 8.5 ounces |
| Lingcod | 0.13 | 0.13 | 13.5 ounces |
| Tuna, canned light | 0.05 | 0.22 | 13.5 ounces |
| Cod, Pacific | 0.04 | 0.12 | 22.0 ounces |

Now, the half-life of DHA in the human brain is roughly 2.5 years,⁸³ meaning that the DHA incorporated into our neurons stays there for quite some time. This provides ample time for this polyunsaturated fatty acid to become oxidized and dysfunctional, which has widespread consequences for brain health.

Both too little DHA and its oxidation are related to increased levels of neuroinflammation, neuronal dysfunction, and cell death, all of which are believed to contribute to the brain aging process.⁸⁴

I'm a big believer in first trying to get what you need from fresh foods, but I also know that sometimes targeted supplements really are the best choice. When it came to Stephanie, I wanted her to introduce more seafood into her diet, but I also told her that if she was struggling to eat because she lacked an appetite, then she should try supplementing. There was no shame in that, and that was what she opted to do. To Stephanie's credit, she did increase her fish intake to twice per week, and she added a fish oil supplement that she took daily.

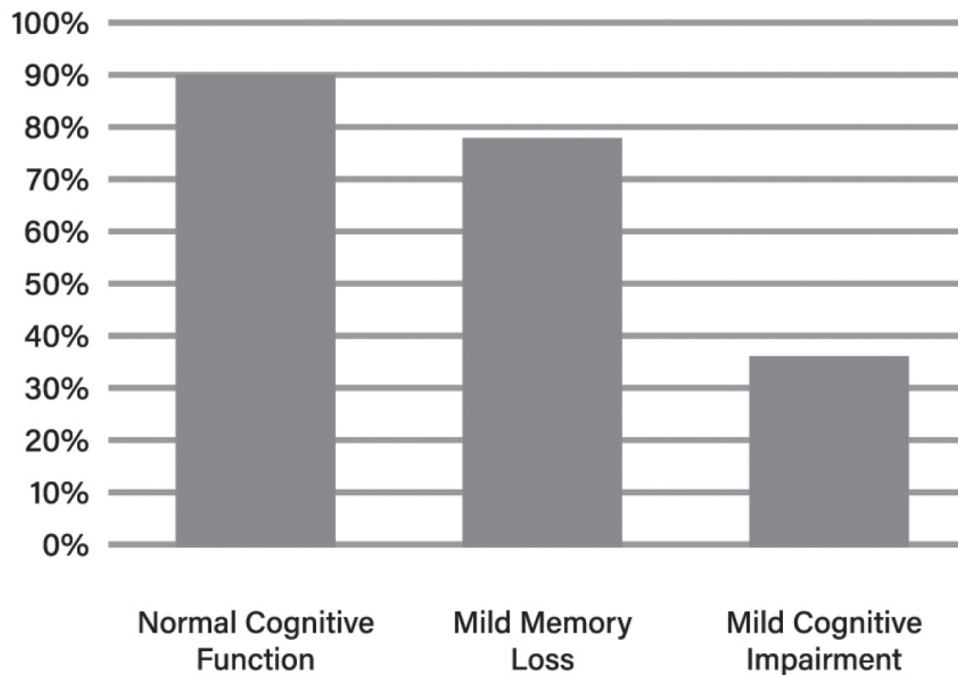
Eat Your Leafy Greens

To help protect your brain against neuroinflammation, neuronal dysfunction, cell death, and DHA oxidation, your brain harnesses two potent antioxidants: *lutein* and *zeaxanthin*.

Lutein is a carotenoid abundant in green leafy vegetables. It makes up a significant portion of our antioxidant defenses.⁸⁵ In particular, lutein has been shown to protect against DHA oxidation within the brain,⁸⁶ and brain concentrations of lutein are correlated with better cognitive function with aging.⁸⁷

Supplements can play a huge role in boosting your brain health. Make sure to check out [Chapter 8](#) to learn about the most effective supplements to optimize your brain function, mood, long-term brain health, and neurotransmitter balance.

BRAIN LUTEIN CONCENTRATION



A systematic review of several studies investigating the impact of lutein supplementation on cognitive performance in otherwise healthy adults without cognitive impairment found that daily doses of 10 mg of lutein consistently improved episodic memory and inhibition, with potential additional benefits for improving attention.⁸⁸ Other studies have reported that lutein supplementation increases neurotrophic factors (molecules that support the growth and survival of neurons) and antioxidant capacity.⁸⁹

The humble egg is a terrific source of lutein in a far more bioavailable form than that found in leafy green vegetables like spinach. In one study healthy adults who ate 6 mg of lutein through eggs every day for 10 days were found to have 68 percent more lutein in their bodies, significantly more than when the lutein was provided from spinach or two different forms of a lutein supplement.⁹⁰ In another study, having vegetarians eat just six eggs per week was enough to boost their lutein status by 20 percent.⁹¹

Lutein Content of Common Foods

| Food | Measurement | Lutein content (mg) |
|-------------------|--------------------|---------------------|
| Spinach, raw | 1 cup (30 grams) | 3.7 |
| Green peas | 1 cup (145 grams) | 3.6 |
| Zucchini, boiled | 1 cup (180 grams) | 2.1 |
| Broccoli, boiled | 1 cup (156 grams) | 2.0 |
| Marigold-fed egg | 1 large (50 grams) | 1.6 |
| Kale, raw | 1 cup (21 grams) | 1.3 |
| Corn kernels | 1 cup (145 grams) | 1.1 |
| Asparagus, boiled | ½ cup (90 grams) | 0.7 |
| Celery, boiled | 1 cup (150 grams) | 0.5 |
| Carrots, raw | 1 cup (128 grams) | 0.3 |
| Conventional egg | 1 large (50 grams) | 0.25 |

Now, none of this means to ditch the spinach for eggs; it only means that eggs provide more bioavailable lutein. Your best bet: eat both. And don't throw out the yolks, since that is where the lutein is found.

Boost Key Nutrients for Neurotransmission

By following the nutritional strategies in this book, most people should get the essential nutrients they need to support their neurotransmitters. But sometimes we must intentionally increase our consumption of certain foods, and sometimes supplements, to ensure we're getting the right amounts. The MIND diet includes most of the foods we will want to eat and use to build a brain-healthy nutritional plan. But understanding *why* certain foods are critical, especially for our neurotransmitters, can help make adopting and embracing new nutritional strategies more successful.

Protein

First up is our good friend protein. It's essential not only for a healthy body composition but also for optimal brain health and neurotransmission. When eating a meal, we want it to contain protein regardless of our other choices. The absolute worst

food choice we can make is to eat a pure carbohydrate meal and very little protein, which would lower orexin and cause sleepiness or fatigue. Protein supplies the dopamine precursor *tyrosine* and the serotonin precursor *tryptophan*. Without sufficient protein, we won't have enough building blocks to make dopamine or serotonin, which will lead us to feeling apathy and fatigue.

Our body requires several nutrients that we get from protein to create dopamine, including the amino acid tyrosine, vitamin B₆, folate, and iron. Basically, tyrosine is converted into the molecule L-DOPA with the help of folate and iron, which is then converted into dopamine with the help of vitamin B₆. Animal studies have shown that being deficient in any of these nutrients leads to disruptions in dopamine metabolism,^{92,93,94,95} so it makes sense to ensure that your diet supplies ample amounts of each.

Vitamin B₆

Regularly eating lean meats, poultry, and seafood makes it easy for us to get the vitamin B₆ we need. You can also meet daily requirements from plants by regularly consuming nuts, seeds, potatoes, sweet potatoes, shiitake mushrooms, and cabbage.

Best Foods for Supplying Vitamin B₆ (per 100 Grams or 3.5 Ounces)

| | Percent of Daily Requirement Supplied | Animal Products | Plant Foods |
|-----------------------|--|---|--|
| “Green” range | >50 percent | Liver (all types) Tuna | Pistachios |
| “Orange” range | 25 to 50 percent | Lean red meat Lean pork Fish and seafood Poultry | Sunflower seeds Hazelnuts Walnuts Hearts of palm |
| “Yellow” range | 10 to 25 percent | Eggs | Most nuts and seeds Potatoes Shiitake mushrooms Brussels sprouts Sweet potatoes Sweet peppers Cabbage |

Iron

Iron, the third nutrient for optimizing dopamine metabolism, is abundant in animal-based foods, but it requires a more conscious effort to obtain it from plants because plant-based forms of iron have a lower bioavailability than animal-based forms.

Best Foods for Supplying Iron (per 100 Grams or 3.5 Ounces)

| | Percent of Daily Requirement Supplied | Animal Products | Plant Foods |
|-----------------------|--|---|---|
| “Green” range | >50 percent (men) >25 percent (women) | Lean red meat Oysters Cuttlefish Octopus | Potatoes |
| “Orange” range | 25 to 50 percent (men) 10 to 25 percent (women) | Sardines Dark poultry meat | Amaranth Teff Most beans Spinach |
| “Yellow” range | 10 to 25 percent (men) 5 to 10 percent (women) | Most fish White meat Eggs Cheese | Most whole grains Kale Asparagus Mushrooms Peas |

There are two forms of iron in the diet: heme and nonheme. Heme iron is supplied only by animal foods and has a bioavailability of 15 to 35 percent, while nonheme iron is the form of iron in plants and has a much lower bioavailability of less than 10 percent.^{96,97} If you don't eat meat, then iron supplementation may be prudent to ensure you get the iron you need for dopamine production.

Folate

We need to get adequate folate, particularly in the form of methylfolate, which is the form required for dopamine synthesis.⁹⁸ It is readily obtainable from fibrous vegetables and beans, where roughly 45 to 65 percent of the folate is in methylfolate form.⁹⁹

Best Foods for Supplying Folate (per 100 Grams or 3.5 Ounces)

| | Percent of Daily Requirement Supplied | Animal Products | Plant Foods |
|-----------------------|--|-----------------------------|---|
| “Green” range | >50 percent | Liver | — |
| “Orange” range | 25 to 50 percent | — | Most leafy green and fibrous vegetables Most beans |
| “Yellow” range | 10 to 25 percent | Fish roe Mussels Crab | Most nuts and seeds |

The only way we can make methylfolate within our body is through the MTHFR enzyme (methylenetetrahydrofolate reductase). Yet many people have polymorphisms that impair its functionality. Thus if you opt to supplement with folate, then please choose the methylfolate form, particularly if you have any polymorphisms in MTHFR. It's the most biologically active form and circumvents any issues with genetics.

Amino Acid Tryptophan

In addition to vitamin B₆, folate, and iron, your body also needs *amino acid tryptophan* to synthesize serotonin. Tryptophan needs to cross the blood-brain barrier to be used for serotonin production within the brain, but it competes with several other amino acids for transport across this barrier.

When we eat carbohydrates, the insulin response will preferentially shuttle many of these other amino acids into muscle tissue, leaving tryptophan with less competition for getting across the blood-brain barrier.¹⁰⁰ Mood disturbances like depression, being quick to anger, irritability, a big appetite, a poor memory, and/or a short attention span can be signs that your body isn't producing enough serotonin. As such, if you tend to run on the lower end of serotonin production, you may benefit from eating a higher-carbohydrate diet that you would get from grains, legumes, starchy vegetables, and fruit (alongside adequate protein, of course).

Choline

Choline is an essential nutrient within the brain required for the synthesis of acetylcholine (the primary neurotransmitter involved in executive functions) and phosphatidylcholine (one of the most abundant and important structural components of cell membranes).

Best Foods for Supplying Choline (per 100 Grams or 3.5 Ounces)

| | Percent of Daily Requirement Supplied | Animal Products | Plant Foods |
|-----------------------|--|--|---|
| “Green” range | >50 percent | Liver (all types) Whole eggs Caviar and fish roe | Sunflower lecithin |
| “Orange” range | 25 to 50 percent | Lean red meat Lean pork Oysters Salmon | — |
| “Yellow” range | 10 to 25 percent | White fish Most mollusks Poultry | Beans and legumes Nuts and seeds Cauliflower Mushrooms Collard greens Broccoli Brussels sprouts |

It’s well established that choline within the brain plays a critical role in neuronal plasticity, membrane stability, signaling events, and neurotransmission, all of which are important for communication within the brain and nervous system.¹⁰¹

An omnivorous diet should provide sufficient choline, as most meat is a decent source of it. Even if you don’t eat meat, just three eggs per day will satisfy your needs, and sunflower lecithin represents a solid vegan option.

Stay Hydrated

Brain cells need a fresh supply of clean, pure water every day to function well. It’s so critical for all our cells, which is why our bodies can exist without food for several weeks but can only function for three to four days at most without water. It takes just hours for dehydration to impair physical energy levels, mood, and brain function.

Proper hydration causes increased blood pressure and arterial vessel expansion (vasodilation), which promotes increased blood flow to the brain, which, in turn, enhances oxygen and glucose delivery to brain cells and improves mood, energy levels, and cognitive performance.

When it comes to how much water you should drink, there is no one-size-fits-all amount. It's not "drink your body weight in ounces each day" either. How much water you need depends on your daily activity levels and the climate you live in. If you are someone who spends hours outdoors each day, does lots of intense exercise, and uses a sauna daily, then your water needs will be drastically more than someone who has a sedentary desk job and who spends most of their time in a climate-controlled room.

The best way to gauge how much water you need to drink is to check the color of your urine. The lighter the color, the more hydrated you are, while the darker the color, the more water you need to drink.

A word of caution: some substances, like beets, carrots, blackberries, and paprika, and large doses of some B vitamins (such as riboflavin) can alter your urine color.

My final tip: don't just run to the faucet for tap water. If you live in the U.S., your public tap water supply likely contains chemicals that may harm your gut health. You want pure, clean water, so check your area.

This was one area Stephanie admitted she could improve. Like many people, she relied on coffee to keep her going in the morning and afternoon, so I encouraged her to slowly cut back on the caffeine—even tea—and up her water intake. She said she didn't like the taste of water on its own, but I encouraged her to buy a home water filter that she could connect to her faucet and to add a spritz of lemon or lime or a few slices of cucumber.

MAKING THE CHANGES STICK

Poor brain function, brain fog, and brain-related fatigue make daily life hard. Healing your brain, balancing your neurotransmitters, and optimizing your brain function will not only improve your mental capacity but will shift your energy. For Stephanie it truly was a journey. Switching to the MIND diet started moving her in the right direction within a month, but it wasn't a miraculous recovery.

Restoring vitality and energy is often a gradual reawakening, which was hard for Stephanie to embrace. But I emphasized to her that she would enjoy better results by loosening the reins on needing to see immediate transformation and instead tracking how she felt monthly. For five days, Stephanie would track her foods, moods, sleep patterns, memory, and overall energy; then a month later, she would track it again.

While it took Stephanie almost a year before she returned to rock climbing, the steady progress each month helped motivate her to continue the work. “For the first time in so long, I feel like I’m moving in the right direction,” Stephanie told me about two months into our work together. “I know I’m not fully back, but I feel better, and I feel like I will make it someday.”

As each month passed and she saw more results, we kept adding nutritional strategies, such as rewiring her circadian rhythm and repairing her gut.

Stephanie’s journey reflects that we don’t control the pace of our healing—whether it involves restoring our brain health or energy. But we can support our brains and our bodies on this journey by nourishing ourselves with the foods we need to return to our optimal capacity.

ACTION LIST

The following checklist is here for you to pick from to start on your energy healing journey for brain health. As with previous chapters, I encourage you to pick no more than three items to implement. Give it at least two to four weeks, or until those actions become habitual, and then pick up to three more challenges.

- **Get your daily dose of DHA and EPA.**
 - Eat fish or seafood 1 time per week.
 - Eat fish or seafood 2 to 3 times per week.

- Eat fish or seafood 4 to 6 times per week.
- **Get your daily dose of lutein and zeaxanthin.**
 - Eat 1 to 2 servings (1 cup raw or ½ cup cooked) of leafy green vegetables per day.
 - Eat 3 to 4 servings of leafy green vegetables per day.
 - Eat 5-plus servings of leafy green vegetables per day.
- **Incorporate berries into your diet.**
 - Eat 1 cup of berries 1 to 2 times per week.
 - Eat 1 cup of berries 3 to 4 times per week.
 - Eat at least 1 cup of berries daily.
- **Incorporate nuts into your diet.**
 - Eat a handful (1 ounce) of nuts 1 to 2 times per week.
 - Eat a handful of nuts 3 to 4 times per week.
 - Eat a handful of nuts daily.
- **Incorporate beans and legumes into your diet.**
 - Eat 1 cup of beans 1 to 2 times per week.
 - Eat 1 cup of beans 3 to 4 times per week.
 - Eat 1 cup of beans every day.
- **Consume adequate choline to support acetylcholine signaling.**
 - Eat 1 serving of the “yellow” choline foods per day.

- Eat 1 serving of the “orange” or two servings of the “yellow” choline foods per day.
 - Eat 1 to 2 servings of the “green,” 2 to 3 servings of the “orange,” or 4 to 5 servings of the “yellow” choline foods daily.
- **Consume adequate vitamin B₆ to support GABA, dopamine, and serotonin signaling.**
 - Eat 1 serving of the “yellow” B₆ foods per day.
 - Eat 1 serving of the “orange” or 2 servings of the “yellow” B₆ foods per day.
 - Eat 1 to 2 servings of the “green,” 2 to 3 servings of the “orange,” or 4 to 5 servings of the “yellow” B₆ foods daily.
- **Consume adequate folate to support dopamine and serotonin signaling.**
 - Eat 1 serving of the “yellow” folate foods per day.
 - Eat 1 serving of the “orange” or 2 servings of the “yellow” folate foods per day.
 - Eat 1 to 2 servings of the “green,” 2 to 3 servings of the “orange,” or 4 to 5 servings of the “yellow” folate foods daily.
- **Consume adequate iron to support dopamine and serotonin signaling.**
 - Eat 1 serving of the “yellow” iron foods per day.
 - Eat 1 serving of the “orange” or 2 servings of the “yellow” iron foods per day.

- Eat 1 to 2 servings of the “green,” 2 to 3 servings of the “orange,” or 4 to 5 servings of the “yellow” iron foods daily.
- **Ensure that your diet is providing you with adequate daily protein to support neurotransmitter synthesis (refer to [Chapter 3](#) for adequacy information).**
 - Calculate your ideal protein intake and eat it 1 to 2 days per week.
 - Eat sufficient protein 3 to 4 days per week.
 - Eat sufficient protein 5 to 6 days per week.
 - Eat sufficient protein every day.
 - Drink enough water throughout the day to have most of your urine be lemonade-colored.

PART II

**SUPERCHARGE
YOUR
MITOCHONDRIA**

CHAPTER 7

ENERGY SUPERFOODS

Food is fuel, and some food choices are “super” fuel in their health-promoting and mitochondria-boosting properties.

You now have numerous nutritional strategies for beating fatigue, supercharging your mitochondria, and improving several areas of your health and well-being. If you find yourself pulled to address one particular stressor—say, your gut health—then start there, incorporating those recommendations and foods first. If you’re unsure where to start, or you want broader suggestions for what to eat that will improve the health, strength, and number of your mitochondria, then this chapter on superfoods is for you.

Some of these superfoods will directly impact your mitochondria and energy levels, while others may benefit critical systems and functions that indirectly enhance your energy levels.

To make this chapter easy to navigate, these superfoods are divided into their general food groups, so the next time you’re looking for the best fruit, veggie, or nut to eat, you’ll pick one that enhances rather than depletes your energy. I’ve included suggested serving or supplement sizes as appropriate when supported by the evidence.

FRUITS

Pomegranates

Pomegranate is a rich source of ellagitannins, potent antioxidants that can be further broken into other antioxidant compounds like ellagic acid and urolithins.^{1,2} These substances have been heavily investigated for their cardiovascular, anticancer, and mitochondrial benefits.

Regular intake of pomegranate juice has been shown to reduce blood lipid oxidation and the accumulation of plaque in arteries over the course of 1 to 3 years,³ particularly in people who have higher levels of oxidative stress.^{4,5}

The most important benefit of pomegranates is their ability to stimulate mitochondrial function and mitophagy, which is done primarily through a compound called urolithin A.⁶ Mitophagy (mitochondria + autophagy) is a quality-control pathway that preserves mitochondrial health by targeting damaged mitochondria for autophagic degradation, making anything that facilitates mitophagy vital for optimal health and disease prevention.

In recreational endurance athletes, supplementing with 750 mg of pomegranate extract for just two weeks increased the total time the athletes could cycle before complete exhaustion by 14 percent and increased the amount of time they could rely on their mitochondria to supply most of their energy by 10 percent.⁷

Recommended Dose: Supplement with 750 to 1500 mg of pomegranate extract or eat ½ to 1 pomegranate daily

Blueberries

If you want to boost your brain power, memory, learning ability, and executive functioning skills, then look to the blueberry. Numerous studies have reported that consuming the equivalent of 1 to 2 cups of blueberries per day improves learning ability, memory, and executive cognitive function in healthy older adults,^{8,9,10} older adults with cognitive impairment,^{11,12} and young, healthy adults.¹³

Additionally, an ever-growing body of evidence suggests that blueberries and their constituent phytochemicals are

protective against the development of cancer, obesity, cardiovascular diseases, diabetes, bone loss, poor immune function, fatty liver, vision loss, and chronic inflammation.¹⁴

Recommended Dose: Eat 1 to 2 cups of blueberries per day.

Acai Berries

Acai berries are an antioxidant- and phytochemical-rich fruit native to the Amazon rainforest. Regular consumption of acai may help battle cardiovascular disease through reducing blood lipid oxidation,^{15,16,17} fight cognitive decline with aging,^{18,19,20,21} protect against cancer and reduce its ability to spread and proliferate,²² and protect against liver damage and inflammation.²³

Consuming acai can help reduce biomarkers of muscle damage following strenuous exercise. It increases serum antioxidant status and lowers blood lipids,²⁴ as well as improving physical performance and reducing perceived exertion.²⁵ Furthermore, consumption of acai berries has been reported to reduce markers of inflammation and oxidative stress while improving blood vessel function, particularly in overweight and obese adults.^{26,27}

Recommended Dose: Eat 1 to 2 cups of acai berries per day

Bilberries

Bilberries are a dark-purple berry originating in Europe that possesses a diverse array of anthocyanin phytochemicals similar to blueberries,^{28,29} which have potent antioxidant and anti-inflammatory effects.^{30,31}

Studies have reported reductions in inflammation with the addition of 330 mL of bilberry juice in adults at an elevated heart disease risk,³² and with 300 mg of bilberry anthocyanins in otherwise healthy adults.³³ Additionally, in adults with type 2 diabetes, eating the equivalent of 50 grams of fresh bilberries before drinking a sugary beverage lowered their glycemic and insulin responses by 18 percent each.³⁴

Recommended Dose: Eat 1 to 2 cups of bilberries per day

Maqui Berries

Maqui berries are an exotic, dark-purple fruit native to South America. They are a rich source of anthocyanins that possess strong antioxidant abilities,^{35,36} and ultimately provide up to three times more antioxidants than blackberries, blueberries, strawberries, or raspberries.^{37,38}

Studies have shown that maqui berries could be a powerful ally against inflammatory diseases.³⁹ Particularly, they have been shown to reduce blood vessel inflammation,⁴⁰ and in one study of smokers, 2 grams of maqui berry extract per day reduced markers of lung inflammation after two weeks.⁴¹

In a three-month clinical study in people with prediabetes, 180 mg of maqui berry extract once daily reduced average blood sugar levels by 5 percent, which was enough to bring their blood glucose levels back into normal range.⁴² It also reduced their LDL and increased their HDL (i.e., improved their blood lipid profile).

Other research has found that 30 to 60 mg of a concentrated maqui berry extract each day increased tear production by roughly 50 percent,⁴³ with follow-up research demonstrating similar effects after just a month, along with reduced eye fatigue.⁴⁴

Recommended Dose: Supplement with 100 to 2000 mg of maqui berry extract daily

Cranberries

Cranberries are pinkish-red berries that are rich in A-type proanthocyanidins (PACs), in contrast to the B-type PACs present in most other fruits. Studies in animals and humans have shown that adding cranberries to the diet reduces markers of oxidative stress and inflammation and thereby protects against mitochondrial dysfunction.⁴⁵

Numerous randomized, controlled trials in adults with metabolic dysfunction have also shown that drinking 1 to 2 cups of cranberry juice or taking 1500 mg of cranberry extract improves blood lipids, blood pressure, vascular function, and insulin sensitivity.⁴⁶

Recommended Dose: Eat 1 to 2 cups of cranberries per day

Camu Camu

Camu camu is an Amazonian berry renowned for its high levels of vitamin C and phytochemicals,^{47,48} which have been consistently associated with health benefits.^{49,50,51,52}

In animals, camu camu has been shown to reduce inflammation,⁵³ reduce fat gain and mitigate metabolic dysfunction,⁵⁴ and protect the liver from injury.⁵⁵

In humans, drinking 70 mL ($\frac{1}{3}$ cup) of camu camu juice per day for just one week has been shown to reduce markers of oxidative stress and inflammation in healthy adults, versus no benefits with an equivalent amount of supplemental vitamin C.⁵⁶ Camu camu has also been shown to blunt the glycemic response to eating,⁵⁷ and improve blood vessel function.⁵⁸

Recommended Dose: Drink $\frac{1}{4}$ to $\frac{1}{2}$ cup per day (or 500 to 3000 mg powder)

Amla

Amla is an Ayurvedic herb used traditionally for enhancing vitality and promoting longevity, with studies in animals and isolate cells showing that it enhances mitochondrial energy production, stimulates mitochondrial biogenesis, increases antioxidant enzyme production, and protects cells and mitochondria from oxidative damage.^{59,60}

Researchers have been investigating its potential as a neuroprotective,⁶¹ anticancer,⁶² and general health agent.⁶³ However, the most promising avenue of benefit is toward metabolic health.

Amla has been shown to have improved metabolic health in adults with and without type 2 diabetes, with the greatest benefits coming from the higher dose. Amla has also been shown to be more effective than a placebo at improving glycemic control and blood lipids, and just as effective as antidiabetic medication at lowering blood glucose in those with diabetes.⁶⁴

In a study of adults with diabetes, 1000 mg per day of amla was as effective as a statin at improving endothelial function, reducing oxidative stress, increasing antioxidant enzyme activity, and reducing inflammation, while 500 mg/d of amla had beneficial effects, albeit less pronounced.⁶⁵ These findings were confirmed in a study focused on metabolic syndrome.⁶⁶ Furthermore, taking 500 mg/d of amla for four weeks has been shown to improve vascular fluidity, reduce an index for vascular age, and reduce markers of oxidative stress.⁶⁷

Recommended Dose: Supplement with 500 to 3000 mg of amla daily

MICROALGAE

Spirulina

For centuries, natives living around Lake Chad in Africa have consumed spirulina, and it was an important trading commodity between the Aztecs of Central America and Spanish conquistadors.⁶⁸ Today you can find it lining the shelves of many health food stores.

Spirulina is one of the most powerful superfoods in existence, possessing amazing, evidence-backed benefits for metabolic health and energy production.

Several studies have shown that spirulina protects the heart, liver, and intestinal cells from oxidative stress and mitochondrial damage, stimulates mitochondrial biogenesis, and attenuates metabolic dysfunction.^{69,70,71} These benefits are largely due to a little molecule it contains called C-Phycocyanin, the potent phytochemical that mimics the

structure of bilirubin and has similar physiological effects.^{72,73,74,75}

Bilirubin is a potent antioxidant and anti-inflammatory molecule that's been implicated in the prevention of metabolic syndrome and diabetes, cardiovascular diseases, and kidney disease.^{76,77,78,79}

On top of improving metabolic health, an abundance of evidence shows spirulina improves endurance exercise performance and reduces fatigue with people who exercise.^{80,81,82}

Recommended Dose: Take at least 2 grams per day, ideally 6 to 8 grams

Chlorella

Chlorella is roughly 2.5 billion years old, one of the first single-celled organisms to inhabit the planet. In order to survive and replicate over that inconceivable span of time and to protect against famine, drought, radiation, and poisoning, this little algae developed an impressive array of carotenoids, antioxidants, and enzymes to create energy, minimize oxidative stress, and neutralize toxicants, all housed within a fibrous armor shell. When we eat chlorella, it passes on many of these defenses to us,⁸³ and it does so with relatively small doses.

Supplementing with chlorella has been shown to increase antioxidant status in patients with chronic obstructive pulmonary disease (COPD)⁸⁴ while also cutting levels of oxidative stress in smokers by 20 percent.⁸⁵

A meta-analysis of 19 randomized, controlled trials reported that supplementing with an average of just 4 grams per day of chlorella significantly reduced LDL-C, blood pressure, and fasting blood glucose after an average of two months.⁸⁶

And this plays out in people struggling with chronic fatigue too. In adults with fibromyalgia, supplementing with 10 grams of chlorella plus a liquid chlorella extract daily for two months has been shown to have significantly reduced the number of

tender muscle points by 8 percent and pain intensity by 22 percent.⁸⁷ The participants also reported improvements in most of their fibromyalgia symptoms, like general well-being and the ability to be active.

Recommended Dose: Take 500 to 3000 mg of chlorella per day

GARNISHES

Broccoli Sprouts

Broccoli sprouts are the richest source of sulforaphane in the world, a molecule that strongly upregulates the master regulator of the antioxidant response element Nrf2 (nuclear factor erythroid 2-related factor 2).⁸⁸ Nrf2 not only protects cells from oxidative damage and other stressors but also induces phase II of the liver's detoxification pathways and thereby helps the body neutralize toxicants and prepare them for excretion.

Studies have shown that individuals who regularly consume cruciferous vegetables (like broccoli sprouts) have enhanced detoxification capabilities that could impact drug metabolism.⁸⁹ These benefits can be obtained with 24 to 48 grams of fresh broccoli sprouts, which provides roughly 20 to 40 mg of sulforaphane.⁹⁰

Moreover, a systematic review of 17 clinical trials found that consuming upward of 100 grams of broccoli sprouts per day reduced fasting glucose, insulin resistance, blood lipids, oxidative stress, and inflammation in those with type 2 diabetes or cardiovascular disease.⁹¹ Even in overweight but otherwise healthy adults, consuming 40 grams of broccoli sprouts has been shown to cut inflammatory biomarkers like C-reactive protein and interleukin-6 by half.⁹²

Recommended Dose: Eat 25 to 100 grams (1 to 4 ounces) of fresh broccoli sprouts daily

Garlic

Garlic (*Allium sativum*) is a bulbous plant related to onions, shallots, leeks, and chives that has been consumed for thousands of years as both food and medicine among the Babylonians, Egyptians, Phoenicians, Vikings, Chinese, Greeks, and Romans.⁹³

Numerous controlled trials have supported the use of garlic as a health tonic. Meta-analyses of these studies have found that supplementing with 600 to 2400 mg of garlic extract (2 to 4 cloves) per day reduces markers of oxidative stress,⁹⁴ markers of inflammation,^{95,96} blood lipids and fasting glucose in adults with type 2 diabetes,⁹⁷ blood lipids in those with elevated levels,⁹⁸ and blood pressure in those with hypertension.⁹⁹ It may also improve liver function.¹⁰⁰

Recommended Dose: Take 600 to 2400 mg of garlic extract or eat 2 to 4 cloves per day

Ginger

Ginger is a culinary and medicinal herb in many cultures, often used as a tonic for the digestive system, including symptoms such as bloating and nausea.^{101,102}

In fact, just 1 to 2 grams of ginger is as effective as vitamin B₆ and certain medications for treating nausea during pregnancy¹⁰³ and can help alleviate nausea and vomiting in those undergoing chemotherapy for cancer.¹⁰⁴

Several meta-analyses have also reported that ginger consumption alleviates menstrual cramp pain,¹⁰⁵ lowers markers of inflammation and oxidative stress,¹⁰⁶ reduces blood pressure (with doses above 3 grams daily),¹⁰⁷ reduces blood lipids,¹⁰⁸ and facilitates weight loss among overweight and obese adults.¹⁰⁹

Recommended Dose: Consume at least 3 grams of ginger daily (about 1.5 tea bags if you drink ginger tea or about ½ teaspoon ground ginger)

Cacao

Cacao has been used by humans for more than 3,000 years as a nutritional and medicinal food, drawing fame throughout the world thanks to its heavy use by the Olmec, Maya, and Aztec cultures of Central America.^{110,111}

While many people may only think of cacao as being used in a dessert or candy, it actually has more phytochemicals and a higher antioxidant capacity than most other flavonoid-rich foods, including both green tea and red wine.¹¹² Of course, the source and processing methods of cacao beans will influence this, and your best bet is to find a non-alkalized (raw) cacao powder.

Meta-analyses suggest that cacao consumption benefits vascular health (lower arterial stiffness and increased endothelial function),^{113,114} reduces biomarkers of oxidative stress,¹¹⁵ modestly lowers blood pressure,¹¹⁶ and improves several other cardiometabolic risk factors like inflammation, insulin sensitivity, and blood lipids.¹¹⁷

Just remember: you want non-alkalized cocoa powder, as the alkalizing (“Dutch”) process destroys the flavanols (which is why this type of cocoa isn’t as bitter). If you opt for chocolate, then get the darkest you can tolerate, and avoid milk chocolate.

Recommended Dose: At least 50 grams (about 2 ounces) dark chocolate or 40 grams pure cocoa powder

NUTS, SEEDS, AND FATTY FRUITS

Almonds

Almonds are a type of drupe (also called stone fruits), like peaches and apricots, only the part we eat is the seed of the tree. Nonetheless, almonds are nuts from a culinary and nutritional standpoint, and they are rich in vitamin E, fiber, and phytochemicals that all converge to provide a nutrient-dense source of fat in our diet.¹¹⁸

Meta-analyses of randomized, controlled trials have shown that eating at least 1 ounce (a handful) of almonds per day can

lower blood lipids implicated in cardiovascular disease¹¹⁹ and reduce body weight and fat mass.¹²⁰ A variety of clinical trials have also suggested that regular almond consumption lowers markers of oxidative stress and inflammation.¹²¹

Another cool thing about almonds is that they contain a resilient plant cell wall that encloses the fat particles, rendering the fat unavailable for digestion and absorption.¹²² Thus, less chewing means more intact cell walls that interfere with the digestive process,¹²³ which means fewer calories available for the body to use while allowing more fiber to reach the microbiome. Eating just 2 ounces of almonds per day has been shown to increase microbial diversity in otherwise healthy adults.¹²⁴

Recommended Dose: 1 ounce per day minimum

Avocado

Avocados are a fatty fruit rich in healthy monounsaturated fatty acids, fiber, and phytochemicals, particularly the carotenoid lutein. Eating just one avocado per day has been shown to increase macular pigment density (the primary location of lutein in the body that correlates with brain concentrations).¹²⁵

Meta-analyses have reported that substituting avocados for other food in the diet results in moderate-to-large reductions of LDL cholesterol and triglycerides,^{126,127} which are key cardiovascular disease risk factors.

Other clinical trials in which participants are instructed to eat more avocados have reported improved autonomic (rest-and-recover) nervous system activity following exercise,¹²⁸ increased serum antioxidant status and lower levels of oxidized LDL particles,¹²⁹ and an improved metabolic response to eating when the avocado replaces carbohydrate in the meal.¹³⁰

Recommended Dose: Eat ½ to 1 large avocado per day

FIBROUS VEGETABLES

Tomatoes

Tomatoes are a fruit best known for their high concentration of the red color pigment lycopene, which is named after the tomato plant (*Solanum lycopersicum*). This carotenoid is considered one of the most efficient singlet oxygen quenchers,¹³¹ which are primary sources of oxidative stress in the body, especially the skin.¹³²

In one study, researchers found that eating 55 grams of tomato paste (16 mg lycopene) reduced mitochondrial damage and increased collagen deposition in the skin.¹³³

Of course, if tomatoes aren't your thing, you can still reap a benefit from pure lycopene supplements,^{134,135} albeit a little less than the benefit from an equivalent amount of lycopene supplied from tomatoes.¹³⁶ That makes sense given that tomatoes contain not just lycopene but other carotenoids that have biological effects in the body.¹³⁷

Aside from making your skin shine, tomato consumption has been linked to lower risks of dying from any cause or heart disease,¹³⁸ modest improvements in blood lipids,¹³⁹ and lower risk of developing prostate cancer.^{140,141}

Recommended Dose: 40 grams tomato paste or 1 to 2 whole large tomatoes per day

Beets

Beets are a food best known for their high concentration of dietary nitrates, which are molecules that are transformed into nitric oxide within the body.¹⁴² Nitric oxide is a signaling molecule within the cardiovascular system that plays a central role in relaxing blood vessels, promoting vasodilation, and reducing blood pressure.¹⁴³

Studies have shown that consuming nitrates from foods like beets increases nitric oxide concentrations in the body and consequently improves blood pressure, endothelial function,

arterial stiffness, platelet function, and exercise performance.¹⁴⁴

For example, an average-sized beet (about 80 grams) provides about 200 mg of nitrates,¹⁴⁵ and a meta-analysis of 47 randomized, placebo-controlled trials reported that supplementing with 250 to 1200 mg of nitrates from beetroot and other sources improved several assessments of endurance exercise performance, particularly the amount of time that healthy adults could exercise before exhausting themselves.¹⁴⁶

Recommended Dose: Supplement with 250 to 1200 mg of nitrates daily or eat 1 to 6 beets

Mushrooms

Mushrooms have been an important part of the human diet and used medicinally to treat countless ailments for thousands of years. Although medicinal mushrooms are considered distinct from dietary ones, the division is becoming increasingly blurred as we learn more about the potent health-promoting properties of mushrooms.

Mushroom species such as cremini, shiitake, and oyster are a rich source of essential minerals like potassium, copper, and zinc, and are also full of prebiotic fiber and bioactive polysaccharides with antiviral, antibacterial, and antibiotic properties that protect against cancer and metabolic dysfunction.^{147,148,149}

The most common culinary mushroom is the cremini or button mushroom, which is an immature portabella mushroom. The polysaccharides contained within this mushroom have been shown to lower the inflammatory response to microbial endotoxins commonly absorbed from the gut,¹⁵⁰ and eating just 100 grams of this mushroom per day for a week increases mucosal immunity via enhanced immunoglobulin A secretion.¹⁵¹

Moreover, in animals, regular consumption of the cremini or button mushroom has been shown to improve microbiome

diversity and protect against pathogenic infections,¹⁵² as well as improve innate immune function.¹⁵³

Clinical trials with oyster mushrooms, mainstays in Asian cuisine, have shown enhanced immune function among healthy adults,^{154,155,156} while those with shiitake have shown it to have immune-boosting effects alongside protecting against dental cavities.^{157,158}

Recommended Dose: Eat regularly (ideally at least 3 times per week)

ANIMAL-BASED PROTEINS

Eggs

High-quality pastured eggs are a rich source of protein and many nutrients, particularly choline, DHA, and lutein. Obtaining pastured eggs is important because the chickens' diet significantly impacts the nutritional quality of their eggs.

Pastured hens lay eggs with significantly more omega-3 fatty acids, including a notable increase in DHA¹⁵⁹ (an amount comparable to seafood), less omega-6 fatty acids, and a lower omega-3 to omega-6 ratio than their conventional or organic counterparts.^{160,161} Additionally, eggs from pastured hens contain significantly more vitamin E and bioactive compounds, including lutein and zeaxanthin.^{162,163}

With choline, a single large egg provides about 170 mg, or about 30 to 40 percent of the adequate intake for men (550 mg) and women (425 mg). In other words, eating 3 to 4 eggs per day could get you all the choline you need to support neurotransmission, brain health, and liver function.

Recommended Dose: Eat 1 to 4 pastured eggs per day

Beef Liver

Beef liver is one of the most nutrient-dense foods on the planet, although the taste does admittedly leave much to be desired. Still, just 3.5 ounces (100 grams) meets your daily

requirements for most B vitamins, vitamin A, and copper, while providing over half your requirements for choline, zinc, iron, selenium, and folate.

Beef liver is basically nature's multivitamin, although you don't want to eat too much due to the risk of vitamin A and copper toxicity. It's best to limit yourself to eating no more than a pound per week.

Also, there's a common belief that the liver is full of toxicants due to its detoxification job in the body, but this is a myth. The liver doesn't store toxicants; it processes them and prepares them for excretion from the body.

Recommended Dose: Consume 4 to 8 ounces of beef liver 2 to 4 times per week (8 to 16 ounces in total per week)

Salmon Roe

Salmon roe consists of red-orange unfertilized salmon eggs, like caviar (salt-cured fish eggs from the sturgeon family). They are rich in many nutrients, including vitamin A, choline, iron, magnesium, calcium, selenium, and omega-3 fatty acids (EPA and DHA); one of nature's richest sources of phospholipids; and can be considered a nutrient powerhouse when added to the diet.

Recommended Dose: To taste

Oysters

Oysters are possibly the best source of zinc in existence, an essential mineral required for proper immune function, wound healing, and metabolism. Just one medium oyster provides you with all the zinc you need for a day, along with a generous serving of iron, selenium, and omega-3 fatty acids (EPA and DHA).

A randomized clinical trial involving 94 healthy adults found that eating 40 grams of boiled oysters (15 mg of zinc) daily for 12 weeks significantly improved sleep efficiency, shortened the time it took to fall asleep, and reduced nightly restlessness compared to a placebo.¹⁶⁴

Recommended Dose: 1 to 3 oysters per day if you enjoy them

WHOLE GRAINS

Oats

If you eat only one grain, choose oats. They are an excellent source of complex carbohydrates, a special type of fiber called beta-glucan, and numerous minerals such as manganese, magnesium, iron, selenium, zinc, and copper.

The beta-glucan fiber of oats has been consistently linked to improved cardiovascular health through its ability to help lower blood lipids.¹⁶⁵ Moreover, including oats in a diet has been shown to reduce fasting insulin and improve glycemic control,^{166,167} but likely only when the oats are minimally processed, such as with steel cut and thick rolled oatmeal.¹⁶⁸

Another unique benefit of oats is their avenanthramide content, an oat-specific phytochemical that increases antioxidant status after consumption¹⁶⁹ and can also reduce exercise-induced inflammation in younger and older adults.^{170,171,172}

Recommended Dose: 1 to 2 servings (about 40 to 80 grams dry oats) per day

LEGUMES

Black Beans

Black beans are a rich source of fiber, protein, phytochemicals, and multiple vitamins and minerals, like calcium, magnesium, potassium, zinc, and folate. Consuming black beans has been shown to improve antioxidant capacity and lower the insulin response to eating more than either an equivalent amount of supplemental fiber or antioxidants alone, suggesting a synergistic effect of the whole black bean.¹⁷³

Other research has shown that black beans can lower the glycemic response of eating,¹⁷⁴ meaning they can minimize

those post-meal surges and drops in blood glucose that often lead to fatigue. They also improve cardiovascular health after eating (improved vascular tone) compared to other beans.¹⁷⁵

Recommended Dose: Eat regularly

Soy

Soybeans and many (but not all) of the products made from them are a rich plant-based source of high-quality protein and generous amounts of fiber. Soybeans are part of the traditional diets of many Asian societies, where they undergo minimal processing to become wholesome foods such as natto, tofu, tempeh, miso, soy sauce, and soy milk.

Many soy products are rich in isoflavones, a type of phytochemical whose consumption has been associated with lower blood lipids,¹⁷⁶ lower blood pressure,^{177,178} and improved endothelial function¹⁷⁹—which could possibly explain the association between soy consumption and reduced risks of developing cardiovascular disease.¹⁸⁰ If you include soy in your diet, we strongly advise consuming only organic soy foods, ideally traditionally fermented soy products like tempeh and natto.

Recommended Dose: Eat soy foods at least several times per week (ideally organic and fermented soy products)

CHAPTER 8

ENERGY SUPER SUPPLEMENTS

The nutritional strategies that we've covered so far create a strong foundation for optimizing your energy levels and mitochondrial function. By using your diet to address the most common cell danger response triggers, you can experience renewed vitality and livelihood.

However, implementing dietary changes takes time. Many strategies involve the altering of eating times and schedules, types of foods, and preparation and cooking techniques. These adjustments are incredibly important, but they can be an involved process that takes weeks before you experience positive changes.

Comparatively, some supplements have been shown to improve people's energy levels in as little time as *one week*.

Supplements are called *supplements* because they're meant to supplement the diet, and to provide nutrients and other compounds that can't be obtained through foods. Truly, at drug-level potency, they have qualities that you will not find in food. For many people suffering debilitating and persistent fatigue, sometimes taking a supplement or two gives just enough relief to start experiencing better energy levels. Feeling slightly better then becomes a motivating factor that inspires them to keep making, and sticking with, the dietary revolutions.

Supplements can play such a powerful role in restoring and enhancing energy levels that my team at *The Energy Blueprint*

created a line of ultra-premium supplements. For many people, experimenting with supplements one at a time can be overwhelming and expensive, so our products were created using multiple clinically effective doses of key ingredients, backed by scientific evidence.

While we encourage anyone to try the “20-in-1” approach using our supplements (or other high-quality products), our aim in this chapter is to explain some of the most powerful and effective supplements individually. We share the science behind how these supplements and compounds work, the suggested doses based on the scientific evidence, and some of the most common benefits that people often experience when adding supplements to their diets. We use many of the supplements described in this chapter in *The Energy Blueprint* products too.

These supplements and compounds can help rejuvenate your mitochondria, get deeper and more regenerative sleep, strengthen the integrity of your gut, improve your glycemic control, and bolster your brain function and moods—each of which will help bring you one step closer to overcoming fatigue and reclaiming your lost energy.

This information can also help you have more informed conversations with health and wellness professionals. If you are uncomfortable identifying and determining the right supplements to take by yourself, that’s okay. Please seek out health care practitioners like functional, integrative, or naturopathic providers who recommend targeted supplements and compounds for their patients.

Of course, taking supplements—whether you’re experimenting with them one at a time or as compounds that include multiple ones—is *not required* for achieving optimal health, mitochondrial function, and top energy levels.

But for some people, supplements can be game changers.

The key lesson with supplements—and with any strategy—is to always *listen to your body*. We’ve included suggested doses for each supplement along with the typical improvements that many people will experience, but feel free

to start with lower doses and gradually work your way up. None of the supplements we talk about have notable adverse effects when used at the recommended doses. Still, bodies are unique, so do your best to notice how yours feels after you start taking a supplement.

Remember, our aim is to increase your energy and make your body feel amazing. If any supplement (or strategy) ever causes a *negative* reaction, get rid of it.

And if something isn't working, don't let that discourage you. Instead, try shifting your perspective. Remind yourself that you're one supplement (or strategy) closer to finding the one(s) that will help you regain your energy.

MITOCHONDRIAL SUPPORT AND ENERGY ENHANCEMENT

First up on our list are supplements that get to the heart of your energy problems by directly bolstering mitochondrial function and helping build their resilience to harm. Given the ubiquitous nature of mitochondria throughout your body, the benefits of bolstering mitochondrial energy production are vast, ranging from the obvious benefit of lessened fatigue to the more subtle: improved metabolic health and cognitive function.

Importantly, none of these compounds are stimulants like caffeine, which serve only to provide a temporary energy jolt through causing a stress response within the body. Worse yet, regular use of stimulants causes habituation: they no longer enhance energy levels but instead just maintain a new baseline. And regular intake must continue lest you suffer withdrawal and lower energy levels until the habituation fades.

Instead, these supplements build your “cellular engine”—your mitochondria—over time, so they become stronger and capable of producing more energy. They essentially raise your baseline energy levels by building up your mitochondria and your body's capacity to produce more energy on its own.

Fortunately you can experiment with a number of supplements and compounds to boost your mitochondria. To start, I recommend working with one of the top seven listed, as they are the best investigated. If you aren't getting the results you want from these, or if you simply want to see if your body responds better to other supplements, then try delving into any of the others outlined in this section.

The Top Seven

1. Comprehensive Vitamin and Mineral Formula

Multivitamins are like a safety net, which most people need. An analysis of 70 diet plans created for athletes and sedentary adults looking to improve their nutrient intake found 3 to 15 vitamin and mineral deficiencies.¹ Another study analyzing four popular diet plans (Atkins for Life, South Beach, Best Life, and DASH) found that a person would need to consume more than 18,000 calories per day to ensure an adequate intake of all essential micronutrients.²

Unsurprisingly, when we look at the average American, things are not any different. More than half of Americans do not meet the estimated average requirement for vitamins A, D, E, or K, calcium, magnesium, or potassium even after taking into account fortified foods.³ In other studies, 33 to 58 percent of U.S. adults are deficient in at least one major vitamin like A, B₆, B₁₂, C, D, and E when looking at diet alone, but only 8 to 19 percent have at least one deficiency when a multivitamin is used.⁴

Given these numbers, almost everyone has *at least one* key nutritional deficiency, if not several. We won't cover every essential nutrient in detail, but it goes without saying that they are all important for your energy levels in one way or another.⁵

- B vitamins are necessary for turning food into cellular energy.

- Vitamin C reduces oxidative stress and is necessary for carnitine synthesis.
- Vitamin E prevents mitochondrial membrane oxidation.
- Vitamin A maintains healthy rates of mitochondrial respiration.
- Vitamin D has countless energy-relevant functions throughout the body.
- Iron is essential for the transport of oxygen throughout the body.
- Magnesium is required for cellular energy creation.
- Zinc is required for antioxidant enzyme activity that protects mitochondria.

And for those taking a multivitamin, there does appear to be a modest health benefit. A meta-analysis of 21 randomized, controlled trials lasting longer than one year found that they tended to reduce the risk of dying from any cause by 6 percent,⁶ likely through preventing clinical and subclinical deficiencies.

More importantly, daily supplementation with a comprehensive vitamin and mineral formula has been shown to reduce fatigue by 35 percent and reduce sleep disturbances by 39 percent after two months in women with chronic fatigue.⁷ Without doing expensive testing to look at what specific nutrients you may be low in, using a high-quality comprehensive vitamin and mineral formula is a powerful way to cover your nutritional bases and correct common nutritional deficiencies that frequently contribute to fatigue.

As an aside, not all studies find benefits in multivitamin use. It's a topic too complex and nuanced to address here, but it's worth mentioning that a primary reason for most negative findings is the use of inferior forms of many vitamins and minerals. As you'll read shortly, using certain forms of B vitamins can reduce their effectiveness or increase the risk of

adverse effects, and these forms are often included in common multivitamins.

Vitamin E is another example. It consists of eight molecules, but most supplements only use one, alpha-tocopherol, which has limited benefits compared to the more bioactive tocotrienols.⁸ Worse yet, they may use the synthetic DL-alpha-tocopherol that not only has lower bioavailability than natural alpha-tocopherol but may cause harm like liver damage and prostate cancer.^{9,10}

Recommended Dose: Aim for a multivitamin that provides an array of biologically appropriate vitamins and minerals in their ideal forms. Seemingly small details like the form of each nutrient can ultimately determine whether you get energy and longevity benefits, making it critical to use an ultra-high-quality multivitamin and mineral formula rather than the typical stuff you find in your local drug or health food store.

Common Benefits: Ensures nutrient adequacy for your mitochondria and every other cell to function optimally

2. Methyl B Complex

Of all the essential vitamins and minerals, the B vitamins deserve special attention because without them, we wouldn't be able to turn the food we eat into cellular energy and our mitochondria couldn't function. The specific vitamins include:

- **Thiamine (B₁)**—required to harvest energy from glucose and for the synthesis of energy-carrying molecules within mitochondria
- **Riboflavin (B₂)**—the central unit for flavoproteins, which are necessary for mitochondrial energy production and antioxidant defenses
- **Niacin (B₃)**—the central unit for NAD⁺ and NADP, which are necessary alongside flavoproteins for mitochondrial energy production and antioxidant defenses

- **Pantothenic acid** (B₅)—the central unit of coenzyme A, which plays a vital role in energy production and the metabolism of many nutrients
- **Pyridoxal** (B₆)—required for amino acid metabolism, gene expression, and the breakdown of homocysteine
- **Biotin** (B₇)—the central component of several enzymes involved in energy production, amino acid metabolism, gene expression, and cell growth
- **Folate** (B₉)—required for methylation reactions, DNA synthesis, and the breakdown of homocysteine
- **Cobalamin** (B₁₂)—necessary for the breakdown of certain amino acids and fatty acids, as well as for the breakdown of homocysteine and recycling of folate

Aside from energy production, three of the B vitamins are essential for another critically important job within the body: the breakdown of *homocysteine*, an excess of which has a diversity of harmful effects on our body, particularly when it comes to our cardiovascular system, brains, bones, and joints.¹¹ Individuals with chronic fatigue have significantly elevated levels of homocysteine in their cerebrospinal fluid that nourishes the brain and spinal cord, and the amount of homocysteine is related to one's fatigability—more homocysteine, more fatigue.¹² Higher homocysteine levels have also been identified as a significant cause of neurodegeneration and cognitive decline with aging.^{13,14}

The breakdown of homocysteine involves three B vitamins: folate, vitamin B₁₂, and vitamin B₆. Folate is the most important and requires the most attention because we need a special form called *5-methyltetrahydrofolate*, or methylfolate for short, to break down homocysteine. As we covered in [Chapter 6](#), the only way our body can create methylfolate is through the enzyme methylenetetrahydrofolate reductase (MTHFR). Yet many people have genetic polymorphisms (a

type of mutation) that impair the ability of this enzyme to function.^{15,16,17}

This means that you're going to have a hard time detoxifying homocysteine unless you directly consume methylfolate to bypass this bottleneck process. While eating a diet rich in fibrous vegetables and legumes can help, since roughly 45 to 65 percent of their folate is in methylfolate form,¹⁸ many people need additional supplementation to keep homocysteine levels in check.

The amount of supplemental folate needed to maintain a healthy homocysteine range of 5 to 7 $\mu\text{mol/L}$ is variable between individuals. The best thing to do is monitor your own homocysteine level and modify the dose of folate you take until homocysteine is in a healthy range. If you don't want to do regular blood work, then make sure you have a more than adequate intake of folate (at least 400 micrograms of methylfolate per day) and other methylated B vitamins.

Next up is vitamin B₁₂, which we need to use folate in the breakdown of homocysteine. You'll find several forms of B₁₂ on the market, including methyl-, adenosyl-, hydroxy-, and cyano-B₁₂, but all get broken into their core B₁₂ molecule during digestion and absorption.¹⁹

Still, some studies have suggested that retention rates with methyl- and hydroxy-B₁₂ are greater than that of cyano-B₁₂, largely due to lower excretion.^{20,21} Plus, there may be yet unidentified polymorphisms in B₁₂ receptors and transporters that impact how someone responds to specific forms of B₁₂ supplements. As such, it makes sense to supplement with methyl-, adenosyl-, or hydroxy- forms of B₁₂—the forms that we naturally obtain in our diet—rather than cyano-.

Recommended Dose: Aim for an adequate intake of all B vitamins.

- B₁: 1.2 mg
- B₂: 1.3 mg

- B₃: 16 mg
- B₅: 5 mg
- B₆: 1.3 mg
- Biotin: 30 mcg
- Folate: 400 mcg
- B₁₂: 2.4 mcg

Pay special attention to the form of folate (methylfolate), B₆ (pyridoxal-5-phosphate), and B₁₂ (methyl-, adenosyl-, or hydroxy-B₁₂).

Common Benefit: Ensuring nutrient adequacy for optimal energy production within mitochondria and maintenance of healthy homocysteine levels

3. NTFactor Phospholipid Complex

One of the primary determinants of whether mitochondria switch from energy mode to danger mode is the integrity of their membranes. Damage to mitochondrial membranes signal danger and a need to shift resources away from energy production and to defense.

Lipid replacement therapy is based on the idea that you can take a supplement containing cell membrane phospholipids to repair damaged mitochondrial membranes that accumulate through life.²² Accomplishing such a feat requires a compound that can survive degradation during digestion and avoid oxidation during transport throughout the body.

NTFactor is a phospholipid complex that supplies the primary cell membrane phospholipids along with antioxidants and fructooligosaccharides to protect the phospholipids from enzymatic degradation and oxidation.²³ This phospholipid complex is absorbed relatively intact and is readily transported throughout the body.

The result is a supply of bioactive phospholipids that naturally replace damaged mitochondrial membrane components, leading to a regeneration of dysfunctional mitochondria.

In a study of older adults with mild to moderate fatigue, 2 to 3 grams per day of NTFactor improved mitochondrial function by 24 percent after 12 weeks, restoring it to a level similar to *healthy 29-year-olds*.²⁴ This improvement in mitochondrial function was accompanied by a 33 percent reduction in self-reported levels of fatigue. In addition, numerous studies have shown that supplementing with 1.5 to 3 grams of NTFactor reduces fatigue by 24 to 43 percent among those with chronic fatigue syndrome or conditions associated with fatigue, like general aging, obesity, Lyme disease, and Gulf War illness.²⁵

Recommended Dose: Take 1 to 4 grams of NTFactor daily

Common Benefits: Repairs mitochondrial membranes and bolsters energy production

4. Acetyl-L-Carnitine

Our mitochondria cannot make energy out of nothing, and our body uses intricate transport systems to get raw materials inside the mitochondria so they can make fuel. One of those transport systems is called the *carnitine shuttle system*, which is essential for bringing fatty acids inside mitochondria.

If you don't have enough carnitine, you won't burn fat and your mitochondria are going to have one hell of a time making energy. Even if everything else about your mitochondria is optimally functioning, a lack of carnitine will cause them to act as if they are damaged and dysfunctional.

While complete carnitine deficiencies cause a host of nasty effects like liver and brain damage, weakness, and lethargy,²⁶ even mild subclinical insufficiencies can cause problems. A systematic review of 25 studies investigating the relationship between mitochondrial function and fatigue reported that carnitine deficits were one of the most common biomarkers linked to fatigue status.²⁷

Acetyl-L-carnitine (ALCAR) is a special form of carnitine that achieves two transformations: (1) it supplies the carnitine your mitochondria need to produce energy, and (2) it provides an acetyl constituent that your mitochondria use to remain youthful and healthy.

To illustrate these benefits, one study of chronically fatigued older adults found that taking 4 grams of ALCAR daily over six months led to profound benefits to their well-being, including a 15 percent increase in cognitive function, 24 percent increase in physical function, and close to a whopping 50 percent reduction in mental fatigue, physical fatigue, and overall fatigue severity.²⁸

Through increasing mitochondrial acetylation and carnitine levels within the brain, ALCAR supplementation:

- Improves mitochondrial function within brain cells^{29,30}
- Increases acetylcholine signaling and improves learning capacity^{31,32}
- Increases brain energy availability³³
- Protects against β -amyloid neurotoxicity and reduces oxidative stress^{34,35}

Accordingly, ALCAR can be a powerful ally in the fight against neurodegeneration and cognitive decline with aging.³⁶ For example, a meta-analysis of 21 randomized, double-blind, placebo-controlled trials reported that 1.5 to 3 grams per day of ALCAR significantly improved cognitive function assessed by a variety of methods in older adults with mild cognitive impairment or early Alzheimer's disease.³⁷

It can also be a powerful ally against mood disorders like depression, with one meta-analysis of 12 randomized controlled trials showing that ALCAR significantly reduced depressive symptoms with an efficacy like antidepressant medications but with fewer side effects.³⁸

Recommended Dose: 1.5 to 4 grams per day, divided across 2 to 3 doses

Common Benefits: Optimizes mitochondrial energy production, increases energy levels, and protects against neurodegeneration and depression

5. Creatine Monohydrate

We rely on our mitochondria to supply virtually all our energy throughout the day, but sometimes they cannot support our energy demands. In situations where we require instantaneous energy bursts, our cells get their energy (ATP) from a molecule called *phosphocreatine*.

It's like gunpowder for your muscles, providing near-instantaneous regeneration of ATP. When we sprint, for example, it is the phosphocreatine that is responsible for exploding with energy (ATP) that our muscles can immediately use to sustain that sprint. The most prominent use of phosphocreatine is by our muscles, which use it to contract whenever we sprint, jump, lift heavy weights, or throw a punch. Creatine supplementation works, quite simply, by saturating our body with phosphocreatine and increasing the amount of readily available energy we have to use. This is why creatine is such a heavily researched ergogenic supplement for bolstering exercise performance, and studies clearly indicate that it can increase muscle strength, power output, and lean body mass in younger and older adults alike.^{39,40,41,42,43}

The benefits go far beyond just improving muscle function; studies show that creatine protects muscle fibers from high levels of oxidative stress and preserves their ability to grow and differentiate.^{44,45} One of the most important ways it does this is by increasing mitochondrial biogenesis, structural integrity, and function.⁴⁶

On top of that, higher levels of creatine sensitize mitochondria to energy production signals, meaning that they will ramp up their energy production more effectively when

faced with signals to do so.⁴⁷ In other words, creatine stimulates mitochondrial respiration.

And muscle contractions aren't the only cellular function reliant on phosphocreatine. Neurons require it to support their intense and fluctuating bursts of communication, with impairments in creatine metabolism linked to neurodegeneration.⁴⁸ Several studies have established that creatine supplementation increases brain creatine stores by 5 to 15 percent, depending on concentrations before supplementation and the size of the person supplementing.^{49,50,51}

Through increasing the supply of readily available energy, acting as an antioxidant, and protecting against mitochondrial dysfunction, creatine is a powerful ally for supporting optimal brain health and physical energy levels.⁵²

Recommended Dose: 3 to 5 grams per day

Common Benefits: Improves strength, physical function, and mitochondrial energy production

6. Taurine

Taurine is an omnipresent amino acid within the body, essential for the development and function of our cardiovascular, muscular, nervous, and ocular systems.⁵³ Taurine is such a powerful amino acid that deficiencies are implicated in numerous chronic disease states.^{54,55}

There are many reasons why taurine plays a role in these conditions. It's required to regulate water balance, for cell signaling, to make bile and excrete toxicants, and, most importantly, for mitochondrial function and energy production.

The highest amounts of taurine are in tissues with huge energy requirements and a lot of mitochondria, such as the retina, nerves, kidney, heart, and skeletal muscles.⁵⁶ That's because taurine is essential for mitochondrial function.

If mitochondria don't have enough taurine, energy production decreases and oxidative stress increases.⁵⁷ To that

effect, several clinical trials have shown that supplementing with 3 grams of taurine per day reduces biomarkers of oxidative stress and inflammation in those with metabolic dysfunction.^{58,59,60} Additionally, a meta-analysis of 10 studies reported that 1 to 6 grams of taurine improved endurance exercise performance, particularly power output and the amount of time that people could run before exhaustion.⁶¹

Recommended Dose: 1 to 6 grams per day

Common Benefits: Supports mitochondrial function and enhances physical performance

7. Astaxanthin

Astaxanthin is a carotenoid produced by the microalgae *Haematococcus pluvialis* as protection for its cells against oxidative stress.⁶² Of course, you've likely seen it in the many creatures that eat it—krill, shrimp, crab, and salmon are all rich sources of astaxanthin that pigments their flesh and shells with a red-orange hue.

While eating astaxanthin won't turn our skin red, it will bestow us with some incredibly potent antioxidant benefits, improved mitochondrial health, and increased energy levels, among many other benefits.

Astaxanthin is an incredibly efficient antioxidant. While other types of antioxidant molecules generally act either inside or outside the membrane, astaxanthin's structure allows it to do both, thereby helping stabilize mitochondrial membranes and protect them from oxidative damage.^{63,64,65}

Ultimately, astaxanthin's polarity and antioxidant properties have afforded it a powerful ability to prevent mitochondrial dysfunction and help reverse the mitochondrial dysfunction associated with aging,^{66,67} leading some researchers to call it a "mitochondria-targeted antioxidant."⁶⁸

For example, just three weeks of supplementing with 5 mg of astaxanthin per day reduced oxidative stress and increased antioxidant status in individuals carrying around too much

body fat to levels seen in those at a normal body weight.⁶⁹ In fatigued elderly adults, four months of supplementation with 12 mg of astaxanthin was found to increase maximal strength by 14 percent, muscle size by 3 percent, and force production by 12 percent compared to a placebo.⁷⁰

Similar benefits have been observed in young adults too. Recreationally active college students who supplement with 4 mg of astaxanthin per day were found to increase their muscular endurance threefold compared to the placebo group.⁷¹ Other studies have found that astaxanthin helps prevent the decrease in antioxidant defenses that occur from prolonged endurance exercise in elite-level soccer players and helps improve endurance exercise recovery in recreational athletes.^{72,73}

Recommended Dose: 4 to 12 mg per day

Common Benefits: Lowers oxidative stress, improves mitochondrial integrity, increases energy levels, and enhances athletic performance

More Mitochondria- and Energy-Enhancing Supplements

Alpha-Lipoic Acid

Alpha-lipoic acid (ALA) is a mitochondrial molecule involved in energy metabolism and the antioxidant system. It is not only essential for mitochondria to create cellular energy but also serves to function as an antioxidant, replenish other antioxidants, and stimulate the production of antioxidant enzymes like glutathione.⁷⁴

ALA has been heavily investigated as a mitochondrial rejuvenator that helps reverse age-related declines in mitochondrial energy production,⁷⁵ particularly within the brain.^{76,77} Additional research has suggested that ALA benefits neurodegenerative disorders and age-related cognitive decline.^{78,79} ALA accumulates in various brain regions as soon as an hour after ingestion,^{80,81} and it has been shown to

protect against neuronal cell death.⁸² In patients with Alzheimer's disease, supplementing with 600 mg of ALA per day alongside fish oil prevented a decline in cognitive function over one year compared to both fish oil alone and a placebo.⁸³

The mitochondrial benefits of ALA supplementation seem to extend to metabolic health as well.^{84,85} Several studies have shown that supplementing with 800 to 2000 mg per day facilitates weight loss and reductions in waist circumference among both men and women using it for several months.^{86,87,88}

Recommended Dose: 600 to 1800 mg per day, divided across 2 to 3 doses (or 100 to 600 mg if using R-ALA)

Common Benefits: Protects against mitochondrial dysfunction, oxidative stress, neurotoxicity, and weight gain

Butyrate

Butyrate is a short-chain fatty acid that is important for our health, particularly the gut and brain. While the primary source of butyrate is fermentation of prebiotic fibers by our intestinal microbes, eating a ton of prebiotic fiber isn't always feasible, depending on one's preferences and sensitivities. As such, supplementing with butyrate can provide great therapeutic value.

Tributylin is a supplemental form of butyrate. Studies have shown that supplementing with tributyrin efficiently increases serum levels of butyrate,^{89,90} making it a potential candidate for reaping many of the systemic effects that butyrate provides.

Animal research has shown that tributyrin protects the liver from endotoxin and alcohol injury,^{91,92} reduces inflammation and insulin resistance associated with obesity,⁹³ enhances mitochondrial function,⁹⁴ and facilitates muscle growth and development.⁹⁵ With regard to the brain specifically, tributyrin has been shown to enhance non-REM sleep,⁹⁶ and may be able

to protect the brain against neurodegeneration and neuroinflammation.⁹⁷

The reason butyrate is critical for mitochondrial function is that it doesn't require any special machinery to be used for energy production—it just moves into our mitochondria and is transformed into cellular energy with ease, which can be a lifesaver when those mitochondria are dysfunctional and having a hard time making energy to begin with.

Recommended Dose: 500 to 3000 mg per day (ideally of tributyrin)

Common Benefits: Enhances mitochondrial energy production and protects against cardiometabolic diseases

Coenzyme Q10

Coenzyme Q10 (CoQ10) is an essential component of the electron transport chain through which mitochondria generate energy. It serves a dual purpose: as an antioxidant within the chain and as an energy-transferring molecule. As such, deficits in CoQ10 will not only lead to a cessation of energy production, but also an increase in oxidative damage. Individuals with chronic fatigue regularly show deficiencies in CoQ10 concentrations throughout the body,⁹⁸ as do those with conditions in which fatigue is a common symptom, like fibromyalgia;^{99,100,101} those who have survived heart attacks or heart failure;^{102,103} and people with multiple sclerosis.^{104,105}

CoQ10 will enhance blood flow, protect blood vessels, lower oxidative stress, and boost vitality in anyone who suffers from fatigue, but especially in those people with the aforementioned conditions. Just several months of supplementing with 150 to 300 mg of CoQ10 decreases fatigue and improves autonomic nervous system activity (the part of the nervous system involved in rest and recovery) and biochemical parameters of mitochondrial energy production.^{106,107,108,109}

Even in healthy adults, CoQ10 supplementation improves general fatigue and reduces oxidative stress.^{110,111}

Recommended Dose: 150 to 300 mg per day

Common Benefits: Promotes mitochondrial energy production, reduces oxidative stress, and reduces fatigue

Curcumin

Curcumin is the yellow pigment and primary bioactive substance in turmeric, with powerful anti-inflammatory and antioxidant properties that protect and stabilize mitochondrial membranes and help the body build more mitochondria (mitochondrial biogenesis).^{112,113}

These effects have led to vast investigation of its benefits for human health, with evidence suggesting curcumin supplementation can help slow cognitive decline with aging, improve cardiovascular health, reduce the risk of developing diabetes, and alleviate other inflammation-related conditions, including chronic fatigue.^{114,115,116}

A systematic review of 11 studies reported that curcumin supplementation in athletes and active adults reduced inflammation and oxidative stress, decreased pain and muscle damage, and improved recovery and muscle performance.¹¹⁷ These studies used 180 mg of Theracurmin, 500 mg of Meriva, 400 mg of Longvida, and 6 grams of regular curcumin combined with piperine.

Notably, there are many forms of curcumin on the market that have increased bioavailability compared to pure curcumin that you'd find in turmeric. Studies in humans have determined that the bioavailability of these various forms are: NovaSol (185-fold), CurcuWIN (136-fold), Longvida (100-fold), Cavacurmin (85-fold), Meriva (48-fold), BCM-95 (27-fold), Theracurmin (16-fold), CurQfen (16-fold), MicroActive Curcumin (10-fold), and micronized curcumin (9-fold).¹¹⁸

Recommended Dose: 400 to 1000 mg per day of an enhanced curcumin form like NovaSol, Longvida, CurcuWIN, or Meriva

Common Benefits: Reduces inflammation and improves mitochondrial function

D-Ribose

D-Ribose is a naturally occurring sugar molecule that assists in the production of cellular energy by virtue of being a necessary component of ATP, DNA, and RNA.¹¹⁹

Evidence suggests that D-Ribose can help boost energy and physical function in situations where energy levels are reduced, such as in people who have suffered from heart disease or stroke^{120,121,122} or people engaging in regular intense exercise.^{123,124}

In adults with chronic fatigue, supplementing with 5 grams of D-Ribose three times per day (15 grams per day in total) led to 45 percent greater energy levels, 25 percent better sleep quality, 16 percent more mental clarity, 14 percent less pain, and 30 percent greater overall well-being.¹²⁵ Another study reported similar findings after using 10 grams per day, with all benefits disappearing within a week of stopping supplementation.¹²⁶

Recommended Dose: 10 to 15 grams per day, divided across 2 to 3 doses, taken with meals. Please be aware that this is a unique kind of “sugar” molecule that can cause *low* blood sugar (hypoglycemia) in some people, so start with 2 to 3 grams and work your way up to a clinical dose.

Common Benefits: Increases energy levels and physical function by supporting mitochondrial energy production

Forskolin

Forskolin is the primary bioactive in the *Coleus forskohlii* herb that has historically been used in Ayurvedic medicine. It works by increasing levels of cyclic adenosine monophosphate (cAMP),¹²⁷ which maintains mitochondrial health through regulating mitochondrial dynamics like biogenesis and energy production.¹²⁸

This effect has ultimately translated into less fatigue and improved body composition in clinical trials of supplementation. For example, in overweight women 50 mg of forskolin per day was able to prevent an increase in fat mass experienced by the placebo group and reduce self-perceived fatigue.¹²⁹ In overweight men 50 mg of forskolin per day for 12 weeks cut the average body fat percentage from 35 percent down to 31 percent—about 10 lbs (4.5 kg) of fat loss.¹³⁰ And in a study with both overweight men and women, 50 mg of forskolin per day alongside a 12-week weight loss diet not only cut waist circumference by 2 inches but led to superior reductions in fasting insulin and insulin resistance compared to placebo.¹³¹

Recommended Dose: 50 mg per day

Common Benefits: Increases energy levels and physical function by supporting mitochondrial energy production

Green Tea EGCG

Green tea (*Camellia sinensis*) catechins include four phytochemical molecules, the most potent one being epigallocatechin-3-gallate (EGCG). Studies show it benefits almost every organ system in the body in doses you can obtain easily from simply drinking green tea.^{132,133,134}

EGCG is neuroprotective,^{135,136} cardioprotective,^{137,138} anti-obesity,^{139,140,141} anticarcinogenic,^{142,143} and antidiabetic,¹⁴⁴ all due primarily to its ability to stimulate mitochondrial biogenesis, enhance energy production, and protect mitochondria from oxidative stress.^{145,146}

Over the course of 12 weeks, daily supplementation with 280 mg of EGCG with 80 mg of resveratrol (a phytochemical found in grape skin) was found to significantly increase the use of fat as an energy source and mitochondrial function (oxidative metabolism) compared to a placebo.¹⁴⁷ Moreover, several meta-analyses of clinical trials concluded that 100 to 500 mg of EGCG reduces body weight and body fat,^{148,149,150,151} particularly abdominal fat.¹⁵²

A single cup (8 ounces or 250 ml) of brewed green tea typically contains about 50 to 100 mg of EGCG, with variation from one cup to another depending on many factors (species of tea, length of steeping, time spent oxidizing, etc.). I prefer ceremonial matcha or EGCG supplementation as my personal go-to.

Recommended Dose: 100 to 500 mg per day

Common Benefits: Reduces oxidative stress, improves mitochondrial function, and protects against cardiometabolic disease development

Gynostemma

Gynostemma pentaphyllum is a vine indigenous to and widely used in Korea, China, and Japan as traditional medicine and tea. It is a potent activator of numerous signaling pathways involved in mitochondrial health and biogenesis, including AMP-activated protein kinase (AMPK) and sirtuin 1. ^{153,154}

Several studies have reported metabolic and mental health benefits. In an 8-week study, chronically stressed adults supplementing with 400 mg per day of a gynostemma extract led to twice the reduction in anxiety compared to a placebo group—a 17 percent reduction. ¹⁵⁵

And in a 12-week study, overweight and obese adults supplementing with 450 mg of gynostemma (Actiponin extract) experienced a 6 percent reduction in abdominal fat, half of which came from their more harmful visceral fat, compared to those taking a placebo. ¹⁵⁶ And all without any apparent changes in food intake.

In another study of adults with diabetes, drinking tea made from 6 grams of gynostemma leaves daily over 12 weeks reduced fasting glucose by 24 percent and insulin resistance by 50 percent compared to a placebo. ¹⁵⁷

Recommended Dose: 400 to 500 mg per day of a gynostemma extract

Common Benefits: Increases mitochondrial biogenesis, facilitates fat loss, and improves mental health

N-Acetylcysteine

N-Acetylcysteine (NAC) is a molecule our body naturally creates from the amino acid cysteine as a precursor to one of our body's master antioxidants, glutathione. Supplemental NAC is an effective way to increase glutathione concentrations in our body and often the supplement of choice in conditions of glutathione deficiency.^{158,159}

The depletion of glutathione ultimately causes Tylenol-induced liver failure, and NAC is the go-to of the medical profession to prevent this. NAC acts to replenish depleted glutathione reserves in the liver, thereby reversing the buildup of free radicals and maintaining mitochondrial energy production within the liver.¹⁶⁰

Glutathione itself has numerous essential functions in the body, so much so that cellular concentrations match those of glucose, potassium, and cholesterol—some of the highest in the body. It is not only a potent antioxidant but a molecule required to recycle other antioxidants, detoxify and excrete toxins, and maintain mitochondrial function.¹⁶¹

Because it helps sustain optimal glutathione concentrations, NAC has been demonstrated to reduce mitochondrial oxidative damage and preserve cellular life in the face of genetic mitochondrial mutations that cause dysfunction or toxic conditions that directly damage mitochondria.^{162,163,164,165} In fact, by serving as an antioxidant precursor rather than an antioxidant itself, NAC shows greater promise than other antioxidant compounds for supporting mitohormesis,¹⁶⁶ a process whereby the mitochondria adapt to stress by growing bigger and stronger. A meta-analysis of 28 clinical trials found that supplementing with 600 to 2000 mg of NAC per day significantly reduced biomarkers of oxidative stress and inflammation.¹⁶⁷

Lastly, glutathione is essential for the proliferation of white blood cells and overall immune function.^{168,169} One potential contributor to chronic fatigue is an overactive immune system resulting from chronic inflammation “stealing” NAC from muscle tissue and thereby limiting energy production in these tissues.¹⁷⁰

Recommended Dose: 600 to 2000 mg per day, divided across 2 to 3 doses

Common Benefits: Supports antioxidant status and immune function, reduces oxidative stress, and improves mitochondrial function

Niacin Derivatives

In mitochondrial respiration, a molecule called *NAD+* is essential for energy generation. You can't turn carbohydrates or fats into cellular energy without it. People with chronic fatigue have lower levels of this molecule compared to healthy non-fatigued adults.¹⁷¹ Accordingly, increasing *NAD+* could be an effective way to restore mitochondrial function and bolster energy levels.

Since *NAD+* is made from the essential vitamin niacin, there has been a growing interest in supplementing with niacin and its derivative, *nicotinamide riboside*, to increase *NAD+* levels and improve mitochondrial function.

But while there has been a lot of hype surrounding these molecules, *the research in humans has not shown benefits*. Studies using 500 to 2000 mg per day of nicotinamide riboside in healthy adults,¹⁷² elderly adults,^{173,174} and obese adults^{175,176,177,178} showed no appreciable effect on *NAD+* concentrations in muscle tissue or several parameters of mitochondrial function, including energy production. A variety of health parameters were also unaffected, including energy expenditure, body composition, glycemic control, insulin sensitivity, exercise performance, and blood lipids.

Given the current state of the literature and the high price of these compounds, we do not feel a recommendation is

warranted.

Panax Ginseng

Panax ginseng has been used medicinally for thousands of years in China, Korea, and Japan to alleviate physical and mental fatigue. While there are several types of ginseng on the market, *Panax ginseng* is considered the “true” ginseng.

At a fundamental level, *Panax ginseng* works to protect mitochondria from oxidative damage and improve energy production under conditions of oxidative stress.^{179,180} Accordingly, a systematic review and meta-analysis of five studies in chronic fatigue patients found significant benefits of ginseng supplementation for reducing fatigue severity with 200 to 2000 mg per day.¹⁸¹

One study reported that supplementing with *Panax ginseng* for just one month led to a 20 percent reduction in fatigue severity compared to a placebo,¹⁸² while another study reported a similar 20 percent fatigue reduction compared to a placebo over a month of supplementing with *Panax ginseng*, along with increased levels of internal antioxidants like glutathione and reduced biomarkers of oxidative stress.¹⁸³

Recommended Dose: 200 to 2000 milligrams per day, divided across 2 to 3 doses

Common Benefits: Protects against oxidative stress and reduces fatigue severity

PQQ

Pyroloquinoline quinone (PQQ) is a potent stimulator of pathways involved in mitochondrial biogenesis and antioxidant defenses.^{184,185} In particular, it stimulates pathways shared by exercise training and is believed to potentiate and enhance activity-induced benefits on mitochondria.¹⁸⁶

Supplementing with 20 mg of PQQ daily was shown to reduce fatigue and increase vigor by 20 percent in adults complaining of poor sleep and energy levels.¹⁸⁷ This study also reported improved mood, sleep quality, and overall quality of life. In another study of healthy adults, just three days of supplementing with 20 to 30 mg of PQQ reduced inflammation and improved markers of mitochondrial respiration.¹⁸⁸

Recommended Dose: 10 to 30 mg per day

Common Benefits: Facilitates mitochondrial biogenesis and energy production, reduces fatigue, increases vigor, and improves sleep quality

Quercetin

Quercetin is a well-known bioflavonoid found in many fruits and vegetables, particularly onions and apples. It is a potent antioxidant and anti-inflammatory molecule that affects an array of mitochondrial processes, including mitochondrial biogenesis, mitochondrial energy production, and the protection of mitochondria from oxidative stress.^{189,190}

Several meta-analyses of clinical trials have reported that 500 to 1000 mg of quercetin taken daily can improve endurance exercise performance and maximal oxygen consumption,^{191,192} and, in those with metabolic dysfunction, reduce markers of inflammation,^{193,194} improve blood lipids,^{195,196,197} and lower blood pressure.^{198,199}

Importantly, most studies use regular unenhanced quercetin. Yet a quercetin phytosome complex has vastly superior bioavailability, leading to quercetin levels 20-fold greater in the blood following supplementation.²⁰⁰ In other words, 50 mg of the phytosome is equivalent to 1000 mg of regular quercetin.

Recommended Dose: 500 to 1000 mg per day, ideally in the phytosome form, which has greatly improved bioavailability compared to the unenhanced version

Common Benefits: Improves mitochondrial function and metabolic health

SLEEP SUPPORT AND RELAXATION

The following supplements can help you fall asleep more quickly, stay asleep, and wake up feeling refreshed and rejuvenated. Most supplements increase GABA signaling and have a sedative effect, thereby helping calm anxiety, promote relaxation, and smooth the transition from wake to sleep.

The benefits of these compounds will be greatest in those who are struggling with circadian dysregulation, insomnia, chronic fatigue, chronic stress, or an anxiety disorder. All supplements should be taken 30 to 60 minutes before bed.

Ashwagandha

Ashwagandha (*Withania somnifera*) is a nightshade revered in Ayurvedic medicine for its physical- and mental-enhancing effects.²⁰¹ Today, it's considered an adaptogen for similar reasons, able to increase a person's resilience to stress and help reduce anxiety.^{202,203}

These effects are largely due to its constituent withanolide structures, which have several important neuroprotective effects within the brain, such as scavenging free radicals, reducing neuroinflammation, and promoting neurotransmitter signaling.²⁰⁴ They also bind to and activate GABA receptors.²⁰⁵

Several studies have reported reductions in stress and anxiety following supplementation with 600 to 1000 mg per day of an Ashwagandha extract called KSM-66. The reductions ranged from 15 to 20 percent in otherwise healthy adults dealing with mild stress^{206,207} to 40 to 70 percent in adults battling chronic mental stress,²⁰⁸ to 50 percent in adults with an anxiety disorder.²⁰⁹ These stress- and anxiety-reducing benefits also translate to improved sleep.^{210,211,212}

Although the KSM-66 extract is the best researched, it is not the most potent. The concentration of withanolides in regular dried Ashwagandha root is less than 1 percent, at least 5 percent in the KSM-66 extract, but a whopping 35 percent in the Shoden extract (which is why we chose it for our mitochondrial formula, Energenesis).

To illustrate this difference, just 240 mg of the Shoden extract reduces anxiety by 60 percent in mildly stressed healthy adults, compared to a 15 to 20 percent reduction in anxiety with 600 mg of the KSM-66 extract.²¹³

Recommended Dose: 600 mg per day of a KSM-66 extract or 150 to 240 mg per day of a Shoden extract, 30 to 60 minutes before bed

Common Benefits: Improves stress tolerance, enhances sleep quality, and lessens anxiety

CBD Oil

Cannabidiol (CBD) oil is the non-psychoactive component of cannabis plants (marijuana and hemp). It's currently being heavily researched as a therapeutic for anxiety, depression, addiction, epilepsy, neurodegeneration, chronic pain, and inflammatory diseases.^{214,215} While research on CBD and sleep is still in its infancy, the results seem promising.²¹⁶

The cannabinoid system is intimately tied to the sleep-wake cycle by inhibiting the arousal system in the brain and promoting a hypnotic-like state.^{217,218} The sleep benefits of CBD have been shown in adults with sleep disorders at doses of 75 mg per night²¹⁹ and at 25 mg in children.²²⁰ Another study involving 72 adults complaining of anxiety and poor sleep found that 25 to 175 mg of CBD nightly reduced anxiety by 31 to 38 percent and improved sleep quality by 15 to 28 percent after three months.²²¹

Anecdotally, in *The Energy Blueprint* program, we've observed that individuals who seem to be resistant to other sleep aids, like melatonin and the variety of herbs already discussed, often have excellent results using CBD oil before

bed. The only issue with CBD is that CBD research for sleep enhancement used high doses, which can be quite expensive and often unaffordable for many people. If you don't have the funds, then don't despair. Instead, try other supplements. Still, if you're interested in trying CBD and it's within reach financially, then we recommend experimenting with doses of 25 to 100 mg taken 30 to 60 minutes before bed.

Recommended Dose: 25 to 100 mg per day, 30 to 60 minutes before bed

Common Benefits: Improves sleep quality and lessens anxiety

Chamomile

Chamomile is a daisy-like flower traditionally brewed into tea and used to treat a variety of ailments, particularly those characterized by inflammation and oxidative stress.²²² It's also been used as a mild sedative to calm nerves and reduce anxiety.

You've likely seen it in teas and supplements that are advertised to help with sleep, and with good reason. A meta-analysis of six studies administering 400 to 2000 mg of chamomile before bed found it to significantly improve sleep quality.²²³

For those who are battling anxiety, there may be additional benefits. Several studies have reported that supplementing with 1100 to 1500 mg of chamomile can reduce feelings of anxiety and improve several other aspects of mental well-being.^{224,225,226}

Recommended Dose: 1100 to 1500 mg per day, 30 to 60 minutes before bed

Common Benefits: Improves sleep quality and lessens anxiety

Lemon Balm

Lemon balm (*Melissa officinalis*) is a plant native to the Mediterranean basin and central Asia, where it was traditionally used for the treatment of mental disorders and central nervous system complaints.²²⁷ Today it is commonly used to promote sedation and relaxation.

Several studies have found that taking 300 to 1600 mg of lemon balm promotes calmness in the hours following supplementation,^{228,229} particularly when dealing with stressful situations.^{230,231} These benefits extend to individuals battling anxiety as well, where supplementing with 600 mg per day has been shown to reduce a variety of anxiety manifestations and symptoms.²³²

Notably, insomnia was one of the most debilitating symptoms for anxious adults, and lemon balm supplementation reduced it by an average of 42 percent, with 85 percent of people dealing with insomnia experiencing a benefit. Other studies have found similar benefits for sleep when lemon balm is combined with valerian root.^{233,234}

Recommended Dose: 300 to 1600 mg per day, 30 to 60 minutes before bed

Common Benefits: Improves sleep quality and lessens anxiety

Melatonin

When it comes to getting a good night's rest, no supplement beats melatonin. As we talked about in [Chapter 2](#), melatonin is naturally secreted by our brain at night to help transition us from wakefulness to sleep.

Numerous meta-analyses have reported that supplementing with 1 to 12 mg of melatonin improves sleep quality in adults and children with a variety of health conditions, including:

- Primary sleep disorders like insomnia^{235,236}
- Secondary sleep disorders resulting from other medical conditions²³⁷

- Neurodegenerative disorders like Alzheimer's disease^{238,239}
- Neurodevelopmental conditions like autism and attention-deficit hyperactivity disorder^{240,241}

Moreover, these doses of melatonin have also been shown to lower fasting glucose,²⁴² blood pressure,²⁴³ systemic inflammation,²⁴⁴ and oxidative stress,^{245,246} suggesting that there are multiple health benefits above and beyond improved sleep quality with supplementation, including boosting energy and reducing the effects of chronic fatigue syndrome.²⁴⁷

All that said, there are anecdotal reports of melatonin interfering with sleep when taken in too high a dose. In *The Energy Blueprint* program, we've found that a subset of individuals (possibly as high as 20 percent of people) is *extremely* sensitive to even small doses of melatonin, where any more than 1 mg disturbs sleep.

While it is not yet well researched clinically, it's possible that individual differences in melatonin receptor distribution and density play a role.^{248,249}

Thankfully, the solution is rather simple: start with a low dose of melatonin and slowly work your way up to higher doses until you find your personal limit. You'll know when you hit your threshold if you wake up feeling groggy or experience any sleep difficulties for two to three nights (not just a one-off occurrence). Just 300 mcg of melatonin mimics what we could obtain with good sleep hygiene,²⁵⁰ so this is a good dose to start with.

As a final point, supplementing with melatonin does not interfere with your own natural production at doses of 500 mcg,²⁵¹ 2 mg,²⁵² 5 mg,²⁵³ or 50 mg.²⁵⁴ However, keep in mind that if you regularly use melatonin to improve your sleep and then stop using it, many people report reduced sleep quality for several nights before things normalize.

Recommended Dose: 300 micrograms to 10 mg per day, 30 to 60 minutes before bed

Common Benefits: Improves sleep quality, quickens the time it takes to fall asleep, increases the ability to stay asleep through the night, and improves cardiometabolic health

Passionflower

For thousands of years, Native Americans have used passionflower (*Passiflora incarnata* Linneaus) as a sedative and treatment for anxiety.²⁵⁵ It works primarily through activating GABA receptors in the brain that are responsible for relaxation.²⁵⁶

Whether taken as a pill, a tincture, or a tea, passionflower has been shown to improve sleep quality,^{257,258} particularly the amount of time that is spent in deep, rejuvenating, slow-wave sleep,²⁵⁹ and without any side effects common to sleep and anti-anxiety medications.²⁶⁰

These sleep benefits may be secondary to reductions in anxiety. Several studies have shown that supplementing with 360 to 700 mg of passionflower reduces anxiety in the 30 to 90 minutes after taking it.^{261,262,263} At least one study has shown that passionflower's anti-anxiety effects are as potent as a benzodiazepine, with both reducing feelings of anxiety by half after just two weeks and by nearly 75 percent after four weeks.²⁶⁴

Recommended Dose: 360 to 700 mg per day, 30 to 60 minutes before bed

Common Benefits: Improves sleep quality and lessens anxiety

Theanine

Theanine is a naturally occurring amino acid found in tea that alters neurotransmitter signaling within the brain. After consumption, it crosses the blood-brain barrier, interferes with excitatory glutamate signaling, stimulates dopamine release, and promotes inhibitory neurotransmission, thereby helping to create a state of relaxation.^{265,266}

In fact, electroencephalography (EEG) studies have shown that theanine shifts brain waves toward alpha oscillatory patterns indicative of a relaxed state, particularly in those with high levels of baseline anxiety.^{267,268,269,270,271} Accordingly, several studies have found that theanine supplementation improves feelings of relaxation, tension, calmness, and anxiety in the hours following doses of 200 to 600 mg.^{272,273} There is also evidence that theanine improves sleep quality, likely through its anti-anxiety and calming effects,^{274,275} and can help offset the stimulatory effects of caffeine.^{276,277}

Recommended Dose: 200 to 600 mg per day, 30 to 60 minutes before bed

Common Benefits: Enhances feelings of relaxation and calmness, lessens anxiety, and improves sleep quality

Valerian Root

Valerian root (*Valeriana officinalis*) is one of the best-researched and most common sleep aid supplements on the market, second only to melatonin. Valerian root's use as a sedative dates back to the first century C.E., and it was used to treat nervous disorders and insomnia in the Middle Ages.

More recently, a systematic review of 60 studies and a meta-analysis of 18 studies reported that supplementing with 450 to 1400 mg of valerian root was effective for both improving sleep quality and reducing anxiety, provided that the whole valerian root was used.²⁷⁸ These benefits were observed in healthy adults, those suffering from insomnia, and those with conditions in which sleep is often impaired.

Recommended Dose: 450 to 1400 mg per day, 30 to 60 minutes before bed

Common Benefits: Improves sleep quality and lessens anxiety

GUT REPAIR

While nothing can replace the dietary strategies discussed in [Chapter 4](#), when it comes to repairing our gut and improving its health, there are a handful of supplements that can provide additional support to the gut barrier and thereby help strengthen the gut's integrity.

Colostrum

Colostrum is the first form of milk made by moms following birth. It's enriched with many immunoglobulins (antibodies), growth factors, prebiotics, and specific proteins that are thought to promote babies' rapid growth and development while improving their immunity.²⁷⁹

These characteristics have garnered an interest in using colostrum to bolster gut health under a variety of conditions. Its prebiotics help facilitate the development of a healthy microbiome while its bioactive molecules work to support intestinal integrity.²⁸⁰ For example, a meta-analysis of five randomized, controlled trials demonstrated that colostrum supplementation reduced the occurrence of infectious diarrhea by 70 percent.²⁸¹

In healthy athletes supplementation with 10 to 20 grams of colostrum daily over two weeks reduced exercise-induced increases in intestinal permeability (due to the heat stress) by 70 to 80 percent compared to a placebo^{282,283} and reduced markers of intestinal damage by 33 percent.²⁸⁴ Even just 500 mg of colostrum has been shown to normalize intestinal permeability among athletes with elevated levels.²⁸⁵

Recommended Dose: 10 to 20 grams per day

Common Benefits: Enhances gut barrier integrity and improves leaky gut

Glutamine

Glutamine is the most abundant amino acid in the body and a favored source of energy for many cells that need to rapidly divide and proliferate, such as those of the immune system and intestinal tract. In particular, glutamine is believed to enhance

gut barrier integrity through reducing inflammation and oxidative stress, increasing protein synthesis, and enhancing mitochondrial function.^{286,287}

One of the established side effects of glutamine deprivation is an increase in intestinal permeability,²⁸⁸ and glutamine supplementation in conditions of deficiency restores intestinal barrier function.²⁸⁹ Given that these intestinal benefits are not seen with glutamine infusions, it's likely that your intestinal cells absorb and utilize most of the glutamine you get in your diet.²⁹⁰

To illustrate these points in a more real-world context, several studies have shown glutamine supplementation to be of benefit in athletes who commonly have to deal with leaky gut due to exercise-induced heat stress. In one such study, taking 45 grams of glutamine two hours before exercise halved the normal increase in intestinal permeability and lowered blood endotoxin levels by 18 percent.²⁹¹

Now, 45 grams is a huge dose, equating to roughly 3 tablespoons of pure glutamine. Thankfully, a follow-up study testing lower doses found that using just one-third this dose, about 1 tablespoon of glutamine, was able to confer similar benefits.²⁹² And for clarity, these benefits don't seem to occur with other amino acids like the branched-chain amino acids.²⁹³

Recommended Dose: At least 15 grams (1 tablespoon) per day

Common Benefits: Improves gut barrier integrity and reduces intestinal permeability

Partially Hydrolyzed Guar Gum

Partially hydrolyzed guar gum (PHGG) is a water-soluble prebiotic fiber used in the treatment of gastrointestinal disorders such as IBS, small-intestinal bacterial overgrowth, diarrhea, and constipation, including in medical settings.^{294,295,296} It's a phenomenal supplemental prebiotic fiber that you can use to help create a healthy microbiome and foster gut health.

For example, in adults with chronic constipation, supplementing with 5 grams (1 teaspoon) of PHGG improved colon transit time by 20 percent after just one month, with the effects being greatest in those who were the most constipated.²⁹⁷ The number of weekly bowel movements increased, less straining occurred, and abdominal pain decreased.

In adults with IBS, supplementing with both 5 and 10 grams of PHGG for three months reduced gastrointestinal symptoms by 37 percent and improved various parameters of quality of life, including a 17 percent increase in vitality.²⁹⁸ In another, larger study of IBS patients, taking 6 grams of PHGG for three months reduced bloating and flatulence by 12 percent.²⁹⁹

These benefits come from its prebiotic effects. Studies have shown that PHGG preferentially increases the abundance of beneficial butyrate-producing bacteria like *Bifidobacterium* and *Ruminococcus*, along with overall microbial diversity and SCFA concentrations.^{300,301}

Recommended Dose: 5 to 10 grams (1 to 2 teaspoons) per day

Common Benefits: Improves microbiome diversity, reduces constipation, and lowers sensitivity to bloating

Zinc Carnosine

Zinc is an essential mineral needed for cell turnover and repair, as well as the maintenance of the intestinal barrier. In particular, zinc is essential for maintaining the integrity of tight junctions between intestinal cells, the breakdown of which is fundamental to “leaky” gut.³⁰²

In adults with inflammatory bowel disease, low zinc status correlates with greater disease severity,³⁰³ and normalization of zinc status through supplementation reduces intestinal symptoms through strengthening tight junctions.^{304,305}

Although any type of zinc is going to provide benefits for gut health, zinc carnosine is unique. Early research found that zinc carnosine was able to promote intestinal repair processes

and prevent a threefold increase in intestinal permeability in response to drug-induced injury.³⁰⁶ Furthermore, in a study of healthy athletes, supplementing with 37.5 mg of zinc carnosine (providing just 9 mg of elemental zinc) twice per day for two weeks reduced exercise-induced increase in intestinal permeability by 70 percent.³⁰⁷

Recommended Dose: 37.5 mg of zinc carnosine (providing 9 mg of elemental zinc) twice per day

Common Benefits: Improves intestinal barrier function

BRAIN HEALTH AND COGNITIVE SUPPORT

What would you think if someone told you that taking a pill could help make you feel smarter, sharper, and more creative? What if they told you a pill could maintain those feelings throughout your life? Would you call BS?

Those pills exist!

They're called nootropics and include an array of compounds that either improve cognitive function—particularly executive function, memory, focus, and the ability to work under stressful conditions—or prevent cognitive decline.

While the best-known examples include synthetic drugs like Adderall, modafinil, and piracetam, there are numerous herbs and naturally occurring molecules that possess similar properties while being far safer, especially for long-term use.

These brain-boosting supplements work through a variety of mechanisms to improve brain health and functionality,^{308,309,310} including:

- Increasing blood flow and nutrient delivery to brain cells
- Reducing neuroinflammation and oxidative stress
- Bolstering mitochondrial function and energy production
- Facilitating the removal of neurotoxins

- Promoting the growth of neurons
- Improving neuronal communication and synaptic plasticity
- Optimizing neurotransmitter levels

The following supplements are some of the most powerful brain-boosting compounds in existence. They can help you fight brain fog, become more vigilant, maintain cognitive performance, and ensure your mind is fully functional—which will contribute to improved energy levels too.

Bacopa Monnieri

Bacopa monnieri is an Ayurvedic swamp plant (Brahmi) traditionally used for enhancing memory and cognition, as well as a general brain tonic. Its bioactive constituents, the bacosides, generate numerous biological effects within the brain that facilitate this use.^{311,312,313,314,315} These constituents:

- Reduce oxidative stress and increase antioxidant enzyme activity
- Reduce inflammation
- Protect nerves
- Reduce β -amyloid deposition
- Increase the growth of nerve endings to enhance neuronal communication
- Increase blood flow and the delivery of oxygen and nutrients

A variety of studies have shown that supplementing with 300 mg per day of bacopa (50 percent bacosides) improves working memory, information processing, learning rate, and other aspects of cognitive function in medical students,³¹⁶

healthy younger adults,^{317,318} and healthy older adults.^{319,320,321}

Recommended Dose: 300 to 600 mg per day

Common Benefits: Improves brain health, protects against neurodegeneration, and enhances memory

Ginkgo Biloba

Ginkgo biloba possesses an array of qualities relevant to brain health and neurological function, with numerous studies showing that it is neuroprotective and an antioxidant, preserves brain receptors susceptible to age-related loss, counteracts cognitive impairment, enhances neuronal plasticity, and improves memory.³²²

Numerous interventions have been conducted with ginkgo biloba supplementation, usually in the form of a 50:1 concentrated extract called EGb-761, and systematic reviews of this evidence have found that it improves cognitive performance and quality of life in older adults experiencing cognitive decline but doesn't have much of a benefit in young and cognitively healthy adults.^{323,324}

Recommended Dose: 240 mg per day, ideally EGb-761 extract

Common Benefits: Helps prevent cognitive decline and neurodegeneration

Lion's Mane Mushroom

Lion's mane mushroom (also called *yamabushitake* or *Hericium erinaceus*) is a medicinal mushroom that has been extensively studied for its neurohealth properties.^{325,326} Research has shown that lion's mane:

- Stimulates the production of nerve growth factor (NGF),^{327,328,329} which promotes neuronal growth, development, and regeneration³³⁰

- Restores levels of key neurotransmitters serotonin, noradrenaline, and dopamine in the brain (that are often suppressed due to chronic stress)³³¹
- Reduces neuroinflammation^{332,333}
- Stimulates the expression of brain-derived neurotrophic factor (BDNF),³³⁴ which has neuroprotective effects, plays a role in neuronal development, and helps in the formation of neuronal connections that are important for memory and cognition³³⁵

Studies in mice have demonstrated that these effects ultimately lend lion's mane cognitive-enhancing,³³⁶ neuroprotective,³³⁷ and mood-stabilizing properties.³³⁸

In men with mild cognitive impairment, 3000 mg per day was found to improve cognitive function by 12 percent over 16 weeks compared to a placebo.³³⁹ In overweight and obese adults, 1500 mg per day for 8 weeks was found to reduce feelings of anxiety by 27 percent and feelings of depression by 39 percent.³⁴⁰

Recommended Dose: 1500 to 3000 mg per day of plain powder (or lower dose of a more potent extract)

Common Benefits: Reduces neuroinflammation, improves cognitive function, improves mood

Magnesium Taurate (or Threonate)

Magnesium is an essential mineral required for over 300 enzymes to function properly,³⁴¹ including those necessary for mitochondrial function and energy production.^{342,343} Within the brain, magnesium is required for optimal nerve transmission and protection against neurotoxicity.^{344,345}

Individuals with neurodegenerative disorders such as Parkinson's disease^{346,347} and Alzheimer's disease^{348,349,350} have lower brain concentrations of magnesium than healthy adults, and studies in mice suggest that elevating brain

magnesium concentrations can provide neuroprotective effects and enhance cognitive function.^{351,352}

But not all forms of magnesium have the same ability to enter the brain. Studies have shown that magnesium taurate increases brain magnesium concentrations 10 to 20 percent more than a variety of other forms.^{353,354}

Recommended Dose: 200 mg (minimum) to 400 mg per day, ideally of magnesium taurate

Common Benefits: Improves cognitive function and lowers risk of neurodegeneration

Rhodiola Rosea

Rhodiola rosea is a medicinal herb traditionally used for enhancing mental performance and resilience to stress,³⁵⁵ resulting from its interaction with genes, signaling pathways, and molecular networks within the brain to alter emotional behavior.³⁵⁶

It's an incredibly powerful adaptogen, with effects noticed soon after supplementation. In one study of over 100 adults dealing with chronic stress, supplementing with 400 mg per day of *Rhodiola* reduced feelings of physical exhaustion, difficulty concentrating, and anxiety after as few as three days, nearly *cutting them in half* after just one week.³⁵⁷

Similarly, in adults with chronic fatigue, 400 mg of *Rhodiola* per day improved every aspect of fatigue after just one week, with further improvements seen after eight weeks.³⁵⁸ Ultimately, 83 percent of the participants reported “very much” or “much” improved conditions, with fatigue, stress, anxiety, and brain fog being *cut in half*.

Several other studies have also shown that supplementing with 100 to 400 mg of *Rhodiola* improves physical and mental energy, reduces stress, and ultimately improves quality of life in adults struggling with job burnout,³⁵⁹ first-year medical students,³⁶⁰ military cadets,³⁶¹ and adults with stress-related fatigue.³⁶² (This is why we made it one of the core ingredients in our brain formula, UltraBrain.)

Recommended Dose: 100 to 400 mg per day (ideally with 3 percent salidroside and 1 percent rosvavins)

Common Benefits: Improves stress resilience, reduces mental and physical fatigue, and enhances quality of life

Vitamin E Tocotrienols

Vitamin E tocotrienols are potent antioxidant molecules that incorporate into cell membranes and neutralize free radicals that would otherwise oxidize phospholipids.^{363,364,365}

It's an incredibly important job, one that works synergistically with other antioxidants like vitamin C and glutathione to ensure the integrity of our cell membranes.³⁶⁶

Supplementation with tocotrienols significantly increases their concentration in critically important organs such as the brain, heart, and liver.³⁶⁷ Moreover, the concentrations achieved within the brain are precisely around the concentrations needed to prevent brain damage and neurotoxicity from excessive glutamate and other toxicants.³⁶⁸

Because of their neuroprotective and antioxidant effects, an ever-growing body of research is looking into tocotrienol use for the prevention and treatment of Alzheimer's disease.³⁶⁹ For example, a randomized, controlled trial of individuals with active white matter lesions of their brains, a sign of neurodegeneration, found that 400 mg per day of mixed tocotrienols completely halted the loss of white matter and further brain deterioration after two years.³⁷⁰ Comparatively, the white matter loss of the placebo group had increased by 23 percent.

Recommended Dose: 100 to 400 mg per day

Common Benefits: Improves antioxidant defenses, protects mitochondria, and prevents neurodegeneration

DOPAMINE BOOSTERS

Dopamine is involved in motivation and reward. Whenever we do something pleasurable, like eat cake, orgasm, or accomplish a goal, dopamine is released to help reinforce that behavior, motivating us to continue engaging in those behaviors.

Mucuna Pruriens

Arguably the best supplement to increase dopamine signaling within the brain is *Mucuna pruriens*, more commonly known as velvet bean. Mature seeds are about 4 percent L-DOPA, meaning that every gram of velvet beans provide about 40 mg of L-DOPA.³⁷¹

L-DOPA is the only reliable way to increase dopamine synthesis, for two reasons:

1. Dopamine itself can't cross the blood-brain barrier, so supplementing with it would be futile.³⁷² L-DOPA can cross the blood-brain barrier with ease.
2. The rate-limiting step in dopamine synthesis is the conversion of tyrosine to L-DOPA because high levels of dopamine inhibit the enzyme responsible for this conversion.³⁷³ Taking L-DOPA directly bypasses this negative feedback loop.

L-DOPA is the go-to molecule to increase dopamine synthesis in conditions that need it, including Parkinson's disease. And velvet beans might be the ideal way to get L-DOPA because they are not only more potent than isolated L-DOPA but also safer,³⁷⁴ with a lower risk for adverse effects like dyskinesias than the standard drug treatment with L-DOPA.^{375,376,377}

Recommended Dose: The dose of velvet bean will be variable depending on one's needs. Start with a low dose of 1 to 2 grams and work your way up until your symptoms of dopamine insufficiency are minimized (e.g., improved mood, motivation, energy levels, and mental clarity).

Common Benefits: Enhances motivation, improves mental clarity, and stabilizes moods

Tyrosine

If you are under a lot of stress, taking tyrosine may also be helpful because dopamine is the precursor to the stress hormones adrenaline and noradrenaline. If you are chronically stressed, then you can expect your dopamine to dwindle as it is further metabolized into these molecules.^{378,379}

As dopamine levels fall, the conversion of tyrosine to L-DOPA picks up, but you need to ensure that you have sufficient tyrosine available to let that happen. Accordingly, supplementing with extra tyrosine can help offset this reduction in dopamine by allowing for its continued synthesis.³⁸⁰

Several clinical trials have shown that supplementing with 2 to 12 grams per day of tyrosine improves cognition, alertness, memory, and energy levels in stressful and demanding situations that would otherwise drain dopamine and impair the ability to think.^{381,382}

Recommended Dose: 2 to 12 grams per day

Common Benefits: Enhances the ability to think and focus under stress

ACETYLCHOLINE BOOSTERS

Acetylcholine is involved in regulating muscle contractions of the heart, blood vessels, and skeletal muscle, as well as the ability to learn and remember. Disturbances in acetylcholine signaling have widespread consequences for cognitive function and physical function.

Alpha-GPC

Alpha-glycerophosphocholine (Alpha-GPC) is a highly bioavailable source of choline for the brain.³⁸³ A systematic

review of 14 clinical trials involving individuals with neurodegenerative disorders and dementia found that supplementation had consistently positive results on brain function,³⁸⁴ being more effective than standard drug therapies.³⁸⁵ The enhanced brain activity has been shown to translate into improvements in exercise performance, with 250 to 600 mg taken before exercise shown to improve strength and power output.^{386,387,388,389} At least one comparative study has found that 400 mg of Alpha-GPC may be more effective than caffeine.³⁹⁰

Recommended Dose: 600 to 1200 mg per day

Common Benefits: Reduces risk of neurodegeneration, improves cognitive function, and enhances physical performance (due to better brain signaling)

CDP-Choline

Supplementing with CDP-choline has been shown to improve cognitive function in both healthy adults and those suffering from cognitive decline.

A Cochrane Systematic Review of 14 double-blind, placebo-controlled trials of older adults with cognitive deficits like dementia reported that 600 to 1000 mg per day of CDP-choline improved memory, corrected abnormal behaviors, and increased physicians' overall impression that participants had improved cognitive functioning.³⁹¹

Several other studies have also shown benefits in older adults with dementia or Alzheimer's disease,^{392,393} older adults with mild vascular dementia,³⁹⁴ adolescents,³⁹⁵ and healthy women.³⁹⁶

Recommended Dose: 500 to 1000 mg per day

Common Benefits: Enhances cognitive function

Huperzine A

Huperzine A is an alkaloid derived from the moss *Huperzia serrata*, which itself has been used in Traditional Chinese

Medicine for centuries to treat neuronal- and cognitive-based illnesses.³⁹⁷ It's a naturally occurring acetylcholinesterase inhibitor, meaning it prevents the breakdown of acetylcholine just as many Alzheimer's drugs do.³⁹⁸

At least 20 randomized controlled trials have evaluated the efficacy of Huperzine A in patients with Alzheimer's disease, with a meta-analysis showing improvements in cognitive function, daily living activity, and clinicians' overall impression that patients showed signs of cognitive improvement with doses of 200 to 800 mcg (average: 370 mcg) over 8 to 36 weeks.³⁹⁹

Other meta-analyses have reported that Huperzine A improves cognition in those with vascular dementia,⁴⁰⁰ as well as in those with major depression.⁴⁰¹

Recommended Dose: 200 to 800 micrograms per day

Common Benefits: Improves cognitive function

GABA BOOSTERS

GABA is the most potent inhibitory neurotransmitter in the brain and regulates many of the sedative actions required for relaxation. It is also critical for the regulation of neuronal communication, cognition, emotion, and memory.

Nearly all the GABA-boosting supplements were already discussed in the sleep supplements section. Passionflower, chamomile, lemon balm, and theanine all induce a state of relaxation that helps us calm down and get to bed, in part by increasing GABA signaling.

It's actually a rarity that we can supplement a neurotransmitter and have it not only survive digestion and absorption but also cross the blood-brain barrier and be integrated into our GABA system.

But that's the case with dietary GABA.

A systematic review of 14 studies concluded that 20 to 100 mg of GABA could reduce stress and increase feelings of

calmness, while 100 to 300 mg could improve sleep quality.⁴⁰² However, it's important to note that some people can't tolerate GABA supplements and don't feel well when using them. Don't stress if GABA isn't working for you personally; instead try some of the other options found in the section on [sleep supplements](#).

Recommended Dose: 100 to 500 mg per day

Common Benefits: Improves relaxation and sleep quality

SEROTONIN BOOSTERS

Serotonin heavily impacts how we feel, think, and behave, as well as numerous physiological processes involved in digestion and bowel motility, breathing, cardiovascular function, and sexual function. In particular, serotonin modulates mood, perception, reward, anger, aggression, appetite, memory, and attention.

5-HTP

One of the best supplements you can take to bolster serotonin production is 5-HTP, the intermediate molecule between tryptophan and serotonin. The conversion of tryptophan to 5-HTP is the bottleneck step for serotonin production, so supplementing with 5-HTP directly helps bypass this step and reliably increase serotonin levels in the brain.⁴⁰³

While research looking into how 5-HTP supplementation affects mood is limited, the data that is available shows it does effectively alleviate depression in those with clinical depression.^{404,405} In particular, studies reveal that supplementing with a slow-release 5-HTP can help treat depression that has historically been resistant to standard drug therapies.⁴⁰⁶

Recommended Dose: 250 to 500 mg per day

Common Benefits: Improves mood; especially reduces depression

Saffron

Saffron is a medicinal and culinary spice that has been traded and used throughout Eurasia for thousands of years. Ancient Persians used saffron to treat a variety of ailments, including depression, and modern research has since supported this use. Studies indicate that saffron can:^{407,408}

- Increase serotonin signaling
- Increase antioxidants
- Reduce neuroinflammation
- Protect nerves

Numerous meta-analyses of clinical trials have reported that 30 mg per day of saffron has a potency comparable to routinely prescribed antidepressant drugs but with fewer side effects in individuals with mild to moderate depression.^{409,410,411,412} The largest of these meta-analyses found that saffron reduced levels of depression by an average of 52 percent, which was comparable to standard drug therapies.⁴¹³

Recommended Dose: 30 mg per day

Common Benefits: Protects the brain against oxidative stress and reduces symptoms of depression (enhances mood)

CONCLUSION

All-Day Energy Starts ... Now

Congratulations! You've made it to the end. You have in your hands some of the most powerful, evidence-based nutritional strategies you can use to beat fatigue, boost your mitochondria, and experience all-day energy.

Eat for Energy Nutritional Strategy Recap

We covered a lot of material in this book, so here's a handy summary of the nutritional strategies you can add to your daily life, starting today.

Circadian Alignment and Quality Sleep

- Eat within a 6- to 12-hour window.
- Stack most of your calories in the morning and afternoon.
- Avoid eating late at night, ideally having your last meal no later than 7 to 8 P.M.
- Do not consume rapidly digestible carbs at dinner.
- Be consistent with your mealtimes.
- Limit your alcohol to no more than one drink.
- Keep caffeine consumption to the morning or early afternoon.

Fat Loss and Muscle Gain

- Eat sufficient protein throughout the day, which is about 1.1 to 1.6 g/kg (0.5 to 0.7 g/lb) of protein if overweight or obese and 1.6 to 2.2 g/kg (0.7 to 1.0 g/lb) if normal weight (BMI > 25 for overweight and <25 for normal weight).
- Eat sufficient protein at every meal, which is at least 30 grams of protein from high-quality sources like meat, soy, or protein powders.
- Base each meal around an abundance of fibrous vegetables.
- Eat as much wholesome, minimally processed food as possible.
- Do not graze on food throughout the day, but instead eat 2 to 4 defined meals every 3 to 5 hours.

Intestinal Integrity and Microbiome Diversity

- Consume at least 30 grams of fiber per day, ideally from prebiotic-rich sources.
- Consume a form of fermented food at least once per day.
- Add resistant starches to your diet.
- Incorporate more prebiotic vegetables into your meals.

Glycemic Control

- Eat within a 6- to 12-hour window.
- Consume fibrous vegetables and sources of protein first in your meal, saving your starches for last.
- Consume 1 to 2 tablespoons (15 to 30 mL) of vinegar before eating meals containing starch.

- Consume at least 5 g of cinnamon per day.
- If you have diabetes and are concomitantly working to lose fat mass, eat a low-carbohydrate diet.
- Reduce your intake of digestible carbohydrates.

Brain Function

- Eat as much wholesome, minimally processed food as possible.
- Incorporate more fish or seafood into your diet.
- Up your berry intake, regularly incorporating it into your diet throughout the week.
- Base each meal around fibrous vegetables.
- Regularly consume nuts, beans, legumes, and whole grains.
- Make leafy green vegetables a staple of your meals.
- Consume adequate EPA and DHA (500 to 1000 mg per day).
- Consume adequate lutein (10-plus mg per day).
- Consume adequate choline, B₆, folate, and iron.
- Ensure your diet provides you with adequate daily protein.
- Drink enough water.

At its heart, this book is truly about transformation—about transforming what’s happening to your body on a cellular level. Self-improvement, regaining your health, and restoring your energy aren’t a race. I know that you want to feel more energized right now and to put your symptoms and all the stressors that have ravaged your body behind you at this very moment.

But the truth is, rebuilding your mitochondria will take time. Honor that. Honor your body's wisdom and the pace that it needs to go at to heal.

While many of my clients do report improvements within four weeks, this isn't a miraculous recovery. It's a foundation they use to continue the steady progress to repair and return their mitochondria to the optimal energy producers they were designed to be. Some days you may feel like you've fallen back. And there may be weeks when the nutritional strategies you've adopted fall to the wayside.

It's okay. Just start fresh the next day. This is about embracing new ways of eating for energy that will remain with you throughout your life.

I understand that setting energy recovery goals like "I want to regain my energy in three months," is important and helpful for many people. I would never tell you "No setting goals," but please make them realistic and achievable. Choose time frames that you can achieve, and at the same time, recognize that regaining your energy and healing your mitochondria are fluid and dynamic processes.

As humans, we have a tendency to weigh the negatives more heavily than the positives. And when it comes to judging, we often give more weight to our perceived failures than our successes.

This isn't some psychological "woo-woo"—we have neuroscientific evidence for a *negativity bias*. Amazingly, our brain can respond more rapidly to negative rather than positive stimuli.^{1,2}

Thus we can identify negativity faster than any positive transformation. Meaning that if you aren't achieving your goals "fast" enough or in exactly the way you imagined, then you're likely to get down on yourself, possibly feeling frustrated, defeated, depressed, anxious, or afraid that your energy will never return.

Fighting negativity bias is a losing battle. So instead of waging war against it, or allowing those intense emotions to drag you down, recognize the emotion. Recognize that the

negativity bias ingrained in all humans has appeared, and then use your prefrontal cortex of rational thought to remind yourself that your thoughts are normal, that it's human nature to perceive the negative ... and that these thoughts are *changeable*.

If it helps, keep a journal. Write down three to five positives or daily wins that you might have overlooked, like that you're eating more protein with every meal, or you've closed your window of eating, or you've added more servings of leafy green or fibrous vegetables to your daily diet, or you're consuming more probiotics, or you've stopped eating four hours before sleep.

As an ancient Chinese proverb states, this energy journey of a thousand miles begins with a single step. Small daily victories add up, and it's those little wins that lead to radical transformation.

Find a pace that works for you, that's comfortable, and that you can sustain. Maybe you add a new strategy every two weeks, or maybe it's one every month, or maybe it's one every six to eight weeks. There is no "right" pace, only what's right for you. I want you to pick changes that you can stick with, that aren't too difficult, time consuming, or overwhelming.

Slow and steady improvements are better than none.

I know it's easier said than done, but try to relax, and dare I say, have fun. You are on the road to recovering your energy, and that's a powerful place to be. Focus on eating healthy, whole foods, mostly plants, get enough protein at every meal, and go easy on yourself. Be kind and cheer yourself on for just taking these steps in the right direction.

Your energy will return.

No matter where you are in life, how old you are, or how long you've lived with fatigue, I know that by rebuilding and restoring your mitochondria, by reducing cell danger stressors, and by utilizing the nutritional strategies in this book, you can regain your energy and your life.

APPENDIX

Best Protein Sources

Meats, Poultry, and Seafood—4 ounces raw (about 3 ounces cooked)

| | |
|--|------|
| Poultry, light meat (chicken or turkey breast) | 27 g |
| Poultry, dark meat (drumstick, thigh, wing, or back) | 23 g |
| Lean beef (top/bottom round, eye of round, sirloin tip, top sirloin, 95/5 ground beef) | 25 g |
| Pork (chop, loin) | 24 g |
| Fatty fish (salmon, sardines, mackerel) | 23 g |
| White fish (cod, halibut, pollack, tuna) | 20 g |
| Shellfish (crab, shrimp, lobster) | 20 g |
| Game meat (bison, kangaroo, elk, venison, lamb, boar) | 24 g |

Dairy

| | |
|--|------|
| Milk, 8 fluid ounces or 1 cup (skim, 1%, 2%, whole) | 8 g |
| Greek yogurt, 1 cup | 23 g |
| Cottage cheese, 1 cup | 25 g |
| Hard cheeses, 1 ounce or 1/4 cup (cheddar, Gouda, parmesan) | 7 g |
| Soft cheeses, 1 ounce or 1/4 cup (brie, Havarti, cream cheese) | 6 g |

Eggs

| | |
|----------------------------|------|
| Whole chicken egg, 1 large | 6 g |
| Whole duck egg, 1 large | 9 g |
| Egg whites, 1 cup | 26 g |
| Whole quail egg, 1 large | 1 g |
| Roe, fish eggs, 1 tbsp | 4 g |

Soy Products—1 cup cooked

| | |
|-------------------|------|
| Edamame (in pod) | 11 g |
| Edamame (shelled) | 18 g |
| Soybeans | 30 g |
| Soy milk | 6 g |
| Soy nuts | 37 g |
| Tofu (soft) | 18 g |
| Tofu (firm) | 23 g |
| Miso | 35 g |
| Natto | 34 g |
| Tempeh | 33 g |

Legumes—1 cup cooked

| | |
|-----------------|------|
| Kidney beans | 15 g |
| Aduki beans | 17 g |
| Lentils | 18 g |
| Split peas | 16 g |
| Lima beans | 15 g |
| Black beans | 15 g |
| Chickpeas | 14 g |
| Black-eyed peas | 13 g |
| Pinto beans | 12 g |

Nuts and Seeds

| | |
|---------------------------|------|
| Peanuts, 1/4 cup | 9 g |
| Almonds, 1/4 cup | 6 g |
| Pistachios, 1/4 cup | 6 g |
| Cashews, 1/4 cup | 5 g |
| Walnuts, 1/4 cup | 5 g |
| Hazelnuts, 1/4 cup | 4 g |
| Hemp seeds, 3 tbsp | 10 g |
| Pumpkin seeds, 1/4 cup | 9 g |
| Sunflower seeds, 1/4 cup | 9 g |
| Chia seeds, 1/4 cup | 4 g |
| Peanut butter, 2 tbsp | 8 g |
| Other nut butters, 2 tbsp | 5 g |

Grains and Starches—1 cup cooked

| | |
|----------------|-----|
| Amaranth | 9 g |
| Quinoa | 8 g |
| Oat bran | 7 g |
| Wild rice | 7 g |
| Oatmeal | 6 g |
| Buckwheat | 6 g |
| Brown rice | 5 g |
| White rice | 4 g |
| Barley | 4 g |
| Potatoes | 4 g |
| Sweet potatoes | 4 g |

Recommended Protein Intake by Weight

| Protein Intake | | | |
|----------------|-------------|----------|----------|
| Weight (lbs) | Weight (kg) | 1.1 g/kg | 1.6 g/kg |
| 100 | 45 | 50 | 73 |
| 110 | 50 | 55 | 80 |
| 120 | 55 | 60 | 87 |
| 130 | 59 | 65 | 95 |
| 140 | 64 | 70 | 102 |
| 150 | 68 | 75 | 109 |
| 160 | 73 | 80 | 116 |
| 170 | 77 | 85 | 124 |
| 180 | 82 | 90 | 131 |
| 190 | 86 | 95 | 138 |
| 200 | 91 | 100 | 145 |
| 210 | 95 | 105 | 153 |
| 220 | 100 | 110 | 160 |
| 230 | 105 | 115 | 167 |
| 240 | 109 | 120 | 175 |
| 250 | 114 | 125 | 182 |
| 260 | 118 | 130 | 189 |
| 270 | 123 | 135 | 196 |
| 280 | 127 | 140 | 204 |
| 290 | 132 | 145 | 211 |
| 300 | 136 | 150 | 218 |

ENDNOTES

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PART I

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Chapter 3

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Chapter 4

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Chapter 6

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PART II

Chapter 7

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OUR PRODUCTS AND PROGRAMS

SUPPLEMENTS

At *The Energy Blueprint*, we strive to make leading-edge, best-in-category formulas designed to provide results that you can actually feel. Whereas most companies put in 1/5th to 1/20th the actual clinical dosage of the various ingredients in their formulas, we put in real clinical dosages for all our ingredients (making our costs to manufacture these formulas 5 to 10 times higher than most manufacturers). We do this because our goal is to provide the absolute best product on the market in each category and, most importantly, to get you noticeable and hopefully life-changing results.

Here's the quick rundown of what we offer.

Energenesis

This is our flagship mitochondrial formula. Instead of stimulant- and caffeine-based products, which give you a quick boost but actually worsen your energy when used regularly, this formula is designed to build up your own body's capacity to produce energy by supporting your mitochondria with cutting-edge ingredients with proven fatigue-fighting and energy-boosting effects like NTFactor®, PQQ, acetyl-L-carnitine, R-alpha lipoic acid, and shoden Ashwagandha. It's also our best-selling product that has changed thousands of lives.

Energy Essentials & Superfoods

More than 9 out of 10 people in the U.S. have at least one nutrient deficiency, and more than 7 out of 10 people have at least three nutrient deficiencies! This is a major cause of fatigue for many people. These nutrients—

various vitamins and minerals—play key roles in your hormone balance, brain function, risk of dozens of diseases, and the ability of your cells to produce energy! With full doses of wholefood sources vitamins, the most bioavailable methylated B vitamins, disease-fighting tocotrienols, and real clinical doses of powerful superfoods like spirulina, chlorella, pomegranate, and fulvic/humic acid to enhance bioavailability and absorption, Energy Essentials & Superfoods is the most powerful and comprehensive multivitamin/multimineral and superfoods supplement on the market—designed to plug the holes in your diet and provide your body with the nutrients and cofactors it needs for optimal health, disease prevention, and energy production.

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UltraBrain is a premium, next-generation brain health-optimizing, anxiety- and depression-fighting nootropic that's designed to combat brain fog, boost your mood, and get your brain functioning at its peak potential. All while supporting long-term brain health! (Again, completely free of stimulants and sugar.) Packed with the most powerful, evidence-based brain-boosting compounds available like *Rhodiola rosea*, lion's mane mushroom (dual extract), cognatiQ, L-theanine, choline CDP, alpha-GPC, huperzine A, saffron extract, and more—all in real clinically effective dosages—this formula is for anyone looking to step into their brain's full potential.

PROGRAMS

The Energy Blueprint

This is our flagship course that's the culmination of over seven years of work. This program covers all the different factors that play into our energy levels and the practical lifestyle habits to optimize everything from circadian rhythm and sleep, to gut health, to detoxification, to light therapies, to hormesis. It's an ultra-comprehensive 60-day program that takes you deep into the science of virtually every aspect of human energy optimization.

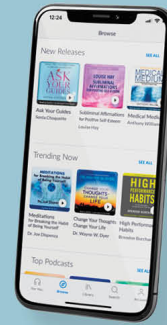
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We partnered with world-leading breathing expert Patrick McKeown to create a cutting-edge program specifically for the purpose of enhancing energy levels. This program centers around using breathing practice to retrain optimal autonomic nervous system function (to de-stress the brain and body) and particularly the hormetic practice of breath holding (intermittent hypoxic training) to systematically upregulate one of the biggest needle movers for energy optimization—the pulmonary and cardiovascular systems. We've created a systematized program to take people from 10- to 15-second breath hold capacities up to multi-minute breath holds. This creates profound adaptations in lung capacity and mitochondrial adaptations that result in massive improvements in oxygen utilization and ultimately, cellular energy production. If you're looking for one specific practice you can do each day to dramatically improve your energy levels, this breathwork training system is the single most powerful and fastest way I've ever found to increase energy levels in my over 25 years of studying and teaching health science.

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