

WHAT COLLEAGUES ARE SAYING

“Dr. Keroack’s Changing Directions will change people’s lives. It’s an epigrammatic work leading to outstanding clinical outcomes for both the patient and the functional medicine doctor. He has walked the tightrope and connected the dots between both traditional and alternative medicine. I’m honored and fortunate to call Dr. Keroack a colleague and friend.”

—Robert Silverman, DC,
2015 ACA Sports Chiropractor of the Year
New York ChiroCare

“Dr. Keroack is truly a gifted and caring healer. In his must read book, Changing Directions, he draws on his personal experiences and expertise in both conventional and functional medicine to outline a clear and effective plan to restore optimal health through balanced living.”

—Jeffrey A. Morrison, MD, CNS
The Morrison Center

“Changing Directions is a vision of what truly integrative functional medicine has to offer! Dr. Keroack offers a very practical path forward for individuals with chronic medical conditions to optimal wellness. This book is an integral component in any healing library for both patient and practitioner.”

—Joseph Lamb, MD
*St. Thomas Medical Group; medical director,
The Hughes Center for Research and Innovation*

“Trained in both traditional and functional medicine, Dr. Keroack is that new-generation physician that has figured out how to bridge these two powerful sciences so you don’t have to. This book is the perfect launching pad to begin your journey toward understanding how to reach your optimal health.”

—Kevin Hoffarth, MD
Founder of *BioFIT Medicine*

“Christopher Keroack, MD, is a doctor in the true sense of the word. The term’s origin in Latin is docere, which means “to teach.” This timely book, Changing Directions, is a narrative by a physician who recaptures his love of medicine in the evolving healthcare paradigm and insightfully conveys his rationale to the reader. As a conventional practitioner who was not always satisfied with outcomes, Dr. Keroack pursued training in functional medicine. He successfully integrates lifestyle strategies, addressing root causes and imbalances, while recognizing scientific advances. It is a model of healthcare that many patients seek, but few are able to access. This isn’t the future of medicine but what must become a standard for the present.”

—Samantha K. Eagle, ND
Biologic Healthcare

“Changing Directions is the True North toward optimal health and vitality—a must read for all seekers on the path to wellness.”

—Monique Class, MS, APRN
The Center for Women’s Health

“Dr. Keroack brings valuable perspective to a timely topic. He answers the question, how do we blend conventional and natural medicine? Unfortunately, patients are often confronted with having to choose between the two. For example, see the natural doctor and don't mention this to your disapproving conventional doctor. Dr. Keroack practices both forms of medicine and thus outlines an approach that allows the reader to obtain the best of both worlds. “

—Dr. Michael Ruscio, DC,
functional medicine

WHAT PATIENTS ARE SAYING

“Over the past year, with the support, guidance, and encouragement of Dr. Keroack, I have learned about the caloric value of food, increased my metabolism, learned new coping skills, and oh, yeah ... lost over 85 lbs. This hasn't been just about the weight lost; it is also about all that I have gained: self-confidence, a new outlook on life, and a physical and emotional strength that is enhancing every area of my life.”

—Beth

“Almost two years ago I found myself in a very scary situation. A trip to the cardiac catheterization laboratory revealed that I had pericarditis. My cardiologist put me on the traditional treatment for the illness; however, as I tried to wean off of the medication I found that my symptoms would return. After multiple rounds of medication and many months of frustration I had a discussion with my best friend, Dr. Christopher Keroack, who thought that just maybe there was something more going on, so we embarked on a detox program and added UltrainflamX. Astoundingly, I was able to wean off the medication in two weeks, and I was back on my bike. The skeptic in me thought it was a coincidence, but when I ran out of my supply of UltrainflamX, my symptoms began to recur. Dr. Keroack and his team at Pioneer Valley Weight and Wellness Center are truly the best in combining traditional and functional medicine.”

—Vinnie

“I am very grateful to Dr. Keroack and his medical team. I suffered for over eighteen years with some debilitating medical issues, and from the first visit I felt validated and that someone cared. His perseverance to find a cause and ultimate treatment has given me back my life.”

—Kathleen

“Dr. Christopher Keroack is more than just a doctor—he is a genius of health. His background in Western and Eastern medicine has given him an insight on health that is one of a kind and beyond remarkable. He has the uncanny ability to find solutions that other physicians would have never found. I have struggled for a decade to find an answer for my hypertension, but Dr. Keroack discovered my problem after just two visits. Again, he did this by examining my tongue (Eastern influence) and analyzing my blood work (Western training). He uses the knowledge from both his alternative and conventional health experiences. Now I am free of poisonous drugs and feeling great. The day I met Christopher was the luckiest day of my life. I thank him for saving my life and giving me back my vitality.”

—Jack

“My first consultation with Dr. Keroack was very rewarding. I am a female in my mid-fifties competing in ultra-distance events. He spent the time necessary to understand and educate me on what was happening to me as an individual/athlete. Dr. Keroack took the time to explain to me how my body handles stress and the importance of nutrition and rest and recovery for the physical aspects of my training. I have never experienced such passion, dedication, and concern from the medical profession as I have from Dr. Keroack and his staff. I have recommended his practice to many of my friends and co-athletes and will continue to do so as I truly

believe his philosophy and passion make a difference and will be the future of the health industry.”

—Donna

“I recently contacted Dr. Keroack regarding his advice on improving my athletic performance and weight reduction. Upon my request he proposed a gluten-sensitive diet, taking into account my genetic background. These alternations coupled with his recommendation to add Endura, a nutritional supplement, to my intake around training times led to immediate results. I quickly saw a higher energy rate during training along with a leaner physique. My appreciation and support for Dr. Keroack’s expert advice and exceptional care cannot be overstated. I extend my highest regards for his personalized and systematic approach to health and wellness.”

—Jake

“Dr. Keroack was the first doctor who listened to me. Although I was not grossly overweight, he put me on the right path. I was always bloated, looking seven months pregnant. I lost eighteen pounds under his care. His staff members are superb. His smile alone brightened my days.”

—Rita

“My saga to achieve my weight goals by losing one-hundred-plus pounds would have never been obtained without Dr. Keroack’s understanding and patience. When we first met, the word “diet” meant so many negative things to me, and I found myself at wits’ end with my health and physical appearance. Never mind my mental state about food. Surgery was the only option in my mind at that point in time. But before

long, my outlook began to change with the help of Dr. Keroack and his staff. In about a year's time, one-hundred-plus pounds fell off me. The road was not easy—there have been setbacks and moments of weakness, but Dr. Keroack helped me understand those setbacks and move forward. Today, I am going to exercise classes three times a week, taking daily walks, and going to the gym with my wife on weekends. Thank you for restoring my life to a point where I am strong, healthy, and happy. My hat is off to you and your team, Dr. Keroack.”

—Chris

“For most of my adult life I had struggled with weight loss and it seemed that I had tried every fad diet that hit the market. I was convinced there was a “silver bullet” out there, and I was determined to find it. When I first met Dr. Keroack and his team at Pioneer Valley Weight and Wellness Center, I knew it was a good fit. They understood the daily struggles of a busy new mom with a hectic schedule. What I found with them was not a silver bullet but something much more valuable—the straight, simple facts and science that lead to weight loss. This was not a diet but rather a lifestyle change that helped me learn how to eat properly and engage in the right type of physical activity for a strong, healthy body. Their team approach was an integral component to my significant weight loss, and they continue to be a constant support in my efforts to maintain a healthy weight.”

—Stephanie

“My relationship with Dr. Keroack has been a powerful experience. He has pioneered several innovative techniques in efforts to optimize my overall health and wellness. I can confidently say this: it works! His unique “patient first” approach to medicine distances him from the rest.

Dr. Keroack digs deeper than the issues on the surface, discovering the “why” and “how” factors with his clients. Since building a relationship with Dr. Keroack, we are constantly finding new ways to fine-tune my health and lifestyle choices, and I am certainly “Changing Directions” for a better quality of life.”

—Tyler

“I can’t thank Dr. Keroack enough for the personalized care provided by him and his team. I was frustrated and exhausted before we began working together. His individualized care has provided positive results! My experience has been extremely motivating and has given me the tools for making realistic, applicable change to my lifestyle. The results have been immeasurable for me and my family!”

—Jim

C H A N G I N G
DIRECTIONS

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DIRECTIONS

NAVIGATING THE PATH TO
OPTIMAL HEALTH AND
BALANCED LIVING

CHRISTOPHER KEROACK, MD

Advantage®

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*To my loving wife, Beth Keroack, the Yin to my Yang,
the calm in my storm, and the greatest gift given
to me to bring balance into my life.*

FOREWORD

CHANGING DIRECTIONS: NAVIGATING THE PATH TO OPTIMAL HEALTH AND BALANCED LIVING

In 1990 I was responsible for convening a meeting of a group of concerned medical practitioners, biomedical researchers, and health educators in Victoria, British Columbia, to discuss what medicine might look like in the twenty-first century under ideal circumstances of its evolution. From this group of remarkable “out of the box” thinkers emerged the concept of functional medicine.

Functional medicine, as it was conceived by this group, had a number of unique features including:

- patient centered versus disease centered

- focused on the interconnections of the body’s systems rather than organ-specific disease

- understanding of the origin of the person’s altered physiological, physical, cognitive and emotional function rather than focusing primarily on a diagnosis

This medical model required the health-care provider to understand their patient’s story in a different way than the traditional medical approach, which was the drive to provide a diagnosis of a specific disease. The functional medicine practitioner was more inter-

ested in how the patient got to the point where they were ill rather than just what the illness was called. This approach required that the doctor ask different questions of the patient as they related to family history, genetic background, personal health history, diet, lifestyle, environment, and social interactions. We all know that the questions you ask determine to a great extent the answers you get. Functional medicine focused on asking questions of why and how a patient got ill rather than the “what” they have.

As the twenty-first century has unfolded, it has become more apparent that these discussions in 1990 that resulted in the development of functional medicine presaged what we subsequently discovered about the origin of disease—it is a result of the way that our genetic uniqueness interacts with our environmental and lifestyle exposures. This is termed the “gene-environment” paradigm. No two people are identical, therefore the food of one might be the poison of another. An example of this is the well-known adverse reaction that some people have to the protein gluten that is found in grain products. It is also seen in people who have toxic reactions to certain drugs and chemicals that they cannot properly detoxify and eliminate from their body that are tolerated by most other people. Each of us carries our own “book of life” in our genes. Our book doesn’t tell us exactly how we will look, act, and feel but rather provides many stories of what our life can be depending on our environment, lifestyle, and diet.

It is each of our jobs to find out what environment is best for us to optimize our genetic potential. This is the area of specialty of the functional medicine doctor who understands the questions to ask in assembling the personalized approach to meeting the patient’s needs to create health from illness.

Dr. Keroack is a specialist with advanced training in functional medicine. He is an expert in the twenty-first century concept of a systems biology approach to patient-centered care. His book *Changing Directions: Navigating the Path to Optimal Health and Balanced Living* represents a manifesto for how to effectively apply functional medicine in both the prevention and management of chronic illnesses. The title of the book exemplifies many of the differences between a functional medicine approach and that of a disease-centric approach to health care—the use of the words “changing,” “navigating,” “optimal health,” and “balanced living” are all reflective of the new approach to health. Life is a journey associated with constant change. We navigate our way through these changes with an objective of where we would like to head. If a person selects “optimal health” as their objective as they age, then they need to introduce a program of living that is “balanced” to their individual needs. This book helps the reader to achieve those goals of optimal health through balanced living.

He has broken down the analysis of a person’s health into functional medicine’s seven core processes that include hormone function, neurological function, metabolism, detoxification, inflammation, digestive function, and structure. His use of metaphors and clinical examples of how these concepts relate to asking the right questions so as to get the right answers about a person’s health makes the journey that the reader takes with him very understandable. He serves as a guide in the introduction of a new way to achieve better health and reduce the burden of chronic disease.

Functional medicine is more a way of how a person can apply a systems biology approach to patient-centered health care in their life than it is a collection of specific therapies. In essence, this book teaches the reader how to utilize the latest in advances in the under-

standing of the gene-environment connection to health and disease to create their own personalized approach to health.

It is truly rewarding to see that the concepts of functional medicine are being successfully applied by physicians of the background, skill, and dedication of Dr. Keroack for the management of complex health problems ranging from diabetes and obesity to arthritis and dementia. *Changing Directions: Navigating the Path to Optimal Health and Balanced Living* is an important resource written by an expert in functional medicine who has seen the benefit of its application in his patients. This book provides an important road map for a person's journey on their path to optimal health.

Jeffrey Bland, Ph.D., FACN, FACB
Cofounder, *Institute for Functional Medicine*
Founder and President of the
Personalized Lifesthealryle Medicine Institute
Author of *The Disease Delusion*

TABLE OF CONTENTS

Foreword.....xvii

Acknowledgements.....1

About the Author3

Introduction

What Is Functional Medicine and
Why Is it Important?5

Chapter 1

A Balanced Body through Functional Medicine15

Chapter 2

A Balanced Metabolism33

Chapter 3

The Cardiometabolic Syndrome41

Chapter 4

Reducing Inflammation.....57

Chapter 5

Improving Detoxification.....67

Chapter 6

Reducing Oxidation81

Chapter 7

Hormonal Imbalance93

Chapter 8

Nutrition for a Balanced Body115

Chapter 9

Sleep and Stress Reduction135

Chapter 10

Understanding Your Blueprint153

Chapter 11

Helping You to Achieve Balance175

A Final Note to the Reader

Taking Your Direction to the Next Level185

Appendix187

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Over the course of the journey that has ended with this book, there are many people I would like to thank:

My family, especially my children David, Joseph, and Faith, who made the sacrifice of time in their childhood to let their daddy work on his book. Your understanding in regard to this did not go unnoticed.

My parents, educators, and professors, who taught me not to settle for good enough but rather to strive for excellence at any cost. Thank you for teaching me, supporting me, and pushing me to be my best.

The circle of my community who influenced me the most—my band of brothers. These are the mentors and friends who unconditionally loved me as I am but loved me too much to keep me that way.

And lastly, I thank God for the gifts given to me, gifts that can only be explained by a remarkable grace that I did not deserve but I am eternally grateful I have received.

ABOUT THE AUTHOR

Christopher Keroack, MD, knows that optimal health and balanced living are realistic goals for every human being at every stage of life. Because of this, he is dedicated to assisting patients in reaching their full potential in order to pursue life to the fullest. Dr. Keroack guides people through foundational and practical approaches to health that focus on dietary guidelines, stress management, sleep management, and activity regimens that are personally and specifically designed for each person. Each personalized health and wellness plan takes into account the five foundational imbalances: nutrition, metabolism, inflammation, detoxification, and oxidation. He believes so strongly in this medical approach to well-being that he chose to author this book as a pioneering work that blends traditional medicine and alternative medicine into the perfect balance of caring and healing that is his signature approach to healthcare.

Dr. Keroack is board certified in both internal medicine and bariatric (weight management) medicine. He received his formal education from Amherst College (BA), Springfield College (MS), and Tufts University School of Medicine (MD). In addition to his formal training, he is certified in functional medicine, age management medicine, and naturopathic and integrative medicine from the Institute of Functional Medicine. He is also certified in age management medicine from the Cenegenics Research and Education Center. He has spoken both nationally and internationally on weight loss, nutrition, fitness, and functional medicine. His combination of experience and training has enabled him to develop a comprehensive and complete approach to optimizing health, wellness, and vitality.

INTRODUCTION

WHAT IS FUNCTIONAL MEDICINE AND WHY IS IT IMPORTANT?

When I was seven years old, I begged and pleaded with my parents to take me to a nearby amusement park. There was an area in the park called the International Plaza that was frequently crowded. As we traversed the plaza, I remember my mom saying, “Don’t let go of my hand.” The density of the crowd resembled a New York nightclub, but I struggled through it and emerged holding my mother’s hand—only, when I looked up, I was shocked to find the hand wasn’t hers.

To this day, I have no idea how that happened. All I remember is feeling completely lost, frightened, and abandoned. (As a parent myself, I now know my parents were equally terrified.) After those initial stages of panic, I decided to go to the one place I remembered in the park, the magic show. I sat down in the front row and cried as the show began. Shortly after that, my mom came in and found me, hugged me, and all was right with the world again.

Many of you likely remember being lost as a child. It’s an alarming experience and so is finding out that the hand you hold has changed from what you knew as loving, caring, and understanding. Returning to that last place of safety and familiarity is one of the hallmarks of finding your way again.

Part of me believes that this is what has happened in the medical field. Once compassionate healers, our field has transitioned into

protocols, ICD-10 code diagnoses, prior approval paperwork, and endless uses of drugs. Many of my colleagues and I long for the golden years of medicine, where there was a one-to-one relationship with our patients. We were sworn to do no harm and committed ourselves to healing and compassionate caring. I believe we can return to those good old days.

We truly need to turn around—to change directions—in our approach to our health. We need to embrace the ancient arts of medicine and somehow still benefit from the modern approaches of scientific medicine. That's where I come in. I have been blessed with opportunities to study both approaches. I have gone through the classic training of traditional medicine, and after that, I took extra time and effort to learn the ancient art and philosophy of Eastern medicine. The blending of these fields is known as *functional medicine*.

I am excited to share with you the root aspects of this amazing field in this book. My hope is that you, too, can utilize functional medicine to change directions. I want you to return to a time of health and balance in your life that is comforting and familiar.

Functional medicine is both a revolutionary and classic approach to health and disease. It is the original approach that Hippocrates founded so many centuries ago, when the major focus was the relationship between the doctor and the patient. The focus of treatment was dietary change and plant-based medicines, but the compassion and caring of the physician was key to healing.

I describe modern functional medicine using two metaphors. One is that the roots of the tree, not the leaves, nourish it. In fact, the root system of a tree takes up as much space underground as the branches do above ground. The leaves may show the outward signs of disease, but if we focus only on them, we completely miss the

deeper problem. Functional medicine sees the roots and knows that by nourishing the roots, the leaves will grow.

Another metaphor that describes the way we see health issues in functional medicine is seeing your body's systems as a flowing stream. We look at your health from an upstream approach. Imagine that pollutants and chemicals from a factory upstream are contaminating the water and creating imbalance and toxicity. The downstream approach of traditional medicine is to put a water filter on your kitchen faucet. That would solve part of the problem but certainly not all of it. What about the water in the bathtub, the dishwasher, the washing machine? You're treating a symptom but not the real problem. Functional medicine looks upstream to find the true source of the problem and corrects it there. The upstream approach requires going directly to the source by removing or diverting the pollutants and chemicals from the stream itself. All the ill effects caused by the imbalance and toxicity can then be rectified and resolved.

According to the Institute of Functional Medicine:

Functional medicine addresses the underlying causes of disease, using a systems-oriented approach and engaging both person and practitioner in a therapeutic partnership. It is an evolution in the practice of medicine that better addresses the healthcare needs of the twenty-first century. By shifting the traditional disease-centered focus of medical practice to a more person-centered approach, functional medicine addresses the whole person, not just an isolated set of symptoms.

Functional medicine practitioners spend time with their people, listening to their histories and looking at

the interactions among genetic, environmental, and lifestyle factors that can influence long-term health and complex, chronic disease. In this way, functional medicine supports the unique expression of health and vitality for each individual.¹

At Pioneer Valley Weight and Wellness Centers, we take a patient-centered approach to uncover the root causes of illness by applying lifestyle strategies and treatments to address the needs of that individual.

We use functional medicine to assist with weight loss and healthy body composition. We're equipped to assess and treat chronic conditions that are not well managed by conventional medicine therapies. These include but aren't limited to:

- Hormonal imbalances
- Neurological imbalances
- Reduction/oxidation and metabolism imbalances
- Detoxification/biotransformational imbalances
- Inflammation and immune imbalances
- Digestive and absorptive imbalances
- Structural imbalances

¹ "What is Functional Medicine?" The Institute for Functional Medicine, <https://www.functionalmedicine.org/about/whatisfm/>.

At the root of functional medicine is the idea that the body, given the right balance of food, movement, stress, sleep, and relationships, will take care of itself. This is a very different viewpoint from traditional medicine, which says the body can't take care of itself and needs interventions, such as procedures and medicine, to stop disease or stay healthy. Functional medicine believes that, given the right ingredients, opportunities, circumstances, environment, and relationships, the body will not only take care of itself, but it will thrive. In functional medicine, we believe that you can improve your health as you go through life. This concept is foreign to traditional medicine, which believes that most people only get unhealthier as they get older. This concept is so accepted as fact that it is sometimes insurmountable. It is my intention to reverse your thinking, and the medical community's thinking, about this falsity.

I see my patients as unique individuals, not just as a set of symptoms and diagnosis codes. Over the course of a visit, I spend a lot of time with my people, taking their medical histories and looking at the many connections and interactions in their lives that can affect their health. We look together at how the body functions, both in balance and out of balance.

A TEAMWORK APPROACH: THE DOCTOR/PERSON RELATIONSHIP

The moment I enter the exam room with people, my approach is, "What can I do to help you?" and, "How can I make your life better?" People often smile or chuckle at this and say, "No doctor has

every asked me that before.” This genuine care and connection with people is what I love about being a doctor and a healer.

The process begins even before I see a person for the first time. As most physicians do, I ask them to fill out the usual family and personal medical history information, but I also give them a more detailed personal history and medical symptoms questionnaire before the first appointment. This isn't the usual sort of medical form, however. I want to know all about you. I want a true head-to-toe perspective to have a complete view of your health. It starts with your head, asking about headaches, faintness, dizziness, and insomnia, and then it moves on to questions about your eyes, ears, nose, mouth, and throat. I also ask about your skin, your heart, your lungs, your digestive tract, and your joints.

That's all the medical stuff. But in functional medicine, we look further. I ask about your weight, your energy level, your physical activity, your mind, and your emotions. But I don't just stop there. I ask about your current health problems, your past problems, your early life, your childhood, and even about the time in your mother's womb (if you have access to that information). It's all pertinent because it all influences who you are and the balance that you have or don't have. And most importantly, I see people as a combination of many forces, all of which have separate needs and balances. I do this because your body, your mind, and your spirit can't be separated; they are all one and are each essential parts of what make you uniquely you.

The questionnaire and my initial intake forms are good starting points for an office visit. In the exam, I'll ask about what the Institute of Functional Medicine calls the ATMs: antecedents, triggers, and mediators. I ask open-ended questions—not the yes and no type—

designed to probe not just the physical but also the mental and spiritual aspects of your life. I'll say, "Tell me about what you eat. Tell me what your sleep is like. Tell me what your activity and movement is like." That's the physical component. Then I say, "Tell me a little bit about your stress, your community, and your relationships." Then I say, "Tell me what you believe in. Tell me the sorts of things you want to accomplish. Tell me some of the things that you look forward to. What makes you come alive?" I want to see the whole person, not just a collection of symptoms.

If you tell me on the questionnaire that you have achy joints, we'll go into that more deeply to find out when the problem started, what sets it off, and what seems to help. A traditional doctor would ask far fewer questions and would quickly reach for the prescription pad to give you a powerful anti-inflammatory drug. As a board-certified internist grounded in traditional medicine, I prescribe these medications when they're needed, of course, but my first step would be to take a broader view. Drugs will help relieve the symptoms in the short term, but what about the underlying causes and the long term? Could more activity and physical therapy help that aching joint? Would herbal supplementation or botanicals work? And let's not forget that dietary changes and weight loss often help. We talk about all the possible treatments. I ask the person what her goal is and what she's willing to do and what she won't do. I base my recommendations on what the patient tells me. I call these *deal breakers*. They're essential to knowing your people as well as knowing the best approach to each one.

In addition to taking a standard personal and family history, I also use active listening and active interviewing techniques to learn more. In functional medicine, we want to know more than usual about your family history and your younger years. For example, I want

to know as much as possible about you before you were born. Did your mother have bad morning sickness? Did she get sick? Did she have any complications, like gestational diabetes? Were you born via C-section? Did you get breastfed? Did you have a lot of antibiotics when you were a kid? All these things matter! Then I'll say, "Tell me a little bit about what your young years were like. Was there anything significant in your childhood, the sort of thing your mom told you about?" We go into later years, looking for significant events that shaped your life. Then I go back to the past six months or even a year, prior to the beginning of the current health concern. We often find that a significant or even traumatic event happened just before things started to decline.

Functional medicine says that balance in your body is what gives you good health. Imbalance throws you off. When you have a major life event, the stress can affect your health by pushing one or more systems to the limit. If there's already a susceptibility, that's the system that will get out of balance and disrupt your health. Think of it as a juggling act with spinning plates. When your system gets out of balance, the plates come crashing down. A traditional doctor will say, "Of course you feel terrible. Your plates are broken." A functional medicine doctor says, "What are the long-term imbalances that broke the plates? What are the environmental factors and genetic predispositions that got you out of balance? How can we work together to fix them?"

Rebalancing is a process. In traditional medicine, your doctor would say, "You have an infection. Here's an antibiotic. The infection will be gone in ten days." That approach has its role, and I take it when it is appropriate. But for longer-term problems, the functional medicine approach is, "You've had some imbalances and disturbances. We have to look further and take some time to repair them

because usually there's more going on than meets the eye. We don't want to miss anything.”

We can often fix the imbalances by changing the diet. Food is foundational; food is forever. Food is a key element, but it may take a longer time to make a difference than symptom-relieving prescription drugs. In fact, it could take up to twenty to thirty months of eating a better diet to change your internal environment. Still, I want to get to the roots, not the leaves. Once your plates are broken, though, you may not want that timeline. Most of my people say, “I need to get this fixed faster than that.” That's where nutraceuticals—foods that act like gentle drugs—and supplements come in. They can give a more rapid response. You couldn't eat whole sprigs of rosemary, but you can take a capsule that contains concentrated amounts of rosemary oil. My traditional medicine colleagues call this pixie dust. Well, okay, I'm willing to make deals with pixies because they can't do much harm. I'm much less willing to prescribe the dark magic of powerful drugs. I only make those kinds of deals when there is no other option. After all, dealings with Voldemort or Maleficent are much scarier and have bigger consequences.

In modern medicine, the body is seen as a machine; each part is important but may or may not interact with any other part. And when a part is broken, you fix it or replace it. In traditional Asian medicine, the body is seen more as a garden. I like to take the garden approach. The plants that grow best in your own backyard are species that are native to your area. They're well adapted to the environment, so they're hardy and will grow without a lot of extra watering and fertilizer. But even native species won't do well if they're in the wrong environment. A plant that needs a lot of sun and not too much water won't do well in the shade. You have to know your own internal environment and choose what will work best for you in terms of diet,

exercise, sleep, and everything else. As a functional medicine doctor, I work to help you achieve and maintain that understanding so you can thrive.

Many of my people have been to other doctors, sometimes many other doctors, without getting any real help. By the time they see me they're usually at a high level of frustration, hopelessness, and even mistrust toward traditional medicine. After our first interview, they're thrilled. At last, a doctor has really listened to them—probed and questioned to get down to the real problem—and finally has taken their problems seriously. They often tell me, “I came into your clinic feeling hopeless about my condition and circumstances, but now, after meeting and listening to you, I have hope again.” Comments like that are what make me feel alive, keep me going, and make me love my role in functional medicine.



CHAPTER 1

A BALANCED BODY THROUGH FUNCTIONAL MEDICINE

Balance matters for your health and your life. Balance is everything. Without it, we have chaos and destruction; with it, we have flow and vitality—we have constructive health. You are robust and sturdy. When you are out of balance, it doesn't take much to knock you over. You are susceptible to damage and disease.

Balance matters because everything in the universe is set up to be balanced. You as an individual human being have been designed to be balanced. Balance is so important to your body that it will compensate even for a major imbalance, such as the loss of a kidney.

The other kidney enlarges to take over some of the lost function. If you have a stroke, you can regain some or even most of the lost function from the injury because your brain is remarkably plastic—it can rebalance, and you can relearn damaged skills.

THE STAR OF WELLNESS

Ancient mariners and early explorers relied upon the stars for navigation. The stars were landmarks and guideposts to help keep travelers from getting lost. Despite the changing landscape, the North Star is always a compass point for the traveler. The Star of Wellness is designed for the same purpose—to help you find your way to health by striking a balance between the five important aspects of how your body functions:

- Metabolism
- Inflammation
- Detoxification
- Oxidation
- Nutrition

Similar to the ancient mariners and early explorers, I too use a star for finding the right direction—as a navigation tool for health, vitality, and a new and improved you (see insert at the back of the book for the Star of Wellness). I also assign colors to each point on the star as a way to symbolize what they represent. All five aspects

of your health are equally important. A problem in any one leads to imbalance with the others.

The real key to solving problems from a functional medicine point of view is to discover patterns in the complexity of each problem. Patterns can often arise from combinations of the creativity of art combined with the systems approach of math and science. Sometimes these kinds of patterns are right in front of us, but we don't see them because they are so familiar to us. Taking a fresh view of a problem helps with this, and I think some of the ancient scientists and mathematicians did just that. One such person who found the marriage of art and math was the great mathematician Leonardo of Pisa. His great work, the *Filis Bonacci*, which is now known as Fibonacci (pronounced fib-on-arch-ee), demonstrates mathematical patterns in the artistry of natural science. In light of this, I began to think of the body's balance in terms of Fibonacci numbers, the mathematical pattern found throughout nature. You can see Fibonacci numbers everywhere, in the petals of a flower, in spirals of the nautilus shell, in patterns in the spikes of pinecones. Each number in a Fibonacci sequence is the sum of the two before. So, starting with 1, the next number is 2 (1+1), followed by 3 (2+1), followed by 5 (2+3), followed by 8 (3+5), and so on to infinity. I am amazed at Fibonacci numbers because they give order to what seems like randomness in nature.

I think functional medicine concepts have equivalent Fibonacci numbers. The number 1 is the mission or the focus. Without this centered point, you have nothing to work from. At Pioneer Valley Weight and Wellness Centers, our number 1 is the restoration of balance in the lives of our people through the provision of expert and exceptional nutritional, emotional, and spiritual care.

Number 2 is the rhythm of deficiency and irritants. Add the number 3, which is mind, body, and spirit, and you reach the number 5, which is nutrition, metabolism, inflammation, detoxification, and oxidation. This sort of natural mathematical pattern helps you understand the formula for health: (1) Restoring balance; (2) Addressing deficiency and irritants; (3) Mind, body, and spirit; and (5) Nutrition, metabolism, inflammation, detoxification, and oxidation.

I'll go into each point of the star in greater detail in later chapters of this book. For now, let's take a quick look at each point to give you the basic idea.

METABOLISM

Every moment of every day, biological processes within your body keep you alive by converting the food you eat into energy. It all happens within your cells inside tiny power plants called *mitochondria*. How much energy you need to burn to maintain your basic body functions depends on a lot of factors, including how much muscle you have. The minimum amount of energy you need to produce to run your body is called your *basal metabolism rate*. The leaner your body, the more active your metabolism will be above the baseline. Metabolism is represented by a blue color point because when your metabolism is out of balance, you're cold.

INFLAMMATION

Inflammation is the body's natural reaction to dangers and strangers. When your body is under attack from germs, irritants, or damage to its own cells, your immune system responds by producing

the four classic signs of inflammation: pain, redness, swelling, and heat. If you cut your finger or sprain your ankle or get an infection, you'll experience the symptoms of inflammation. It's your body's natural defense, so up to a point, inflammation is a good thing. However, when it's constant or uncontrolled, inflammation can be very damaging. Inflammation is represented by a red color point because when your inflammation is out of balance, you're hot.

DETOXIFICATION

Detoxification is your body's way of ridding itself of waste products, both the natural by-products of metabolism and digestion and also any toxins and pollutants you take in. Efficient detoxification is essential for maintaining good health. Detoxification is represented by a green color point because when your detoxification is out of balance, you're dirty.

OXIDATION

As part of your normal metabolism, you produce a lot of waste products, including molecules known as *free radicals*. A free radical has a free electron, but electrons don't like being alone. They're only happy when they're paired up, so they bounce around in your cells looking to grab another electron from anything they come up against. Usually, what they come up against is an antioxidant, a natural chemical in your body that is there primarily for the purpose of quenching free radicals quickly, before they can do any damage. If you don't have a lot of natural antioxidants such as vitamin C in your body or if you're producing a lot of free radicals because of poor diet or exposure to toxins such as cigarette smoke and air pollution,

those unquenched free radicals can do a lot of damage, especially to your mitochondria. Oxidation is represented by a yellow color point because when your oxidation is out of balance, you're rusty.

NUTRITION

Nutrition means all the nutrients you put into your body to fuel it. Nutrients fall into two main categories: macronutrients (carbohydrates, proteins, and fats) and micronutrients (vitamins and minerals). The right balance of nutrients gives you the building blocks to maintain an active, healthy body. The wrong balance creates deficiencies and disease. Every individual has his or her own unique nutritional needs. Your blueprint is unique to you.

When your body gets out of balance, it can take some time to restore it completely, but you'll start to notice the benefits almost at once. Let's say you change your diet to eat fewer inflammatory foods by cutting out highly processed junk food. Your intestinal tract contains at least 70 percent of your immune system. If you stop eating junk food, you calm a big portion of your immune system, which in turn cuts back on inflammation. You could start feeling the effects of less inflammation within a few days—you might notice that you have more energy or you think more clearly—though it could take as long as six months to truly create a lasting change. Nutrition is represented by a black color point because when your nutrition is out of balance, you're sticky.

In both chemistry and pigment, black is the summation of all colors. It reminds us that without proper nutrition, all the other color points of the star are out of balance. This is why nutrition points to

True North on the star—because it is the most powerful aspect of all the other points.

BODY COMPOSITION

A balanced body has a good ratio, or composition, of lean muscle mass to body fat. I believe that your body composition is the key to everything. Within your body, there's an intricate interplay, both physically and hormonally, between fat and lean tissue.

We now recognize that fat is more of an endocrine (hormone-producing) organ than just a storage unit for excess calories. Your body fat is more than just stored energy; your body is saving up for a time of scarceness. Your fat is metabolically active, meaning it produces hormones and other natural chemicals, such as clotting factors that increase inflammation. Body fat affects your inflammatory pathways, your cardiovascular pathways, and the way you use energy. The balance between your fat tissue and your muscle tissue creates either inflammatory or anti-inflammatory pathways. Interestingly enough, we are beginning to learn that muscle is also something of an endocrine organ. It is not as powerful a force in the body as fat, but it has now been shown that muscle systems act in an anti-inflammatory way, as a separate endocrine system that opposes the endocrine system of fat.

When you look at the Star of Wellness, your body composition affects every point on it. You can't separate them from each other. The balance between fat and muscle is critical for every pathway in your body.

Body fat is stored in two ways: subcutaneously, or under the skin, and viscerally, deeper within the body around your organs. People

with a lot of visceral fat have apple shapes, with the excess weight around their waist. Visceral fat is the most dangerous because of the way it interacts with the organs near it. I like to call this type of fat *angry apple fat*. It's the fat that is most associated with obesity-related illnesses, such as hypertension, diabetes, and high cholesterol. It's also associated with heart attacks, strokes, and some cancers. Apple fat is deeply linked to insulin and sugar balance as well as inflammation. Fortunately, visceral fat is also the easiest fat to lose. When you start putting your body back in balance, your body seems to know that the visceral fat should go first. The other way to store fat is in the hips, buttocks, and thighs. People who store fat this way have pear shapes. Compared to the angry apple, I call this distribution the *pooped-out pear*. This type of fat is influenced by estrogen and estrogen toxicity. The level of toxicity often robs us of our energy and contributes to fatigue and pain. Ultimately, we want to gain a balance in our fat distribution that is neither apple nor pear but rather banana. It seems only logical to call this the *balanced banana*.

The other side of body composition is muscle mass. The key elements to maintaining and increasing your muscle mass are nutrition and resistance. Good nutrition gives you the right balance of proteins, carbohydrates, and fats to keep your muscles healthy. Resistance (exercise) helps your muscles maintain their strength and grow larger. The more muscle you have relative to your body fat, the more metabolically efficient your body will be. That's why physical activity is so important for maintaining good health. I always recommend physical activity to my people, but you need to keep it all in balance. Too much activity in the form of overtraining or overexertion leads to destruction—but a sedentary lifestyle leads to destruction as well.

In Dan Buettner's book, *The Blue Zones*, he reveals the results of his studies, in conjunction with National Geographic and the world's

best longevity researchers, of the “Blue Zones”—pockets around the world where people live measurably longer and better. Based on the results of these studies, people who lead the longest, most robust lives have relatively moderate daily activity.

They do things that move and nourish their muscle tissue just enough to balance the inflammatory pathways of their fat tissue.²

Everyone has their own blueprint for muscle tissue. Most hockey players aren't good long-distance runners; hockey players are designed for short bursts of stopping and starting, while distance runners specialize in endurance. You may not have the muscle blueprint of a professional athlete, but you can take what you've been given and optimize it and balance it with good nutrition and consistent, moderate daily activity.

Your muscles also play a big role in helping your lymphatic system work efficiently. The lymphatic system is your other circulatory system. It doesn't move blood. Instead, it moves lymph, the clear fluid that contains your infection-fighting white blood cells, through a network of vessels, nodes, and organs that help rid the body of toxins, wastes, and other unwanted materials. The heart pumps your blood, but lymph depends on the movement of your muscles to get transported around the body. The lymph system is essential for detoxification, so the more muscles you have and the more you move them, the more efficient your detoxification will be.

BALANCING YOUR BACTERIA

Literally trillions of bacteria live inside and on your body. In fact, you have about ten times as many bacteria as cells in your digestive

² “Blue Zones History,” *Blue Zones*, last modified March 20, 2014, <http://bluezones.com/2014/03/blue-zones-history/>.

tract. Within your small and large intestines, where digestion and absorption of food, water, and nutrients takes place, an intricate dance is going on between you, the trillions of bacteria that live in your gut, and your immune system.

The community of microbes living in your gut is unique to you, sort of like a microbial fingerprint. In fact, studies seem to suggest that there are more bacteria in you than there is “you” in you: There is about ten times the amount of bacteria in your gut alone than there are cells in your entire body. However, you need those bacteria. In fact, they may be influencing you without your knowing it because if you think about it, they have a ten to one vote. To keep your bacteria balanced, you want to make sure you have the right bacteria in the right places to do the right things.

In a balanced state of living, the bacteria within you are, for the most part, beneficial—or at least not harmful. You will always have some bacteria that can be harmful as well. Because the harmful bacteria are in the minority, the good and neutral bacteria generally crowd them out. Sometimes, however, if the environment changes, the bad guys can get the upper hand. In the most obvious scenario, you get sick for a few days with a stomach bug or food poisoning. Or you might need to take an antibiotic drug that ends up killing off both the good and bad bacteria in your gut, throwing off the balance. But your intestinal balance can be thrown off in more subtle ways that show up as digestive problems, fuzzy thinking, tiredness, and other health issues that may not seem directly related to your intestines.

When your body is balanced overall, your bacteria will be balanced as well. When your body is imbalanced from poor nutrition or from

taking antibiotics, your bacteria will respond by growing out of control and doing some damage.

One of the most common problems caused by imbalanced intestinal bacteria is what is known as leaky gut syndrome. Imagine the lining of your small intestine as a bathroom tile floor. Each tile fits very closely to the next and is held together with grout. The tile and the grout keep things from getting through to the subfloor. In your small intestine, the cells fit very tightly together, held in place by a grout-like substance. Not to get too technical, but zonulin, a modulator protein, is released with exposure to gliadins, which are components of the protein gluten which is found in wheat and other grains. As a result there are changes in the grout-like proteins that hold the junctions of your cells or in the ceramic tiles as it were. This in turn influences the protective barrier of the grout and tiles.

Normally, as your food is broken down into molecules in your gut, it is absorbed into your bloodstream through very tiny spaces between the cells, spaces barely large enough to let a single molecule of digested food get through. From there, the molecules are carried to the liver for additional processing before entering your circulation and being carried into your cells for fuel.

But if the spaces between the cells open too widely and the grout is removed, undigested bits of food pass through into the bloodstream. If this happens a lot because your intestinal lining is damaged, then you have leaky gut syndrome, also known as intestinal permeability. Your body sees those bits of undigested food as invaders. When strangers and dangers enter your system, the immune system responds and sets off the inflammation cascade. You end up with a range of symptoms that can include bloating, skin rashes, runny nose, headaches and migraines, irritable bowel syndrome, arthritis,

and achy muscles. You might have mental symptoms such as depression, anxiety, foggy thinking, and forgetfulness. Leaky gut syndrome may also be behind some chronic inflammatory conditions, such as chronic fatigue syndrome, fibromyalgia, asthma, and some autoimmune diseases. When things get in that shouldn't get in, bad things will happen.

THE 5 R PROGRAM

Fortunately, we can restore the imbalanced bacterial levels that can cause leaky gut syndrome. The key element is to remove the offending agents and then regROUT the floor. Fixing leaky gut syndrome takes time and commitment, but I have seen remarkable improvements in my people when they follow the 5 R program:

- *Remove* irritating and inflammatory foods, such as artificial colors, artificial flavors, high-fructose corn syrup, sugars, gluten, and dairy. Also remove possible irritants, such as soy and peanuts; some people also need to remove eggs. To remove the bad bacteria, add in natural antimicrobials, such as oregano, sage, and thyme.
- *Replace* missing digestive enzymes. (I'll talk more about that in the chapter on inflammation.)
- *Reinoculate* with good bacteria from probiotic supplements and fermented foods. (I'll talk more about this in the section on probiotics below.)

- *Regenerate* a stronger intestinal wall that doesn't leak by continuing a supportive diet that eliminates artificial colors, artificial sweeteners, and inflammatory and highly processed foods. Add in rosemary, turmeric, and ginger.

- *Retain* the improvement by continuing all the above steps. If you return to a poor diet, your leaky gut syndrome is likely to return.

I have a person with really bad irritable bowel syndrome (IBS). She came to me to get help for both her IBS and to lose some weight. We decided that she would try the 5 R program. When she came back for her first visit after starting it, she was upset that she had only lost four pounds in a month. I realized I hadn't been clear with her about how the program works. I explained, "Actually, I'm impressed that you've lost some weight because at first most people don't. It's only when you've been doing it longer, which you're just about to begin, that you'll see real weight loss."

As I explained to her, the first steps of the program are the killing phase. We're weeding out the bad bacteria in your gut along with the inflammatory foods and irritating chemicals—the strangers and dangers. But your lawn doesn't look better after you weed. The weeds are gone, but now your lawn is covered with patches and bare spots. Similarly, your inner landscape still needs some repair. That is what's going to start happening as you enter what I call the *seed and feed* stage. Appropriate probiotics (the seed), as well as prebiotics (the feed or fertilizer), come in at this stage. That is when you're really going to start coming alive. I'm happy to say that my patient completed all five steps. Her IBS greatly improved. She's a lot more comfortable, can eat a wider variety of foods, and continues to lose weight slowly

but steadily. Most of all, she feels she has her vitality back—she looks forward to each day.

GLUTEN SENSITIVITY

Some people have a hard time digesting a protein called gluten that's found in barley, rye, oats, wheat, and spelt (BROWS, for short). If you have a severe inability to digest gluten—or more to the actual point, if you have an immune reaction that causes the gut to get inflamed and lose the much-needed absorbing intestinal villi so that there is nutrient malabsorption, then you have celiac disease. That's serious because it can cause a lot of inflammation and damage to your digestive system. Some people who have celiac disease have had it since childhood, but others may develop it later on in life. Because the symptoms are severe and can actually lead to malnutrition, it would be unusual for someone to have celiac disease and not know it. However, you might be on the gluten sensitivity spectrum, where you have some difficulty digesting gluten. You might have bouts of indigestion or foggy thinking or a skin rash and not make the connection between eating a food with gluten and having symptoms the next day.

The incidence of people who think they are sensitive to gluten has been rising a lot over the past years. Part of that is increased awareness—a lot of people have finally figured out why they have digestive issues when they eat bread, pasta, and other gluten-containing foods. When they cut these foods from their diet, their symptoms go away. The reason for the rising number of people with gluten sensitivity is unclear, but it may be because the grains we use today have been bred to contain a lot more gliadin, which is a component of gluten. It may be that the grains are sprayed with a chemical that attaches to

gluten and causes the actual problem. It is possible that the increased amount of irritation triggers an immune response in people who might not otherwise react.

Whatever the cause, I do see a lot more gluten sensitivity in my people than I used to. The solution is to avoid or limit barley, rye, oats, wheat, and spelt. (Actually, oats don't contain gluten, but they're often processed in the same machinery as gluten-containing grains, so they can pick up some gluten. The problem can be avoided by buying only oat products that are certified gluten free.) Avoiding all those grains isn't easy, but it pays off in feeling much better. Unfortunately, we don't have a standard blood test for gluten sensitivity (although there are some specialized tests to detect it) like we do for celiac disease, so treating it involves a bit of trial and error. If you're only mildly sensitive, wheat products might give you symptoms, but you might be okay eating oats.

PROBIOTICS

When your beneficial bacteria get out of balance, it's possible to restore them to normal by taking the right strains and levels of probiotics—supplements that contain live microorganisms (beneficial bacteria) that are either the same as or similar to microorganisms found naturally in your body.

The probiotics aisle is one of the most confusing places in a health-food store. Look for supplements that contain the beneficial bacteria *Lactobacillus acidophilus*, *L. rhamnosus*, *L. plantarum*, *L. salivarius*, *Bifidobacterium longum*, and *B. lactis*. A yeast called *Saccharomyces boulardii* is often included as well. The dose should contain at least thirty billion (yes, billion) bacteria per capsule. Unfortunately, a lot

of probiotic products don't contain what the label says they do. I recommend products that come from reliable sources and have third-party reviewers to make sure there is accuracy in labeling and research to support the claims.

You can also get beneficial bacteria by eating naturally fermented foods such as yogurt, keifer, brined pickles, sauerkraut, and kimchi (the spicy Korean version of sauerkraut). Beneficial bacteria are also found in unpasteurized plain yogurt made with live, active cultures and in miso, a Japanese food made from soybeans. I ask my people to add a daily serving of a fermented food to their diet.

FEWER DRUGS

The overall goal in functional medicine is to reduce the use of powerful drugs and go with gentler botanicals and nutraceuticals. Drugs are designed to block downstream pathways—the end products of disease. Botanicals and nutraceuticals are meant to modulate and regulate upstream pathways that are closer to the source of the problem. When you modify the problem upstream, the effects cascade downstream.

When we moved into our first home, one of the things that we loved was the dining room because it had a cathedral ceiling. After we had been living there a while, we discovered that the dining room was an addition to the original house. The foundation hadn't been done correctly, so the room started to sink. There was a crack between the addition wall and the house wall. I noticed the crack. I put joint compound on the crack, and I painted it. Three months later, the crack came back. I put joint compound on it, and I painted it. Three

months after that, I put joint compound on it, and I painted it. Finally, three months after that, I hung a picture over the crack.

That's drugs. Drugs see the end product—the symptoms, the crack—and try to stop them. Functional medicine looks more closely and realizes something is wrong with the foundation. If you repair the foundation, then you won't have the crack in the wall. In the end, both approaches will remove the crack in the wall, but the nutraceuticals and the botanicals will deal with the foundational issue, whereas the drugs only deal with the covering up the crack.



CHAPTER 2

A BALANCED METABOLISM

Your metabolism is your ability to convert resources, such as food and nutrition, into energy. These remarkable pathways of conversion occur at two levels—a macro or big level and a micro or small level. All your many cells and systems play roles in your metabolism, but at the macro level, your muscles and lean tissue play the largest part. That's the main reason we're so concerned with muscle tissue in functional medicine—it is so influential in your overall metabolism and, therefore, your health.

On the micro, or small level, the pathways that convert the food you eat into the energy produced by the tiny power plants called mitochondria in your cells are very complex. These small organs

work endlessly to convert the food you eat into workable and usable energy sources for the cells in your body. Almost every cell in your body has mitochondria. They rely on specific nutrients, vitamins, and minerals to make sure they operate at peak capacity.

Because of the big and small interplay, it's easy to get your metabolism out of balance. If your metabolism is going too fast or too inefficiently, or if it is being fueled by too many fast-delivery carbohydrate foods, you end up producing a lot of damaging free radicals.

It's sort of like making a fire just with lighter fluid instead of wood or charcoal. You'll have a big flame for a little while, but it will be too hot and too big to do anything productive. And shortly after this burst of flame, the fire will go out for lack of fuel. You'll have to find more lighter fluid, or refined carbohydrates, and start the cycle all over again. You need a balance of fuel to keep your fire going.

Equally, if your metabolism is running too slowly, you end up with excess storage, unable to use your fire to burn off your excess. Not only do you gain weight, but other bad things also start to happen.

However, if your metabolism is balanced and efficient, it's like a great campfire, one that gives off plenty of light and heat but which you can also use to make s'mores. What's more, if you do throw some inappropriate fuels into the fire, like say a tin can or a sneaker, it gets burned up without really affecting the flames. If you keep throwing tin cans and sneakers into your fire, however, you will get a lot of smelly black smoke and flare-ups. Throw in enough and the fire will die out. Think of a good diet as being your campfire. It burns fuel well, so if you have the occasional day where you can't eat well or decide to treat yourself to triple-chocolate mousse, the bad nutrients will just get burned off. But eating poorly more often can make your campfire flicker and burn out.

MUSCLE SYSTEM: THE BIG PICTURE

Our muscle system is a series of protein-filled fibers that are designed to move us around. They contract and relax to keep us moving and balanced. We used to think that muscles were pretty limited in their function, just causing movement by contracting and relaxing, but now we know that there is more to the picture. Muscle cells actually release chemicals called *myokines*, which act as anti-inflammatory chemicals. They balance out the inflammatory messages we get from the stress and strain in our day-to-day lives. They also counter the highly inflammatory chemicals we get from eating bad fats, so they are a critical component to keeping a balance.

But when it comes to metabolism, nothing beats the mass effect of our muscles—nothing has a greater impact. The more muscle we have, the more metabolism we have. This is true even if the muscle is covered by layers of fat. This is part of the reason that overweight people who believe they have a slow metabolism may actually have a better metabolism than they think. However, this imbalance of muscle and fat damages their system in other ways, as we will see in other chapters.

Muscle consumes a lot of energy to work and tends to give off a lot of heat as a result. As a 2015 study in the journal *Nature* found, this is part of the reason that women complain of feeling cold in their offices and ask to turn up the heat. The real reason for this, the study showed, was that men, with their greater muscle mass, were turning the thermostat down, making the women in the office with less muscle mass feel chilly. Suit coats on men did play a bit of a role,

but it was the high-burning capacity of the men's muscle that caused them to want the thermostat at a cooler temperature.³

Like any sort of balance, there is a right amount of lean and fat tissue for the best health and metabolism. Athletic men are best suited to have roughly 85 percent of their body as lean tissue (not all muscle, but nonfat tissue). Women are best suited to have roughly 80 percent of their body as lean tissue.

Muscles need several things to be in peak condition: food, movement, and rest. Paying attention to the specific needs of our muscles will protect them and even enhance them. For food, muscles need protein. There is much debate of the type of protein to eat for the best impact on muscles, but in the end, most agree that getting enough of the building blocks of proteins is a bigger key than is the source of the protein. Whether you choose animal or plant protein, concentrated or isolated proteins, the amino acids in them are the real key.

The amino acids that are good for your muscles are the essential types—the ones you must have for good health and can only get from your food. The essential amino acids (EAA) are histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Proteins that contain these amino acids are called complete proteins, and those are the kinds you want. It is easier to find them in animal foods than in plant foods, but good combinations of plants can result in complete proteins. Within these essential amino acids are a group known as branch chain amino acids (BCAA): leucine, isoleucine, and valine. What is special about the BCAA is how they help muscles grow and repair. As we age, we need more

3 Kingma, Boris and Wouter van Marken Lichtenbelt, "Energy consumption in buildings and female thermal demand," *Nature Climate Change* 5 (2015): 1054–1056. doi:10.1038/nclimate2741.

of these types of amino acids to keep our muscle tissue strong. If we have athletic goals, we need these even more.

Muscles need protein for growth and repair, but for activity, especially power movements like lifting, they need carbohydrates for the best performance. Some experts may disagree, but carbohydrates are powerful fuels for muscles. The carbohydrates should be the kind that produce slow, steady energy rather than a burst of flame. Slow, long-acting carbohydrates, also known as low-glycemic-index carbohydrates, are generally starchy foods that haven't been processed much, such as whole-grain bread, sweet potatoes, and oatmeal. These provide steady fuel without causing spikes in your blood sugar and insulin level.

Lastly, muscles need movement: not just any movement, but movement against resistance, because movement against resistance makes muscles grow (and also strengthens bones). As they move against appropriate resistance, muscles get microscopic damage, little tears that stimulate repair and growth when they rest. This is an essential part of the muscle growth cycle. It's a big part of why I emphasize resistance training to improve metabolism because it helps muscles to grow. To be clear, resistance training is a form of physical activity that is designed to improve muscular fitness by exercising a muscle or a muscle group against external resistance, such as weight, a tension band, or machine. Although aerobic (cardiovascular) exercise also has an impact on your metabolism, the impact of resistance training is much greater. Aerobic exercise has other great health benefits and should definitely be part of your fitness program, but resistance training is central.

Resistance training needs to be progressive because as your muscles grow, they get stronger and they use less of themselves for

each resistance movement. If you don't change the level of resistance by moving to heavier weights, the growth and metabolism improvement stop. Legend has it that the first progressive resistance training regimen started with Milo of Croton, who was the most famous athlete of the ancient Greek Olympics. He supposedly trained by lifting up a newborn calf every day. As the calf grew, so did his muscles—so much that he carried a bull into the Olympic stadium. I am not recommending this method of training, but you can see from Milo that progressive resistance has the most benefit for muscles and metabolism.

TINY POWER PLANTS

Moving from the big picture to the small, let's look at the mitochondria, another key factor in metabolism. These energy-producing organelles are found within most of the cells of our bodies. For the most part, these tiny power plants contribute to and even control metabolism at the cellular level. The mitochondria convert glucose and fatty acids from your food into energy through a complex chemical process. The energy takes the form of a molecule called adenosine triphosphate (ATP). I like to call this your energy currency. The more you have, the more you can spend—and the more you feel like spending. Within the mitochondria, there is also a beautiful and complicated pathway that lets us store energy for use at a later time.

Because the mitochondria depend on the chemicals that come from your food, the key to keeping them healthy is to supply them with the nutrients they need. You also want to avoid anything that could damage or poison the system.

Let's start with the needs of the mitochondria. From a nutrient point of view, several vitamins make the mitochondria work well. Vitamin C and the B vitamins riboflavin (B2), thiamine (B1), and niacin play key roles in the health of the mitochondria and the energy pathways. The B vitamin pyridoxine (B6) plays a key role in making everything run smoothly, not too fast and not too slow. The minerals selenium, chromium, and magnesium are cofactors that improve the efficiency of the many pathways within the mitochondria. Resveratrol, a phytonutrient found in blue and purple fruits such as grapes and blueberries, nourishes and protects the mitochondria from oxidative damage.

Your mitochondria also need the specialized organic acids carnitine and taurine to convert fatty acids to energy. (Taurine is one of the magical ingredients in Red Bull and other energy drinks.) Another powerful fuel for mitochondria is alpha lipoic acid, which helps break down carbohydrates so they can be converted to energy. One of the key last steps in the electron transport chain that creates energy within the mitochondria is coenzyme Q10. Think of the energy production as an assembly line moving the electrons along. CoQ10 makes the line move along faster and more efficiently. It's easy to see how such a complex process can get disrupted—a glitch at any point affects production both up and down the assembly line.

Many of these substances were discovered in the laboratory of Dr. Bruce Ames, a renowned biochemist at the University of California, Berkeley. He gave them to old mice that were no longer interested in their usual mouse activities—they were acting old. But once these mice received these specialized nutrients, they started acting young and energized again. The reason for that was the return in balance to their mitochondria.

If these are the nutrients that make the mitochondria better, what are the substances and poisons that harm them? Mostly these poor little organs are sensitive to two major factors. One is processed foods, such as sugar and refined flours. The simple nutrients and chemicals of these foods travel through the pathways of the mitochondria so quickly that they do damage along the way. To understand why, let's look at the Krebs's cycle, one of the major chemical pathways in the mitochondria. As the name suggests, it's a circular pathway used to form energy. If the pathway is cycling too fast, then it makes highly reactive by-products known as *free radicals*. I'll go into free radicals in more detail in the chapter on oxidation. For now, I'll just say that free radicals damage the mitochondria as well as other parts of the cells, and even the DNA in the nucleus of the cells. Think of a bicycle wheel after you've ridden through a puddle. If you spin the wheel slowly, then the water falls off slowly. But if you spin it fast, the water flies off and gets everything wet ... only wet in this case means oxidative damage. By avoiding refined foods, as well as other sources of oxidation—such as smoking, excess alcohol, and electromagnetic and radio waves—you help to protect the delicate mitochondria.

The other big factor that is especially damaging to mitochondria is statin drugs, which are widely prescribed to control cholesterol. Statins have been shown in rat studies and implied in human studies to cause direct damage to mitochondria. This happens because statins directly lower your level of CoQ10 by blocking its production. If you take statins to lower your cholesterol, you need to take CoQ10 supplements to protect your mitochondria. The lack of CoQ10 may be why some people who take statins feel tired and sick—their mitochondria have been damaged and thrown out of balance.



CHAPTER 3

THE CARDIOMETABOLIC SYNDROME

The cardiometabolic system is not a single point in the Star of Wellness—it is a combination of two points: inflammation and oxidation. Even though it is not its own point, the cardiometabolic syndrome is such a serious and common problem that it needs special attention and its own position around the star. Because it's a blending of two points, red for inflammation and yellow for oxidation, the cardiometabolic system is orange, and the problems associated with it are the cardiometabolic syndrome.

The cardiometabolic syndrome, often called the metabolic syndrome for short, is a group of risk factors that sharply increases your chances for type 2 diabetes, heart disease, stroke, circulatory

problems, and other life-threatening health conditions. The metabolic syndrome isn't a disease in itself. Instead, it is a set of markers that warn of the strong likelihood of disease, both now and in the future. Probably the most notable and most dangerous part of the metabolic syndrome is its combination of the effects of sugar and stress, factors that influence oxidation and inflammation.

These pathways influence not only excess fat storage but also where we store our fat. A primary sign of the metabolic syndrome is fat stored around the waist, what is called *central fat* or *visceral fat*. Why is fat stored around the waist more of a problem than fat stored elsewhere? Because central body fat doesn't just sit there—it is metabolically active. It produces hormones and cytokines (chemical messengers) that put your body in an inflammatory and oxidative state. (Hence the color combination of red and yellow, making orange.) Inflammation leads to a cascade of other problems, such as blood pressure changes and insulin resistance that eventually lead to hypertension and type 2 diabetes. Oxidative pathways also play a role, changing normal cholesterol into more dangerous and reactive types. These oxidative states of cholesterol are the real problem behind our elevated cholesterol. The combination of inflammation and oxidation can lead to real and devastating health problems.

By traditional medical guidelines, you have the metabolic syndrome if you have any three of these five risk factors:

- **A large waistline.** If your waist measurement is thirty-five inches or more for a woman or forty inches or more for a man, that is a metabolic risk factor. If you don't have a tape measure handy, stand up and look down. If you can't see your toes, your waistline is too big.

- **High triglycerides.** These tiny fat droplets can't dissolve in your blood. In a healthy state, they play a role in transporting and storing unused energy in the body. Unfortunately, when they get too high, they're a signal that other problems are going on in your body, such as weight gain, clogged arteries, and increasing inflammation and oxidation. A triglyceride level of 150 mg/dL or higher is a metabolic risk factor.

- **Borderline high blood pressure (hypertension)** is also an independent risk factor of metabolic syndrome. A blood pressure reading of 130/85 or higher or being on medication to lower your blood pressure are metabolic risk factors.

- **Low HDL cholesterol.** HDL is the so-called good cholesterol that helps remove the "bad" LDL cholesterol from your blood. Think of H for healthy in HDL and L for lethal in LDL. You want your HDL to be high and your LDL to be low. Having HDL cholesterol of less than fifty mg/dL for a woman or less than forty mg/dL for a man is a metabolic risk factor.

- **High fasting or even borderline high fasting blood sugar** is equally an independent risk factor for metabolic syndrome. Normally, your fasting blood sugar level should be less than one hundred mg/dL (5.5 mmol/L) and preferably between seventy-five and eighty-five mg/dL. Having a level higher than this is a sign that you are at risk for oxidation and inflammation.

The metabolic syndrome is an early warning system that tells you your body is on the path to destruction. It is like the gauges on the dashboard of your car. If all your gauges are “borderline”, then the cumulative effect is damaging to the overall performance of your car, even if the check- engine light hasn’t come on yet.

THE ENDLESS SUMMER

Before we start thinking that we need to eliminate inflammation, oxidation, and fat storage completely, we must return to the concept of balance. Some components of inflammation and oxidation are important, especially when it comes to warding off attacks from strangers and dangers. Inflammation and oxidation are a normal and necessary part of your body’s battle plan against threats and foreign invaders. In earlier times, when you were out hunting and gathering, you might have come under attack or get hurt by a wild animal or an enemy. The pathways of inflammation and oxidation then kicked in to help you be prepared for and fight off attack and equally start healing an injury or infection.

Another adaptive method in earlier times was your body’s ability to store unlimited amounts of fat. In those times, it was a good thing. In the winter or in times of scarcity, that stored fat would be used to keep you alive. An environment leaning toward storage as well as a high-alert defense was once highly beneficial for survival.

Unfortunately, because we now have convenience stores, fast food, and mega marts, scarcity never happen to us. We now live in an endless summer. In that environment, you don’t need the hormones that store fat and help you deal with starvation. However, your body doesn’t know that, and those hormones continue to store fat against

a winter of scarcity that never comes. Because the balance is off, the cardiometabolic syndrome can begin.

Equally, our low but consistent levels of stress, such as job deadlines, traffic jams, and financial and relationship stress, create the same kind of response that attacks from rival clans and cave bears once did. Our bodies create pathways of inflammation and oxidation from our low-level environmental and food stressors that are similar to the more deadly attacks that these pathways were designed for. Chronic attacks become cumulative and dangerous, contributing to the cardiometabolic diseases and cancers that are the largest killers in our country.

In Western medicine, the metabolic syndrome, cardiometabolic diseases, and cancers are treated with a downstream approach. Doctors start blocking the pathways at the bottom with drugs, and they often fail to look for and correct the imbalanced components upstream.

This is especially true with the early warning system of the metabolic syndrome. What makes the syndrome so dangerous is that it is a sneaky, smoldering problem that can go undetected, sometimes for a very long time.

Unfortunately, you can't really check your cholesterol or triglycerides or blood sugar on your own. You might go check your blood pressure using the machine in the pharmacy, but that's just one component. Even if your blood pressure is in the normal range, other aspects of the cardiometabolic syndrome might be happening to you. By the time a doctor takes a comprehensive look at your health and sees the other markers, a lot of damage may already have occurred. Your check-engine light may come on when you least expect it, landing you in the emergency room with a heart attack. We need

to start looking at the gauges and effectively listening to the subtle signals of those early detection systems.

The guidelines for the metabolic syndrome must be seen as a spectrum, not as cut-off points. If your blood sugar is just below the upper limit, for example, you're not off the hook—it's still high and you need to do something about it. The sooner you deal with any aspect of the cardiometabolic syndrome, the better. You'll have a much bigger impact on your health than if you wait for an actual disease to develop. In the Western medicine world, once you cross over to a disease state, you've got it. And once you have it, you can never get rid of it. In medicine, we're often only concerned with disease. If there is no disease, there is no problem.

That's like saying as long as my check-engine light is off, my car is fine. But is it? Without oil changes and routine maintenance, your car will develop mechanical problems—and our bodies are much more complex than our cars.

RESTORING THE CARDIOMETABOLIC BALANCE

When someone comes to my office with cardiometabolic disorders or the metabolic syndrome, I want to understand what got that person to this point. It's almost always the basic one-two rhythm of functional medicine: irritants and deficiencies.

We go upstream. What is creating the irritation? What deficiencies could you have?

The irritation is almost always coming from a diet that's too high in processed carbohydrates and junk food and too low in good fats and proteins. That's the part that contributes most to create imbalance of

the inflammation and oxidation pathways. My standard approach to removing the irritation is to change the diet for the better with a Modified Mediterranean Plan. I'll discuss this powerful nutritional approach to cardiometabolic problems and the metabolic syndrome in chapter 8.

Then I may recommend some supplements and nutraceuticals in order to improve insulin resistance, lower inflammation, and quiet oxidation pathways. I'll add essential fatty acids in the form of omega-3, usually in the form of fish oil. I'll add some botanical modulators, such as acacia and hops, which help improve insulin sensitivity. Then I'll recommend good-quality vitamins with phytonutrients to help enzymatic pathways work the right way. Finally, I'll add extracts of superfoods to begin reversing high-oxidation pathways.

BALANCING BLOOD SUGAR

When your blood sugar is consistently elevated or cycles in a high and low pattern, bad things start to happen to your body. First, your pancreas, the organ that produces insulin, has to work a lot harder. Over time, this is what leads to insulin resistance and elevation of blood sugar. Your cells have become resistant to the effects of insulin, the hormone that carries glucose into them to be converted to energy. That's why your blood sugar is elevated—insulin is knocking on the doors of the cells, but they're not answering, so the sugar builds up. Your cells are actually starving while the external environment, the blood, gets sticky because it is flooded with sugar. Sugar is not getting into the cell—it's getting stuck in the bloodstream. It won't take long for you to burn out. The same thing happens to your pancreas. Once the pancreas burns out, you don't have any insulin production at all, and you develop type 2 diabetes. The next treatment step is to give you

drugs to force your pancreas to squeeze out a little bit more insulin, until finally it really can't make any more. When that happens, you need to get insulin from somewhere else, which normally involves you injecting it into your own body.

When you have a lot of extra sugar sloshing around in your blood, it literally starts gumming up the works. Think about that horrible prank of putting sugar into someone's gas tank—it gums up the inner workings and seizes up the engine. If that's too harsh an example, think of the process of making caramel candy. You start with a lot of sugar dissolved in water and then add heat until the mixture turns into a brown and sticky mixture. That's what happens in your body, too. The excess sugar in your blood turns sticky and clogs the tiny blood vessels in your body, including the ones that are in your kidneys, heart, and eyes. You start having imbalance, inefficiency, damage, and even cellular death in these parts of your body. That is why diabetes is such a devastating disease, causing blindness, kidney failure, and amputations. The stickiness of excess sugar affects every system, every organ, and every part of your body.

Insulin is an anabolic hormone, which means it builds things in your body. When you become insulin resistant and start making a lot of excess insulin, it starts building cholesterol and fat. That is what's making you build up fat around your waist, raising your triglycerides and raising your cholesterol. The visceral fat around your middle starts an inflammatory response that raises your blood pressure. The beautifully intricate communication system in your body gets thrown out of balance. Once the cascade starts, it can be hard to stop. And as this cycle builds and builds, we get sicker and sicker, until we are then forced to use downstream solutions to handle the out-of-control fire, stickiness, and rust. What we really need is an upstream solution to stop the cascade in the first place.

TOO LITTLE SUGAR

When you have the metabolic syndrome, your blood sugar is on a roller coaster. Your pancreas often overshoots and puts out so much insulin that your blood sugar drops too low—you become hypoglycemic. The swings come mostly from an imbalanced food plan. If you eat sugars, white flour, and other refined carbohydrates, you raise your blood sugar quickly and your pancreas overreacts. It puts out so much insulin that it carries off too much glucose, and your blood sugar starts getting too low. That makes you feel very hungry because low blood sugar is a stimulus for you to eat. Your body sees hypoglycemia as an emergency. To raise your blood sugar again quickly, you crave carbohydrates—and the cycle starts all over again. I call this the cookie cycle. When you're hungry and grab a cookie or candy bar, you get this great rush of energy and excitement, followed by a letdown and crash. And once you have that crash, it seems that the only thing that will bring you out of it is another cookie or candy bar. As you ride this cycle over and over again, you are unwittingly building up the consequences of being on this roller coaster. It's not the amusement park experience you expected—after a while you just want to get off and go home.

To restore the balance, you need to slow the delivery of sugar to the bloodstream. Not surprisingly, you start by cutting back on the intake of refined carbohydrates. Because the absorption of carbohydrates is slowed down through the digestive system, adding in some proteins and fats keeps the food in the stomach longer so the glucose from the carbohydrates takes longer to hit your bloodstream.

Now you have a slower, steadier, balanced influx of sugar, instead of highs and lows. In response, you will have a slower, steadier production of insulin and have better delivery capacity, instead of highs

and lows. Your blood sugar becomes a lot more stable. Studies show that if you eat some fat before you eat carbohydrates, your insulin secretion is decreased by about 50 percent. It turns out that the sequence and combination in which you eat your food can make a difference.

So, whenever possible, start a meal with your fat, protein, and veggies, and then eat the carbohydrates. For example, have salad as an appetizer, then eat your baked chicken and vegetables, then eat your baked potato. With this approach to eating, you may find you don't even want the baked potato after all.

Physical activity also improves blood sugar. One recent study showed that going for a ten-minute walk after eating carbohydrates decreased insulin secretion by 50 percent. The more muscles you have and the more you use them, the better for your blood sugar. Lean muscle tissue actually modulates insulin production and blood sugar as well as inflammation, which are the foundational factors leading to the metabolic syndrome.

I take a two-pronged approach to restoring normal blood sugar. First, I get my people off the Standard American Diet (SAD) of around 55 to 60 percent carbohydrates. We move to the Modified Mediterranean Plan for the metabolic syndrome, which is 40 percent carbohydrates, 30 percent protein, and 30 percent fat. At the same time, we try to increase the amount of muscle tissue to compensate for the disproportionate amount of fat tissue.

ADDING FIBER

A diet that is high in fiber has been shown to slow down the digestion of food, which in turn means it slows down the entry of

glucose from carbohydrates into your bloodstream. That helps prevent spikes and dips in your blood sugar. Dietary fiber is the indigestible parts of plant foods. It comes in two types: insoluble and soluble. Insoluble fiber is mostly cellulose, the fiber that makes up the walls of the cells in plant foods. Insoluble fiber absorbs water, but it doesn't dissolve in it. This type of fiber is what gives plant foods their crunch and chewiness—think of the stringy part of a celery stalk.

Soluble fiber dissolves in water to form a soft gel. There are a number of different types of soluble fiber, but the most common are pectin and mucilage. All plant foods contain both insoluble and soluble fiber in varying amounts.

In addition to helping even out your blood sugar, fiber is an essential food for the natural bacteria in your gastrointestinal tract. When your gut bacteria get what they need, they do a better job at digesting your food and managing the entry of glucose into your blood.

Current FDA recommendations for dietary fiber are twenty-five to thirty grams a day, but on average, adults in the US get only about fifteen grams per day. If you start eating on the phytonutrient spectrum by adding at least five servings of fruits and vegetables to your diet each day, you'll start getting the amount of fiber your body really wants. You'll feel the difference as your bowel movements become much more regular. Getting rid of your waste efficiently can have a surprisingly energizing effect.

NUTRACEUTICALS FOR BLOOD SUGAR BALANCE

The best way to improve your blood sugar balance is to improve your diet by cutting back on junk food and highly processed carbohydrates. Beyond that, nutraceuticals can be very helpful for getting balanced faster.

I like to add supplements of two specialty amino acids, RIAA (rho-iso-alpha acid, found naturally in acacia) and THIAA (tetrahydro-iso-alpha acid, found naturally in hops). These supplements act as selective kinase response modulators (SKRM) to help maintain normal insulin levels and regulate inflammation levels. Doses of these nutrients vary, but targets of 250 milligrams per kilogram of body weight are a good start to begin lowering the inflammation. Remember, the heat is what makes the caramel, so regulating the inflammation helps turn down the heat and lower the stickiness of the system. As these supplements help lower inflammation, they modulate insulin secretion and bring blood sugar and insulin secretion into better balance.

Interestingly, SKRMs are found in many bitter foods. It's logical when you think of the defenseless plants warding off attacks from herbivores and insects. The plants needed to come up with a chemical system to keep from being completely eaten. Turns out, though, that in appropriate doses, these bitter extracts are beneficial because of their powerful chemical make-up. So if you move away from sweet foods and you move toward bitter foods (strong-tasting vegetables), you're going to naturally give yourself supplements that improve insulin resistance. In earlier times, you would have eaten sweet fruits when they were nice and ripe in the summer and switched over to

bitter roots, herbs, and vegetables for the winter. Today, we basically live in an endless summer, and our bodies get way too many sweet foods all year round.

Green tea is a great nutraceutical for improving blood sugar balance as well. Green tea contains a phytochemical called epigallocatechin-3-gallate (EGCG), which helps protect the insulin-producing cells in the pancreas. Supplements with green tea extract can be helpful.

Cinnamon is another useful nutraceutical for helping with healthy insulin activity and lowering blood sugar. Alpha-lipoic acid, a sort of cousin to the B vitamins, is used in the body by your mitochondria—the tiny power plants in your cells—to convert glucose to energy. Taking supplements can help lower your blood sugar.

Some other supplements that can help you bring things back into balance include vitamins such as methylcobalamin (vitamin B12), biotin, vitamin C, and vitamin E. The minerals chromium and vanadium can help by mimicking the action of insulin.

I'm not opposed to using downstream medicine when it is warranted. I sometimes prescribe the medication metformin (Glucophage). This is a widely used oral drug that lowers blood sugar by suppressing glucose formation in the liver. I choose this one because it influences blood sugar but leaves the pancreas and insulin alone. As an added benefit, most people lose some weight from metformin, which helps in an upstream way. I usually prescribe it for people who are in a dangerous situation and need something to bring their blood sugar down quickly. I ask them to take it while we work on getting their blood sugar under control through diet and other upstream approaches. Sometimes you have to make a deal with the devil to get a critical situation under control. Then, after you mop up the floor, you can go find out why the sink is overflowing.

BALANCE THROUGH ACTIVITY

Physical activity is a powerful tool for balancing your blood sugar. The approach I like combines several types of activity:

- aerobic activity: walking, swimming, jogging, biking—anything that gets your heart beating faster
- resistance training: exercises that build muscle by lifting weight or working against some form of resistance, such as exercise bands
- flexibility training: stretches that improve your range of motion
- neuromotor training: tai chi and yoga—exercises combining strength and balance

Much as my people moan and groan, everybody can do a moderate amount of activity on a regular basis. That seems to be the way we were designed, and it seems to be the lifelong secret of the healthiest individuals in the world.

You can't outrun a bad diet, but doing some moderate activity for about half an hour at least three times a week can really help balance your metabolism. In addition, I strongly recommend doing moderate resistance training for at least twenty minutes at least once a week. Resistance training has the largest impact on the metabolic syndrome.

Rather than have them join a gym, I teach my people to do NEAT: nonexercise activity thermogenesis. It's not really exercise. NEAT is

more about changing your behavior to add more overall activity to your day. You could take the stairs instead of the elevator or park further away or get off the bus one stop earlier. Pace around while you're on the phone—anything that gets you up and moving a bit more throughout the day will add up.



CHAPTER 4

REDUCING INFLAMMATION

Inflammation tends to get a bad rap just based on its name. But really, it's your body's natural reaction to strangers and dangers. When you have an infection or injury of some sort, your immune system responds to those strangers (the bacteria or virus causing the infection) or dangers (a splinter or a thorn or even a sprained ankle, for instance) by making the affected area red, swollen, hot, and painful. That's the appropriate response. When the strangers are vanquished and the danger is past, then your immune system calms down and the symptoms and signs of inflammation go away.

But what if the strangers and dangers are coming from within you? Or worse yet, what if they go on for a really long time? These

problems cause inflammation, but they may never go away. You end up with chronic inflammation. You still have the redness, swelling, warmth, and pain that characterize inflammation, but because they're happening inside your body, you can't really see or feel them directly, the way you do when you sprain an ankle. And even if they are low or slow levels of inflammation, the pathways are still triggered and the results are the same.

Chronic inflammation often shows up as the underlying cause of a lot of other chronic health problems, including type 2 diabetes, heart disease, kidney disease, eye disease, autoimmune diseases, allergies, asthma, Alzheimer's disease, and even cancer. It also shows up as aching joints, skin problems, and frequent infections such as colds or cystitis. Chronic inflammation smolders away inside you, doing its damage slowly and silently. These are the fires that burn and never cool down. That's not how inflammation is designed to work in your body.

WHAT CAUSES INFLAMMATION?

Chronic inflammation has many causes; most people are inflamed from a combination of factors. First and foremost is that the food we take in through the Standard American Diet is highly inflammatory. The sugars, refined flours, and bad fats push your body toward inflammatory pathways that stimulate the immune system. If you're overweight or obese, your body's own fat cells produce inflammatory mediators. Add in other factors, such as a poor-quality sleep and high or prolonged stress levels, and inflammation goes up.

Finally, and possibly most importantly, chronic inflammation can be triggered by cellular dysfunction—that is, when your cells

aren't working right because of exposure to toxins and damaging free radicals or excess sugar in the blood. Exposure to these substances damages many parts of our cells and even the cells themselves.

Unfortunately, a steady diet of pro-inflammatory foods or foods to which you're sensitive or allergic will move you toward a state of chronic inflammation. Some foods by themselves can cause inflammation, especially if you have food sensitivities. But far more common is the cumulative effect of a lot of pro-inflammatory foods, such as sugar, refined flour, and saturated fats that aren't balanced out by anti-inflammatory foods, such as fruits, vegetables, and good fats.

Poor sleep quality and just not sleeping enough can cause inflammation. Sleep is your body's natural way of detoxifying and repairing the effects of the day. It is believed that we need at least one hour of sleep for every two hours of wakefulness to compensate for the damage occurring from the day. We know from a lot of studies that sleep deprivation is linked to pro-inflammatory processes in the body, which raises the risk of inflammation-related diseases, such as high blood pressure, type 2 diabetes, and high cholesterol. Left unchecked, these lead to the major killers: heart disease and stroke.

In addition, exposure to toxins such as pesticides and tobacco smoke triggers inflammation—it's the strangers and dangers response we are naturally designed for. We're exposed to toxins all the time, not just from what we eat but also from everything we breathe and touch with our skin. We can have the intention of eating organically and clean, but when we walk across a street full of car exhaust, second-hand smoke, and cosmic rays, we get exposed without even trying. These exposures are somewhat out of our control and meet with us through our skin, nasal passages, and lungs.

In traditional medicine, we worry about our skin and skin exposure a lot, mostly because we can see it. We're always putting things like sunscreen and moisturizers and antiseptics on our skin to protect it. But we have a second skin that travels all along inside of us. These are the cells that line our digestive tract, which is in effect a second skin designed to digest, assimilate, and eliminate all the things we come in contact with. The problem is, we can't see our gastrointestinal tract, and worse yet, we don't do anything to protect it. But we're most vulnerable to inflammation and toxins from the things we put into our mouths, which then travel through our stomach and intestines.

This is most true when it comes to foods we're sensitive to. Foods that don't exist in nature—such as artificial colors, artificial sweeteners, artificial flavors, preservatives, and other chemicals—tend to be major contributors to inflammation. Everyone must avoid these foreign substances. But more subtle strangers and dangers can show up, often on a very individual basis. Many people have some food sensitivities or intolerances, foods that cause an unpleasant response when they're eaten. Most common among these types of foods, in order of sensitivity, are gluten (a protein found in wheat and some other grains), dairy products, soy products, sugar, peanuts, and eggs. Food sensitivities may also be a hidden cause of poor immunity and weight gain.

Unfortunately, pinpointing your sensitivities can be difficult. And just to complicate things, it may not even be the actual foods that cause the intolerance; it could instead be environment related. In an environment where we genetically modify foods, spray them with pesticides and herbicides, and give animals antibiotics and hormones and feed them foods they are not used to in a stressful environment, our foods contain a lot of unnatural substances. Your body sees the chemically changed food as a stranger or danger.

Besides food itself, too much food can be a problem. Looking at the overall history of mankind, we see that famine is far more common than abundance. Our bodies are adapted to cope with famine, not with feasts. As many of us live in a world of abundance, it is easier than ever to become overweight. Being overweight, especially with a lot of visceral fat around the waist, is a direct cause of inflammation. The visceral fat releases inflammatory cytokines (chemical messengers that tell cells what to do) and other inflammatory products, such as clotting factors and hormones. Because visceral fat is so close to the vital organs—liver, pancreas, intestines, kidneys—those cytokines affect them directly, causing a much more influential inflammatory cascade.

In addition, stress really alters the pathways of inflammation. But let's not give stress a bad rap either. Stress is to the body as tension is to the violin strings—too little or too much leads to disharmony. When you're under stress, your body releases a lot of hormones, such as cortisol and adrenaline, which have powerful effects on your body. In the short term, stress hormones aren't really damaging and may even be protective—think again of that cave bear. But when you're under constant non-life-threatening, low-level stress, like deadlines and time constraints, as many of us are, all these hormones cause chronic inflammation, and mostly that is not a good thing.

INFLAMMATORY DAMAGE

Like the metabolic syndrome, low levels of chronic inflammation often go undetected for a long time. We tend to say, "This isn't really worrisome because it's low." But if you're in the bathtub, adding a cup of hot water won't be as noticeable as adding a bucket of lukewarm water. Low-level inflammation over a long time has a bigger impact

than short periods of acute inflammation. If you start managing low levels of inflammation while you're young, you may actually change the long-term effects that will arise when you reach middle age. If you calm down your immune system and reserve inflammation only for real, significant attacks, you may actually change the quality and the quantity of your life.

Chronic inflammation affects you even at the genetic level. Telomeres, the end caps on the strands of your DNA, are a lot like the aglets found on the tips of your shoelaces. You want them to be smooth and compact. Low levels of inflammation can start to fray and shorten the telomeres and lead to DNA damage. And you know how frustrating it can be to lace up your shoes without these aglet tips. Think of your life the same way—the better your tips, the better your life.

The damage from chronic inflammation happens slowly but surely. The volume is turned very low at the start. When enough damage accumulates, the volume is finally up high enough for you to hear it. But what you usually hear at that point is a diagnosis of heart disease, diabetes, kidney disease, eye disease, or cancer. That's the downstream effect. In medicine, once that happens, we unfortunately often have to rely on downstream approaches, when really it would be much more advantageous to deal with the upstream effects before the downstream effects occur.

Low-level chronic inflammation causes heart disease by damaging the inner layer of the blood vessels that nourish the heart. Instead of being slippery and smooth, inflammation roughens the lining and disrupts the flow of blood. The little nicks and cuts create inflammation signals that cause the defending army of white blood cells to repair the damage, but when the inflammation is chronic, the repair

process itself gets out of whack. Instead of repairing the damage to the lining, the white cells attract calcium, cholesterol, and other substances and create areas of plaque that stiffen the blood vessels. If the plaque builds up to the point of blocking the artery, partially or completely, a clot can form at the choke point and cause a heart attack. The plaque can rupture, also causing a clot and a heart attack. If the blockage is in the brain, you have a stroke. All of this is from changing the original slippery and smooth surface to something rough and sticky. The upstream approach of keeping the area smooth and slippery will prevent the downstream effect.

Low-level chronic inflammation can also lead to type 2 diabetes through a complex process. In response to inflammation, your body produces lots of the stress hormone cortisol as a way to turn down an overactive inflammatory response. But when your cortisol levels are high, your insulin doesn't work normally, and your blood sugar goes up; cortisol also makes you mobilize your stored fat, which raises your triglycerides level. The result is insulin resistance and eventually type 2 diabetes.

Inflammation may also play a role in cancer by making a defective cell grow out of control—the definition of cancer—instead of dying off. The inflammation stimulates the growth components in the cancer cell. The inflammation also causes damage to healthy cells over time, but chronic damage and chronic repair can lead to errors in the repair process. Think about using a photocopier to make copies of copies of copies. The further the copies are from the original, the blurrier they are. The same thing happens when the DNA in your cells has to repair itself over and over again. Errors can creep in. And if you make a critical error in a repair component, you could turn a healthy cell into a cancer cell and then copy that new cancer cell, leading to a much bigger problem. If your diet has a lot of refined

sugar, you're adding fuel for the cancer cells. Artificial additives in food can stimulate an inflammatory response and may play a role in stimulating the growth of cancer cells.

REDUCING INFLAMMATION THE NATURAL WAY

To cool the fire naturally, we need to understand two components of the immune system, either directly or by changing the cascade of inflammatory chemicals.

First, different headquarters of the immune system are all over your body. Your tonsils, spleen, a special gland in your chest called the thymus, and the hundreds of lymph nodes scattered throughout your body are all centers of your immune system. Most experts agree, however, that the largest headquarters of the immune system is in the digestive tract. Immune cells line your digestive tract, perhaps making up 70 to 80 percent of all the cells. This makes a lot of sense because the digestive tract is your first line of defense against what comes directly into your body.

Just as you want to keep your skin intact as a barrier against infection, you also want to do the same thing with your intestines. Choosing foods that avoid strangers and dangers is a great way to keep your gastrointestinal tract in good shape. In this case, strangers are additives: the artificial colors, sweeteners, preservatives, and other chemicals that are added to foods. They are also toxins like cigarette smoke and more than very moderate amounts of alcohol. The dangers are foods that your body has trouble with, such as gluten, dairy, and sugar. Bad bacteria are another danger. We can kill these off and maintain a strong intestinal barrier with botanicals such as

oregano, thyme, sage, berberine, rosemary, turmeric, and ginger. Sulfur-containing foods, such as onions, garlic, and shallots are also great for healthy intestines.

Diet helps cool inflammation in another way as well. If you keep the huge portion of your immune system found in your gastrointestinal tract healthy, you don't have to call on it as much, which means in turn that you will have less overall inflammation.

ESSENTIAL FATTY ACIDS

To understand the individual and cellular pathways of the immune system, we need to take a quick look at the role of essential fatty acids in how the body's inflammatory pathways work.

Let's start with essential fatty acids (EFA). These are dietary fats you have to get from your food—they're essential because you need them and your body can't manufacture them from other components. You have several different fatty acids in your body, but they're all made from just two essential fatty acids: linoleic acid, better known as omega-6 fatty acid, and linolenic acid, better known as omega-3 fatty acid. These two fatty acids are the building blocks for all the other fats in your body. Omega-6 fatty acids are found mostly in seeds and nuts and also in avocados, poultry, and eggs. In our modern society, omega-6 fatty acids in the diet mostly come from liquid vegetable oils, such as corn oil, palm oil, canola, sunflower oil, and soybean oil. Omega-3 fatty acids are naturally found in fish and seafood, eggs, whole grains, seeds, nuts, avocados, and vegetables. Flaxseeds, flaxseed oil, walnuts, and nut oils are all good sources. Supplements containing fish oil or krill oil are also a good source if needed.

Your body uses omega-3 and omega-6 fatty acids to make eicosanoids, powerful hormone-like signaling chemicals that control the inflammatory response. All the pathways for creating and reducing inflammation have a common starting point: an omega-6 fatty acid called arachidonic acid (AA). The eicosanoids involved with inflammation primarily metabolize omega-6 fatty acids. So if you have large amounts of omega-6 in your body, it will be preferentially converted to eicosanoids, which means you will produce these inflammatory chemicals quickly and in abundance. That leads to chronic inflammation. But if you avoid eating omega-6 fatty acids and increase your intake of omega-3 fatty acids, you make less AA and can steer the chemical cascade into a less-inflammatory or even anti-inflammatory direction.

The one exception to the overall principle of avoiding omega-6 fatty acids is a particular type called gamma-linolenic acid, or GLA. This is found in borage oil, black currant seeds, and evening primrose. GLA can have a powerful anti-inflammatory effect. I usually recommend using it almost like a drug to treat inflammatory conditions such as asthma.



CHAPTER 5

IMPROVING DETOXIFICATION

Detoxification is how your body removes metabolic waste products and harmful substances. When your detox mechanisms aren't working efficiently, your body is thrown out of balance. Simply put, detoxification is taking your garbage out, and you need to take your garbage out every day. One of the most important areas I work on with my people is natural ways to improve their detoxification. For some people, simple dietary changes help quite a bit. For others, we need to take things a step further and spend some time following a detoxification diet and supplementation program. Either way, I find that just about every one of my people benefits from improving their detoxification pathways.

SYMPTOMS OF POOR DETOXIFICATION

Symptoms of poor detoxification include muscle pain, low energy and generalized fatigue, hormonal changes, liver problems, and migraines. People with poor detox also have constitutional symptoms, such as a constant runny nose, lots of phlegm production, or mild skin rashes. Usually we get these when our larger detox systems are overloaded. The buildup of garbage makes us feel like garbage. Our skin, lungs, and nasal passages all act as detoxification systems, but the larger role of detoxification is carried out by the liver, kidneys, and gastrointestinal tract. It's also possible that many autoimmune diseases are linked to poor detoxification, either as a cause or a symptom. In general, any misunderstood disease that has the word "syndrome" after it, like chronic fatigue syndrome, has a detox component.

How do you know if your toxic load is high if your methods of detoxification are out of balance? There aren't really any blood tests for this, and many Western medicine providers don't even believe that toxicity plays a role in our health. Instead, I base the diagnosis on what my people tell me about their symptoms and how they score on their medical symptoms questionnaire (MSQ). If you score twenty-five or lower on your MSQ, then things are pretty balanced in your life. If you score fifty or more, chances are your detox pathways are unbalanced. If you score above seventy-five, I would recommend a slow and steady detox. If you're above one hundred, you probably have other issues along with unbalanced detoxification. Usually, these are problems with inflammation that must be addressed along with, or possibly even before, a detoxification program.

I also listen carefully to what you tell me about your symptoms and about your lifetime toxic exposures. Each section of the MSQ has its own unique set of chemistry and problems, so listening to people, along with collecting information, is the real key to putting the whole picture together. For example, if someone tells me that she worked for years in a plastics factory, and her MSQ is high, that sets off warning bells to me.

HOW DETOXIFICATION GETS OUT OF BALANCE

Your body can generally handle normal levels of toxin exposure easily. These toxins come from the environment in general but also come from the natural metabolic pathways and breakdown pathways that are going on in your body every day. In modern society, however, the toxin load we place on our bodies can be too much. You can eat a good diet of nothing but organic foods, but you're still exposed to exhaust fumes when you drive to the farm. We're surrounded by toxins, so it is not surprising that many of my people need some help to get their detox processes working better.

Your body's normal waste products and any toxins you might encounter from your surrounding environment, from drugs you take, alcohol, and so forth, get metabolized and broken down in the liver. What your liver basically does is convert the wastes and toxins into water-soluble compounds that can then leave the body in the urine or in the bile produced by your gall bladder, where it leaves through the colon.

The process happens in two stages. In Phase 1 detoxification, a powerful enzyme system called the cytochrome p450 system goes

into action. The enzymes oxidize, reduce, or hydrolyze the waste, turning it into intermediate compounds. At that point, Phase 2 detoxification takes over and acts on the compounds to make them water soluble through methylation or by attaching a molecule, such as sulfur or the amino acid cysteine, to it—a process known as conjugation.

Phase 1 detoxification happens very quickly in the liver. Phase 2 takes a lot longer. That's a problem because sometimes the intermediate compounds formed by Phase 1 are actually more dangerous than the original compound. The whole detoxification process is sort of like a bucket brigade. The waste molecule gets passed along from one part of the liver to the next, getting changed at every step, until finally it goes back into the bloodstream and gets sent to the kidneys or gall bladder on its way out of the body. You don't want these things hanging around in your liver longer than required, so detoxification and conjugation need to happen efficiently. But if one part of the bucket brigade is moving too quickly and another part too slowly, all the buckets wind up getting stuck in the middle.

The intermediate products between Phase 1 and Phase 2 detoxification are very reactive. Their chemical structure makes them a little like Velcro—they'll stick to anything that gets in their way. The hope is that Phase 2 will get rid of these sticky intermediates before they do damage, but if Phase 1 is too fast and Phase 2 is too slow, then you have a lot of Velcro being made. That can really clog up the whole system.

The key to improving detoxification is to try to slow (down regulate) Phase 1 and speed up (up regulate) Phase 2. We can do that with a lot of different phytonutrients, some specific for Phase 1 and

others specific for Phase 2. And some actually do both, so the bucket brigade winds up staying in sync.

Phase I Required Nutrients	Phase II Required Nutrients
Folic Acid	Calcium d-glucarate
Vitamin B3	Amino Acids:
Vitamin B6	L-glutamine
Vitamin B12	L-lysine HCL
Vitamin A	Glycine
Vitamin C	L-carnitine
Calcium	Taurine
Vitamin D3	Cruciferous vegetables
Vitamin E	(Sulfur metabolites)
Milk Thistle	MSM
N-acetyl Cysteine	N-acetyl Cysteine
Citrus Bioflavonoids	
Quercetin	

EATING THE RAINBOW

The best way to keep your detox pathways in balance is to eat the rainbow. Aim for a diet with as many colors as possible. The colors and characteristic taste of a plant food come from phytonutrients—natural chemicals—in it. On the phytonutrient spectrum, you want to eat plenty of foods that are red, orange, yellow, green, blue/purple, and white/tan. Each phytonutrient has a different role and different benefits. To be sure to get them all, aim for two servings from each color group every day. Within the phytonutrient-rich spectrum of foods are some that help out more than others when it comes to detoxification. When you are making your choices, some fruits and vegetables are particularly good. Apples, pears, berries, and

pomegranates are great choices in fruit. In vegetables, the brassica family—broccoli, cauliflower, kale, cabbage, Brussels sprouts—are good options. So are watercress and parsley.

If you eat the Standard American Diet, your Phase 1 detox is probably a little too fast and your Phase 2 conjugation is probably a little too slow. Eating the rainbow keeps the detox bucket brigade moving along. The various phytonutrients naturally help down regulate Phase 1 and up regulate Phase 2 and keep them in sync with each other.

Just to be clear about this concept of color spectrum eating: if you are eating the rainbow in Skittles, not fruits and vegetables, your detox pathways will become highly inefficient. In a diet with a lot of saturated fat from animal foods, too much sugar, and a lot of foreign chemicals from additives and other sources, your pathways can get disrupted or distorted. You want to limit the toxic load your liver needs to clear out by avoiding artificial colors, artificial sweeteners, preservatives, pesticides, and other pollutants.

Alcohol is processed in your liver. If you have an excess of it, your detox problems will get even worse. But we also have a lot of evidence showing that in moderate amounts, alcohol is okay or even beneficial. Red wine, for instance, contains detoxifying and antioxidant chemicals such as polyphenols and resveratrol. The alcohol itself, however, is a foreign substance to your body, and so it has to get broken down into a water-soluble form and then eliminated. This is part of the reason we get a hangover if we drink a lot. The alcohol up regulates Phase 1 and down regulates Phase 2. The parent and intermediate compounds make us sick. But even so, alcohol isn't nearly as complicated to dispose of as some of the other things that we take into our bodies on a day-to-day basis. Persistent organic pollutants

(POPs), such as dioxin and many insecticides, for instance, are much more difficult to break down than alcohol.

Prescription drugs are another strain on your detox system. Your liver can't tell the difference between a toxin and a drug—drugs are really nothing but regulated poisons. The best way to avoid the damaging effects on drugs on your liver is to avoid them. In functional medicine, we do this by treating the problem upstream so that downstream drugs aren't needed.

People with diabetes can end up with something called nonalcoholic steatohepatitis (fatty liver disease), called NASH for short. Your liver normally contains some fat, but if you have NASH, more than 5 to 10 percent of your liver's weight is fat. The primary sign of NASH is that your liver gets swollen. Eventually the swelling will cause cellular damage that can, over time, lead to cirrhosis (scarring), which reduces liver function and can lead to liver failure or liver cancer.

We don't know exactly what causes NASH, but we highly suspect it is due to inefficient detoxification pathways. In addition, obesity and insulin resistance play important roles in liver damage and NASH. Many researchers believe these factors slow down Phase 2 conjugation processes so much that by-products build up in the liver. The real problem with NASH is that there is not much we can do to treat it once it gets beyond the beginning stage. Eating on the phytonutrient spectrum is a great way to prevent it and treat it early on—the perfect picture of upstream treatment before downstream effects.

LIFESTYLE FOR BETTER DETOX

The main way to improve your detoxification through lifestyle is by avoiding environmental poisons such as pesticides, plastics, and pollutants. Of course, maintaining a normal weight and keeping your blood sugar normal will also help quite a bit.

Physical activity also plays an important role by keeping your lymph system moving. Your lymph system transports white blood cells and lymph around the body and removes toxins. It's like your body's organic sewer system. Unlike blood, which is pumped by the heart, the lymphatic system depends on your body's own movement to circulate the lymph. The more active you are, the better your lymph drainage and the better it can deliver toxins to your liver for removal. This is part of the vitalization of hot and cold running water exposure in the shower and the beneficial effects of sweating in an infrared sauna. Moving the lymph around through temperature changes and utilizing the detoxification system of sweating assists the liver and other organs with the large and endless job of body detoxification.

RESTORING THE DETOX BALANCE

For the most efficient detoxification, we want to slow down Phase 1 and speed up Phase 2. The main dietary step is to start seriously eating the phytonutrient spectrum and choosing foods that detoxify. At the same time, however, you want to make sure you're getting plenty of plant-based protein from sources like nuts and beans. You need protein to make the many different enzymes that are needed in the liver. The enzymes are the workers in the bucket brigade. If you

don't have the protein to make them, the buckets just sit around and do nothing—and a protein-deficient diet will worsen toxicity.

Overall, aim for the modified Mediterranean diet ratio: 40 percent carbohydrate, 30 percent protein, and 30 percent fat, but with the focus on plant-based foods. This will be the best support for detoxification. Choose organic foods whenever possible; for animal proteins, choose free-range and grass-fed whenever possible. Of course, you'll want to avoid artificial colors, artificial sweeteners, preservatives, and added chemicals in food. Unfortunately, organic produce can be expensive and hard to find. For some produce, such as strawberries and grapes, organic really matters for avoiding pesticides and other chemicals. For others, such as cabbage and sweet potatoes, nonorganic is fine. For a list of the clean fifteen and dirty dozen in produce, check the annual lists put out by the Environmental Working Group (ewg.org).

Another factor that's very important for detoxification is plenty of pure water. I ask my people to start drinking sixty-four ounces of water a day or about eight eight-ounce glasses. Ideally, they'd take in eight ounces of water for every five pounds beyond their ideal body weight, but frankly, nobody can do that. Just stick to aiming for sixty-four ounces. It doesn't all have to be plain water, although that's the best, cheapest, and easiest way to stay hydrated. Green tea, herbal teas, infused water, and anything else that doesn't contain sugar is fine. Stay away from carbonated drinks (even the sugar-free kind) and fruit juice. (I'll talk about juicing later in this chapter.)

SUPPLEMENTS FOR IMPROVING DETOXIFICATION

Phase 1 detoxification and Phase 2 conjugation need a lot of enzymes to drive the processes. To make those enzymes, you need adequate protein in your diet. You also need a lot of different cofactors for making the enzymes. Because many of those cofactors are phytonutrients, that's another good reason for eating the whole rainbow every day.

The B vitamins folic acid (folate), niacin (vitamin B3), pyridoxine (vitamin B6), and cobalamin (vitamin B12) are also needed for making many of the enzymes. So are the minerals calcium, zinc (found in nuts, whole grains, and beans), and sulfur (found in garlic and members of the onion family). The amino acids cysteine, taurine, glycine, and glutamine are also needed—these come from dietary protein.

FAKE DETOX DIETS AND CLEANSSES

So-called detox diets and cleanses are very popular these days. I believe the right sort of detox diet can be very helpful—in fact, I'll discuss these diets later in this chapter. Some of the popular detox diets, however, are in my view, actually harmful fads. Detox diets that claim to work in just twenty-four hours or even just a few days could harm you. Your liver takes a few days to catch up to your dietary changes and makes changes in how the bucket brigade works. In the meantime, a short detox diet could actually leave you worse off, because the Phase 1 intermediate products will end up staying around

longer. Low-protein detox diets can also be harmful because they don't give your liver the protein it needs for normal detoxification.

Cleanses or detox diets that focus just on the colon essentially ignore the liver. Ignoring the major organ of detoxification means that you are not really detoxing. Cleanses and detox diets that claim to be weight-loss diets are also possibly harmful. The main focus of a detoxification diet should be detoxification.

REAL DETOX DIETS

I recommend detoxification diets to many of my people, particularly when their main symptoms are achy muscles and fatigue. I work with two plans, one for ten days and the other for twenty-eight days, which really help with the underlying causes of these symptoms.

The ten-day plan is designed for someone with mild to moderate toxicity levels. The ten-day program is a bit restrictive because we want to accomplish a lot in a relatively short time. It is sort of a detox sprint, so it's only appropriate for someone who doesn't have any serious medical issues and isn't seriously toxic.

The ten-day diet is a process of a step-wise elimination. The diet is mostly fruits and vegetables, with beans and fish for protein (see the list of allowed foods below). It includes rice and gluten-free grains, nuts and seeds, natural sweeteners, and nondairy products such as almond and coconut milk. Use spices such as oregano and rosemary for seasoning, and drink lots of water. You start the program by eating the full menu and slowly eliminating some foods. By day five, you're down to apples, pears, cruciferous vegetables, raw greens, legumes, and wild fish. You shouldn't feel hungry, however, because you can

eat as much of the allowed foods as you want. By day seven, you're starting to reintroduce foods and returning to a more varied diet.

The twenty-eight-day detox diet contains the same foods. The difference is the speed of delivery. The elimination process takes longer, as does the reintroduction. The deep phase, where your diet is the most restricted, lasts for a week, but you still have a lot of choices during the period. Throughout the detox period, you shouldn't ever feel hungry because you can eat as much as you want of the allowed food. Most of my people get through the twenty-eight days pretty easily and feel much better when they finish than when they started.

The longer plan is appropriate for someone with a heavy toxic burden. I believe detoxification is best done low and slow. If you remove toxins too quickly, you can actually make yourself sicker. I always have my people go at a low and slow pace because it pays off in the end. They can stick to the low and slow plan better, and they don't feel worse in the process. We pay a lot of attention to how they feel during the reintroduction phase because this is a good way to detect hidden food sensitivities. Sometimes a food that the person never associated with her muscle pain and tiredness causes those symptoms when it's reintroduced. That's a clue to avoid or cut back on that food going forward.

DETOX FOODS

Fruits: apples, pears, peaches, melons, berries, bananas, avocados; all other fruits except oranges

Vegetables: cruciferous vegetables (broccoli, cauliflower, kale, cabbage, Brussels sprouts); greens (lettuce, spinach, endive); all other vegetables except corn

Beans: all beans, hummus, and legumes (except soy products, which have benefit, but are challenging to the gastro-intestinal system)

Grains: white rice, brown rice, oats, buckwheat, millet, quinoa

Nuts and Seeds: all nuts, nut butters, and seeds (except peanuts)

Fish: fresh, wild-caught fish including cod, halibut, salmon, flounder, sole, tilapia, mahi mahi, and trout; no shellfish and farm-raised fish

Meat and Poultry: free-range lamb, chicken, turkey; no eggs, beef, pork

Dairy: unsweetened milk alternatives; no dairy foods

Spices and Condiments: vinegar, fresh and dried spices and herbs, vegetable oils (olive, flaxseed, canola, safflower, sunflower, sesame, walnut); no prepared condiments and sauces, such as ketchup, relish, and mayonnaise

Sweeteners: brown rice syrup, fruit concentrate, stevia; no sweetened foods, table sugar, corn syrup, maple syrup, honey

Beverages: water, mineral water, seltzer, herbal teas; no soda, energy drinks, alcohol, coffee, nonherbal teas

JUICE IT UP

While you're doing a detox program, you can go with freshly made juices as a way to get the level of fruits and vegetables the program calls for, especially in the green leafy vegetables area. It's frankly challenging to eat that much, so juice is a good addition. Even if you're not doing a detox program, it can be difficult to eat as many fruits and veggies as you would like, simply because of their total volume—

they fill you up very quickly, sometimes before you've eaten enough daily portions. If that's the case for you, go ahead and drink juice in moderation. Be cautious with substituting juice for too much of your color spectrum. You'll be getting plenty of phytonutrients but in a very concentrated form. You really want to get these more slowly, as your body digests the whole plant. Most juice blends use some very sweet fruits, like pineapple and dates, to add some sweetness and flavor. That can make them surprisingly high in calories and sugar from fructose.



CHAPTER 6

REDUCING OXIDATION

One of the consequences of living in an oxygen-rich environment is oxidation—changes that happen when our cells interact with oxygen. A good example is an apple slice that turns brown when you leave it out for an hour or so. In some ways, oxidation is a good thing. Your body uses oxidation to kill off infections and grow a scar around a wound. But too much oxidation in the body can be damaging if it is unbalanced. Bleaching is an oxidation process, for example. If you want your shirt to be nice and white, bleaching is good. But if you spill bleach on your favorite jeans, that’s an irreversible disaster.

Within your body, oxidation happens constantly. The cells in your body are busy all the time, doing whatever they're specialized to do to keep you alive. All of that activity uses a lot of energy, involves numerous chemical reactions, and creates various waste products—sort of like the way your car burns fuel efficiently but still produces exhaust.

In your body, the endless process of staying alive produces “exhaust” in the form of free radicals. These free radicals are molecules, atoms, or ions that have a free electron. Electrons don't like being all alone. They're like that lonely guy at the speed-dating table—they'll do anything to get paired up, fast. In fact, they're only happy when they're paired up, which makes free radicals very reactive. They bounce around in your cells, looking to grab another electron from anything they come up against. Another good way to imagine them is as angry molecules that are looking high and low to find something to grab. They'll lie, cheat, and steal to find that missing charge. Usually, an angry molecule will come up against an antioxidant, a natural chemical in your body that's there primarily for the purpose of quenching free radicals quickly, before they can do any damage. They give the angry molecule what it wants, and that calms it down.

But what if you're low on antioxidants or if you're making so many free radicals that the antioxidants can't keep up? Or what if you're exposed to a lot of excess free radicals (from cigarette smoke, for instance)? In that case, unquenched free radicals can do a lot of damage by seizing electrons from important parts of your cell, such as the membrane that encloses the mitochondria.

We call the process of handling free radicals *reduction-oxidation reactions*, or redox for short. Losing an electron is oxidation, while gaining an electron is reduction. The reduction and the oxidation

components go hand-in-hand. They're natural metabolic pathways. But when redox is inefficient or imbalanced, damage can happen from free radicals bouncing around. We can't escape oxidation, but we don't want to enhance it.

NATURAL ANTIOXIDANTS

Your body quells angry molecules efficiently with a range of natural antioxidants. The most abundant is one called glutathione. Vitamin C and vitamin E are important antioxidants and so is coenzyme Q10.

To make sure you have enough antioxidants to calm down those angry molecules, you need to eat plenty of foods that contain them or contain the elements your body needs to make them, such as the minerals selenium, magnesium, and zinc.

THE CONSEQUENCES OF FREE RADICALS

Oxidation and free radicals are just the inevitable consequence of living in an oxygen environment. A good way to think about oxidation is as rusting. When iron is oxidized by exposure to oxygen, it turns into iron oxide—rust. When you have an excess of free radicals and oxidation pathways that aren't efficient at quenching them, you "rust" internally. The faster you rust, the more you age beyond your chronological years. You feel like the Tin Man in *The Wizard of Oz*. That is why smokers get wrinkles more than nonsmokers—they get free-radical damage to the collagen in the face.

When free radicals grab electrons away from healthy cells, they disrupt the cells' natural membranes. The membranes that enclose

every cell are semipermeable. They let certain things in and lock others out—the membrane combines the functions of bouncers and prison guards. They protect the cell from the outside environment, letting in only what the cell needs, but at the same time, they keep things in that are supposed to stay in.

If free radicals disrupt the membranes or damage the connections between cells, then damaging things can get in. If the damaging substances reach the cell nucleus, they can damage the DNA. That can kill the cell, make it function less efficiently, or even trigger the uncontrolled growth we call cancer.

When a free radical attacks a cell membrane and damages it, it creates a gateway for other free radicals, letting them get in more easily. The free radical gets past the bouncer and gets into a party that it wasn't invited to. Once inside, it can trash the place. Think of it like renting out your house to a bunch of drunken college fraternity boys. Everything they get their hands on will be changed permanently—and not in a good way.

Atherosclerotic heart disease—clogged and stiffened arteries in the heart—is caused by natural oxidative pathways that have gone bad or that are in the wrong place. Free radicals play a major role here by damaging the smooth lining of the arteries. They rough it up and make it stiff. In an attempt to repair the damage, the area gets inflamed. But that can actually cause more oxidative damage from the immune response. In a complex process, the damaged area of the artery builds up plaque, a hard, impenetrable blockage on the inside of the blood vessel or hidden beneath the thin layer of cells that line it. The plaque on the surface of the lining impedes the flow of blood and can cause a blood clot; hidden plaque can rupture and cause a blood clot. Either way, you have a heart attack. Once plaque forms, it's almost impossible to get rid of it. It is much more important to

protect against now than to wait until the damage is done and then try to reverse it.

Free radical damage can also contribute to high blood pressure by damaging the lining of blood vessels throughout your body. That makes them stiffer, so your heart must beat harder to push blood through them. Instead of being flexible like hoses, the blood vessels become more like copper pipes. There's not a lot of give in a pipe as compared to a hose. And when you don't have any give from a pipe, you get resistance to flow. We measure that as blood pressure; the greater the resistance, the higher your blood pressure.

Free radicals damage all your blood vessels, including the tiny capillaries in your eyes, your kidneys, your brain, your toes—everywhere. Most of your blood flows through the capillaries that link arteries and veins. These capillaries are so small that often the oxygen-delivering red blood cells have to travel single file to get through them. This allows the transfer of oxygen and nutrients and the disposal of waste in such close quarters. The capillaries are very spread out to reach every part of your body. Once you start losing capillaries, you need to rely on the larger blood vessels, but they're just not designed to circulate blood to every cell the way the capillaries are. The parts of the body that lose their capillaries start to deteriorate with what's called *end organ damage*.

The retinas in your eyes are very susceptible to free radical damage. These thin, light-sensitive layers at the back of your eye can easily be damaged when free radicals disrupt their blood flow. But the retinas are also exposed to ultraviolet radiation from sunlight, which triggers free radicals. Without plenty of antioxidants, damage can be done to this very delicate area, leading to problems such as age-related macular degeneration, the leading cause of blindness in older adults.

UNBALANCED REDOX ACTIVITY

When redox activity gets out of balance, the problem can come from the inside or the outside. Outside components include everything we're exposed to, such as air pollution, cigarette smoke, ultraviolet radiation from sunlight, and even normal background radioactivity. Exposing yourself to the natural and unnatural toxins of the world creates redox reactions.

Internally, the normal process of converting food to energy naturally leads to a certain level of the creation of free radicals. Your metabolic pathways are designed to deal with the free radicals efficiently. But your metabolic pathways are meant to run on a diet very different from the Standard American Diet. When you choose a diet that has lots of refined foods that are high in sugar and unhealthy fats, your metabolic pathways don't function efficiently. They run too fast, creating a lot of excess free radicals in the process. Between external exposures to our toxic world and internal exposures to a toxic diet, the balance of free radicals and oxidation goes awry. Remember that wet bicycle wheel spinning faster and faster? The water flies off the wheel when it spins fast. That's a bit like the free radicals flying off of our metabolism cycles.

The Standard American Diet is high in calories but low in nutrients. Many people aren't getting the building blocks they need to make antioxidants, much less antioxidants in their natural form. When your diet is mostly brown, white, and tan, you're missing out on the phytonutrient spectrum. The lack of colorful plant foods means free radicals can get the upper hand.

Part of the reason we have color vision is to attract us to all the colors of our food. We are truly limiting our resources by our current

diet. One of the things I vividly remember about my early school years is that wonderful Crayola box of sixty-four crayons (and the built-in sharpener). What we are doing with our Standard American Diet is using all the neutral colors in that glorious box of crayons, without harvesting the full bounty of the colors. That's just sad ... and unhealthy.

IMPROVING ANTIOXIDANT PATHWAYS

To reduce free radicals, a good start is to just make fewer of them by avoiding environmental toxins and eating a better diet. But that's only half the equation. The other part is improving your antioxidant activity. The best way to do that is by eating a colorful diet—the phytonutrients are full of natural antioxidants, like vitamin C.

Some of my favorite top antioxidant foods include:

- **Foods with resveratrol.** This natural antioxidant is a phytochemical found in red and purple grapes, red wine, and also in cocoa. Resveratrol may inhibit the spread of cancer, lower your blood pressure, make your blood vessels more elastic, and help regulate inflammatory responses. What's better than red wine and chocolate? But in moderation, of course.
- **Foods with carotenoids.** These are the phytochemicals that give red and orange foods their color, although they're also found in many other fruits and vegetables. In fact, there are about seven hundred different carotenoids with a lot of different names, such as lycopene, beta

carotene, and zeaxanthin. Carotenoids support your immune system, help reduce inflammation in the blood vessels in your retinas, and a lot more. If you eat on the phytonutrient spectrum as often as you can, you'll be getting plenty of carotenoids.

- **Turmeric.** This bright yellow spice, used widely in Indian cooking, contains curcumin, a powerful natural antioxidant. Ayurveda, the traditional medicine of India, says that your body has energy centers called chakras. Interestingly, the chakra associated with the liver, where detoxification takes place and lots of antioxidants are needed, is also yellow.
- **Epigallocatechin-3-gallate (EGCG).** Found in green tea, this is one of the most powerful natural antioxidants. It helps lower your risk for heart attack and stroke, and it improves cholesterol levels. It can also increase fat oxidation, which may help with weight loss.
- **Quercetin.** Found in apples, all members of the onion family, olive oil, red wine, and black tea, quercetin is a very powerful antioxidant.
- **Proanthocyanins.** These natural antioxidants are found in berries, especially the blue and purple ones, and in red grapes and cocoa.
- **Isoflavones.** These are a family of phytonutrients found in soy foods. They're great antioxidants, but they have

other roles as well. I'll discuss them further in chapter 7, where I cover balancing your hormones.

- **Glucosinolates.** Cruciferous vegetables, such as broccoli, cauliflower, Brussels sprouts, kale, cabbage, and watercress, contain these potent antioxidants. They're what give foods like mustard and horseradish their sharp taste.

ANTIOXIDANT SUPPLEMENTS

I always ask my people to get their antioxidants the natural way by eating plenty of colorful fruits and vegetables. You can take supplements that contain resveratrol, green tea extract, and plenty of other antioxidant components, but it's always best to get them the natural way, from your food.

Eating a lot of fruits and vegetables every day is a good goal, but the reality is that sometimes we fall short. We might be traveling, or not feeling well, or too busy—or we might just really, really hate broccoli.

If you can't eat your superfoods, then you can drink them. Juicing, for example, is a good natural way to add more fruits and vegetables to your diet. As I have personally discovered, it takes a fair amount of time and prep work ... and clean up. An alternative to preparing or buying fresh juice is to use powders that contain dehydrated fruits, berries, and vegetables to make natural shakes and smoothies. I like adding a scoop or two of these mixtures to my own green shakes, or making shakes using just the powders. I add a scoop or two of berry powder to what I call a Popeye shake, mixing it with spinach and

other greens into a smoothie in the blender. The shake formula of super fruits and vegetables, combined with the powder, concentrates nutrients just as juicing would but in a more convenient way. For many of the powdered formulas, one scoop mixed with eight ounces of water gives you the antioxidant power equivalent of more than twenty servings of fruits and veggies. I don't recommend using green powders and smoothies as meal substitutes or instead of eating your vegetables, but they're a good bridge to healthier living.

It's the same thing with juicing. Some juice bars brag that they use several pounds of vegetables to make your tall glass of juice. That's a reasonable way to get your antioxidants and phytonutrients, but only now and then. Nature wants you to eat real food, not just the juice, and not in such a concentrated form. When you eat fruits and vegetables in their original form, you eat the right amount, and you won't be hungry again just a few hours later. You'll also get your antioxidants in a more long-lasting form. A lot of redox reactions happen quickly and don't last long; your antioxidants have to get replenished all the time. You can't necessarily store your botanical health in just one serving of juice. You also don't get the benefit of the insoluble fiber from the ingredients, and you don't get the pleasure of enjoying vegetables and fruit as part of a meal. You're not chewing your food, but you're drinking it, so you can fit it into your day. Most research demonstrates that when you chew your food you get fuller, and you eat less food. Sometimes that is a benefit in and of itself. But by drinking all your food, you're missing out on engaging with your food. You're also speeding up the natural digestive and metabolic pathways. When those pathways are operating too fast or too inefficiently, they get imbalanced, which will lead to greater oxidation.

It's easy to get too many calories too quickly when you drink a lot of juice. One glass of orange juice is the equivalent of eight oranges.

You can drink down the juice quickly, and it will hit your bloodstream very rapidly. But you'd have a hard time eating even three oranges in a row, plus the sugar in them would take longer to enter your bloodstream because of all the fiber that comes with it. The natural design that's been created for us is still the best.

A WORD OF WARNING

Once you understand how important antioxidants are for your health, you might start going a bit overboard with them. I sometimes see this with my people. We have a discussion about antioxidants and the next time I see them, they bring in a shopping bag full of supplements. Oxidation is a natural process in your body; you even use free radicals as part of your immune system to kill germs. The natural exchanges of reduction and oxidation are normal pathways that should be occurring in balance. Overdosing on antioxidant supplements could swing you to an overly reduced state as compared to an overly oxidized state. Once again, think of the natural tension of violin string. You want to have the strings at the right tension to make the music. Too much tension breaks the string, but with too little tension, there's no sound. You want to have the right balance. What's the best way to get that balance? The phytonutrient spectrum. Get at least two servings of all the colors, each day.



CHAPTER 7

HORMONAL IMBALANCE

Hormones are chemical messengers your body makes in organs such as your thyroid or ovaries. The messengers tell your body what to do. Unlike your nervous system, which communicates in a rather rapid fashion, hormones have far-reaching and in-depth conversations with your body and the regulation of your body's systems. Neurochemicals and electricity in the nervous system can be powerful, but they are a bit more like texts and tweets and posts that get messages out very quickly. Hormones are more like love letters and poetry as a form of communication for your body. But as you can imagine, production, delivery, understanding, and even appropriate disposal of these communication pathways

are critical. Nothing is more powerful in the world of communication than a written letter. A thank-you note, a birthday card, or a heartfelt sonnet can truly make us feel something. Equally though, a threatening letter from an authority figure or a ransom note from a criminal can fill us with a very different response. Worse yet is forgery; say a foreign chemical creates a method of communication that looks familiar but actually isn't. Like forgery, a foreign chemical or mimicker in the world of hormones causes communication destruction—wreaking chaos within your body.

Of all your systems, your hormones are the most likely to get out of balance, simply because the system is so complex and so dependent on feedback and even feed-forward loops to work correctly. We need to truly understand our hormones and the chemicals that look like our hormones if we are to understand a balanced body. The functional medicine approach to balancing hormones is to look upstream for the cause of the imbalance. It doesn't matter if you're a woman or a man—the approach is the same.

ENDOCRINE HORMONES

You actually make several different kinds of hormones, but in this book I'll be focusing on the endocrine hormones. These are the hormones produced by glands in the body. Endocrine hormones help control many important body functions, particularly your metabolism and your sexual function. Insulin, produced by beta cells in your pancreas, is an endocrine hormone. Your thyroid gland produces endocrine hormones, as do the ovaries in a woman and the testes in a man. In all, your endocrine glands make about twenty different hormones and release them directly into the bloodstream. It's not surprising that they can get out of balance.

Your endocrine hormones are like an orchestra. They must all work together to play the symphony that is your body. If your hormones can be said to have a conductor, it's the pituitary gland in your brain, which is a sort of master control switch. In response to your environment and the needs of your metabolism, the pituitary gland sends out signals to all the endocrine glands, telling them to what to do—play louder by making more of the hormone, play softer by making less, or even rest until needed later in the music. But the endocrine glands relay information back to the pituitary and to each other. When your nutrition isn't optimal, or when you're under a lot of stress, or if you're overweight, or if anything else in your body is out of balance, the hormonal messages sometimes get out of tune.

In an orchestra, when someone plays a wrong note or is briefly out of tune, that's fine. The music goes on even when you lose a beat. When the whole orchestra starts playing out of tune, missing notes, or when instruments even drop out, the symphony turns into cacophony. Fortunately, you can get your hormones tuned up and back in harmony.

LOOKING UPSTREAM

Among other things, an unbalanced diet can lead to unbalanced hormones. Your hormones are complex proteins. You can't make them unless you're getting enough of the building blocks they need. On the Modified Mediterranean Plan, you're getting 40 percent high-quality carbohydrates, 30 percent protein, and 30 percent fat. That's giving your body what it needs to make hormones, while avoiding inflammation, which amps up your hormone production. The color cascade of your plant foods will give you the appropriate vitamins, minerals, and phytonutrients you need. I think animal

protein is important, so every meal should have a moderate amount of an animal food. But I think plant foods are twice as important, so every meal should have at least two plant foods.

If your diet is imbalanced—it's inflammatory or creating a reaction—then you're bringing in strangers and dangers. When it comes to your hormones, the body sees the imbalance as danger. It then starts responding to that danger with inflammation and a high level of oxidation. Your hormones sense the heat and the rusting and will try to cool the system down.

The body's initial effort to cool things down is to release the hormone cortisol from the adrenal glands. You may have used non-prescription cortisone cream on an itchy insect bite or poison ivy rash. Cortisone is a steroid hormone very similar to cortisol. Inside your body, cortisol is the stress hormone.

In traditional medicine, doctors look at each hormone individually and tend not to see the bigger picture. In functional medicine, we look at all your hormones because they all work with each other. We look at the hormone cascade, instead of each hormone separately, when we work to improve your hormonal balance.

ESTROGEN

When a woman approaches the perimenopausal years, usually starting in her late thirties to early forties, her production of the female sex hormone estrogen starts to drop off. That's a very natural process, but it causes changes in the body. Many, many women start to experience hot flashes at this point. For most, the hot flashes are manageable and short term. The average woman has hot flashes for about eighteen months to three years. Another issue that appears

with the loss of estrogen is vaginal dryness, which can make intercourse uncomfortable. And then there's the increased risk of heart disease, breast cancer, osteoporosis, and the tendency to gain weight more easily.

Your young daughter doesn't have any estrogen either, but she doesn't get hot flashes. Why does this happen to women when they get past the child-bearing years? It's possible that low estrogen levels are actually closer to what a woman's normal state is. The high estrogen levels of puberty and the child-bearing years are a relatively short part of a woman's lifespan.

Is the lack of estrogen what's really behind hot flashes and the other issues that come with menopause? The ovaries make estrogen, but they also make the hormones progesterone and even small amounts of the male sex hormone testosterone. Any woman who has experienced pelvic surgery—ovary removal, hysterectomy, or tubal ligation—before menopause has had her hormone production disrupted. This is mostly due to the direct changes to the ovaries themselves or the change or disruption in the blood supply to the ovaries.

For women who are experiencing severe hot flashes from menopause, I first start by looking at the hormone cascade upstream and trying to reduce the stress hormone cortisol. I also look at inflammation levels and for any abnormalities in the gastrointestinal tract and immune system. After all, inflammation is heat. Do you have sensitivity to gluten or dairy? That can also be a source of irritation, inflammation, and cortisol production. I also look for the metabolic syndrome and problems with insulin. I look for any problems with the thyroid gland. (I'll talk more about thyroid hormones later in this chapter.)

Only when we've done all we can upstream do I prescribe estrogen replacement therapy. We aim to raise the estrogen level using bio-identical hormones to a moderate level, not to the level of a younger woman. High estrogen later in life puts a woman at risk of breast cancer. The reason for using bio-identical hormones is so that the replacement estrogen gets metabolized as if it were natural estrogen. That means your body is able to detoxify and remove the breakdown products normally. The breakdown products of synthetic estrogen are harder for your body to detoxify and can lead to dangerous side effects, such as an increased risk of heart attack. This matching and breakdown production is the main reason we use bio-identical hormones for replacement. Without getting too deep into the bio-chemistry of steroid production and breakdown, I'll just say that the closer we get a hormone to its natural biological state, the better it works in the body. Equally, bio-identical hormones break down in the right pathways, which are also the safer pathways.

The three breakdown products of estrogen are often called the good, the bad, and the ugly. What you obviously want is more of the good breakdown products because these actually lower your risks for estrogen-related cancers and cardiovascular events. But if you have the wrong original product or your body has a tendency to make bad or ugly breakdown products, estrogen replacement therapy may create more problems than benefits. Moreover, choosing the right hormones and the right levels will keep the communications flowing correctly. A breakdown in communications can lead to internal fights and even war, which can have devastating effects on an imbalanced body.

One of my people is approaching menopause. She's decided to compete in her first Ironman triathlon. She came to me because she started getting hot flashes and wanted me to prescribe synthetic

estrogen. We talked about it, and I convinced her that we should explore further before going straight to the drugs. We tested her estrogen level. It was normal for a woman of her age—but her cortisol level was way too high. I pointed out that she was putting a lot of stress on her body by overtraining and restricting her diet too much. We finally agreed that she would cut back on training, eat more high-quality but low-glycemic-index carbohydrates, get to bed on time, and use some traditional Chinese botanicals for the adrenal glands. She followed through, and a few weeks later she posted on my Facebook page, “I feel the best I’ve ever felt. I’m training less, and so my times are not as good, but I’m sleeping well. What’s more, my hot flashes have definitely decreased, and that has made the biggest difference in my life.”

NUTRACEUTICALS FOR HORMONE HELP

In general, when hormones get out of balance, you want to travel upstream and find out which hormone or hormones are leading the imbalance. Remember the orchestra? Well, keep that idea in mind when you think about the harmony of hormones. Often, the source of the imbalance is the adrenal glands. These organs, which sit on top of your kidneys, are most like the piano in the orchestra. Because of its size and lack of portability, all the other instruments tune themselves to this instrument. In your body, your other hormones tune themselves to the adrenals. The adrenal glands are most responsible for responding to attack and invasion. They regulate and control the pathways of inflammation by secreting the hormones adrenaline and cortisol.

Nutraceuticals that cool off inflammation and oxidation can be useful for helping the adrenals do their work. Specifically, I look to turmeric and ginger because they affect the production of estrogen and testosterone, insulin, thyroid hormones, and cortisol. In addition, I ask my people to apply the color spectrum and get vitamins, minerals, and antioxidants by eating plenty of colorful plants.

For women who are having unpleasant menopause symptoms, I recommend supplementation with vitamin A, vitamin D, vitamin E, vitamin K, vitamin B6, folic acid, and isoflavones (natural hormones from soy). In addition, Siberian rhubarb, red clover, turmeric, rosemary, and resveratrol are helpful for cooling off the overall system. I work with my people to find the doses that work for them. When using nutraceuticals, we don't expect the rapid results of traditional medicine. We're working upstream, so affecting the cascade takes time. A reasonable expectation for seeing good results is one to three months.

In traditional medicine, drugs are used to block very specific downstream pathways and receptors. But in functional medicine, when we move upstream, one botanical can affect multiple pathways because the stream branches and changes. When you use a botanical upstream, it cascades down and has multiple effects downstream. That can be both beautiful and confusing at the same time. Let's say you start using turmeric. That affects inflammation and detoxification and oxidation pathways, which in turn affect the endocrine hormones. It has a bigger influence on the whole orchestra than adding another flute to the winds section would.

LIFESTYLE CHANGES AND STRESS MANAGEMENT

To lower cortisol levels, you need to lower stress levels. That's not always entirely possible—we all have complicated lives. But we can do things to counteract and filter stress and help bring our cortisol levels down. One important step is to get moderate exercise every day whenever possible. You don't have to run 10Ks; all you need to do is take a half-hour walk, do yoga, ride an exercise bike—anything that you enjoy and that gets your body moving. Other good stress reducers are deep breathing, getting some direct sunlight, and meditation. I find that getting my people to just make a little time for themselves to do something they enjoy every day is really helpful. Getting enough sleep also really helps. Lastly, and most foundationally, removing food sensitivities as well as refined foods helps lower inflammation from a gastrointestinal point of view. And when your GI tract isn't at war with your food, the immune system can relax a bit and work more effectively in other places when it's needed. With less inflammation, your system isn't on edge or on fire all the time.

THE HORMONE CASCADE

The hormone cascade is really how the entire hormone orchestra works together to make the music of our lives. It begins with the hypothalamic pituitary adrenal axis (HPA axis). The hypothalamus and pituitary glands in your brain send signals to the adrenal glands that sit on top of your kidneys. The adrenal glands produce several hormones, including adrenaline and cortisol. These are your first-line hormones when it comes to responding to strangers and dangers. The adrenal glands will produce adrenaline in short bursts when

you're threatened. If a bear turns up at your picnic, for instance, adrenaline will make your heart race, so more blood gets to your muscles, so you can run faster or fight harder. Adrenaline will make your pupils dilate so you can see the danger better. And adrenaline will make you stop eating and get ready to run away. At the same time, your adrenal glands will make cortisol, a long-acting hormone that increases inflammation, shuts down insulin, and generally gets your body ready to deal with the bear in the longer term, by running far away and being able to heal if it bites you.

When you encounter the bear, the outcome is probably going to be one of two things: the bear kills you, or you escape, wounded or not. If you escape, your adrenaline and cortisol production return to normal because the bear isn't chasing you anymore. But what if you're always being chased by a bear? In our lives, that's often the case. You get stuck in a traffic jam, you're late for work, you're frustrated on the job, you miss lunch, you stay late to catch up, and then get stuck in another traffic jam on your drive home. The bear has been chasing you all day.

Many millennia ago, long-lasting stress would have meant something like famine conditions or harsh weather like an ice age or perhaps attack from an enemy clan. In those circumstances, your body would adapt by making more cortisol, which among other things, would raise your blood pressure and your blood sugar and slow your metabolism as a way to conserve your body's resources. At the same time, cortisol suppresses the production of testosterone and estrogen because reproducing wouldn't be wise in a time of famine or threat. Seen in the context of the whole length of human history, cortisol starts a cascade of changes that are beneficial in the long run. And when the famine is over or the danger has passed, your body returns to normal.

But in our society, where famine never happens but we have very high levels of stress unimaginable to our distant ancestors, we end up producing lots of cortisol all the time. Your body thinks that you are at war or in a famine, but the supermarket shows otherwise.

THYROID HORMONES

Constant production of adrenaline and cortisol starts affecting other aspects of the endocrine system. The adrenals send messages back to the hypothalamus and pituitary that things aren't going well. Based on that feedback, the hypothalamus and pituitary send messages to your thyroid telling it to slow down your metabolism to conserve energy.

In functional medicine we think of the thyroid as the canary in the coal mine. Miners would take canaries or small birds into mines to warn them about poisonous gas leaks or other threats in the mine. If the canary died, the miners knew to get out of the mine and get out of danger. What they didn't do was get a new canary and pretend that everything was fine. When your thyroid begins to act up, either in its shape or in your lab values, this is a warning that something bigger is going on. Take heed of this and explore the mine, your body, for abnormalities, and don't settle for the traditional medicine role of replacing the canary and missing the deeper problem.

The thyroid, a butterfly-shaped gland in your neck, produces hormones that play a key role in controlling your metabolism. You can think of your thyroid as your body's thermostat, turning your metabolism up or down as needed. Your thyroid is a good example of how your hormones are linked in feedback loops. In simplified

terms, the pituitary gland signals the thyroid to produce thyroid-stimulating hormone (TSH).

In turn, TSH controls your production of two thyroid hormones, T4 and T3. (Why these names? Because in medicine we're not very creative. T4 has four iodine molecules in it; T3 has three.) The T4 hormone is inactive; the active form is T3. These two hormones are like a present inside a box. The T4 is the box, while T3 is the gift inside. You can't really use the box by itself—you have to open it to get to the gift. That's complicated enough, but when you're constantly producing too much cortisol, your production of T3 can get out of balance. The iodine molecules end up in the wrong place, and you produce reverse T3 instead. It's like a glove that should fit your right hand but ends up being left-handed instead. The reverse T3 hormone doesn't fit into any of the normal T3 receptors, but it works just well enough to send feedback that shuts off the thyroid-stimulating hormone.

When the thyroid feedback loop gets out of balance and you don't make enough thyroid hormones, you feel tired and sluggish, your skin gets dry, you gain weight, you feel cold all the time, and you may have menstrual irregularities. You might have hypothyroidism, or low thyroid function. Or you might have Hashimoto's thyroiditis, an autoimmune condition that slowly destroys the thyroid gland. Hashimoto's thyroiditis is fairly common; in my experience it is usually the cause of low thyroid function, especially in women.

Low thyroid function can be treated by taking a synthetic thyroid hormone to replace your missing natural hormones. Before going to that step, however, I work with my people to boost their thyroid hormones naturally. Inflammatory foods, especially gluten, are linked to Hashimoto's, so the first step is to cut back on these foods and

treat leaky gut syndrome if it is present. Then I add in anti-inflammatory botanicals, especially rosemary, ashwaganda, and turmeric. Antioxidant vitamins like zinc, selenium, vitamin C, and minerals work well along with the botanicals for underlying problems related to the thyroid or the thyroid itself.

Unfortunately, by the time many of my people are finally diagnosed with Hashimoto's thyroiditis, so much damage has been done to the gland that we have to go to thyroid supplements. The supplement works better at a smaller dose if it is combined with the natural approach.

INSULIN

The long-term effect of constantly high cortisol levels on the pancreas, which makes the hormone insulin, can be very serious. Cortisol makes your body create energy (blood sugar) so you can run away from the bear. For reasons we don't fully understand, cortisol prefers to convert muscle tissue, not stored fat, into energy. In fact, high cortisol makes you store more fat, even as it breaks down your muscles. That's because cortisol makes your blood sugar go up, which makes your pancreas put out more insulin to carry it away. If you have more blood sugar than your body can use, insulin carries it off to be stored as fat. Your body composition starts to change. You lose lean muscle tissue and gain fat, especially in the abdominal area, which leads to the metabolic syndrome and insulin resistance. So the adrenal glands produce too much cortisol and once again upset the balance of your hormones.

SEX HORMONES

The sex hormone pathway—the production of the male sex hormone testosterone in the testicles and the female hormone estrogen in the ovaries—is also easily unbalanced. To start with, cortisol and the sex hormones are all steroidal hormones. They all begin with cholesterol as their foundation and use the same precursor hormones. When you are having chronic stress and are producing a lot of cortisol, those things take up a lot of the available cholesterol and precursor hormones, leaving less to produce the sex hormones. That's called cortisol steal syndrome. The need for cortisol in certain situations actually robs your body of sex hormones. If cortisol is used for famine and war and sex hormones are used for abundance, fertility, and joy—you can see that this shift is caused from too much war and not enough joy in our lives, either from our environment or our nutrition. In the end, as a result of war, you don't have the building blocks to make the joy hormones you need.

At the same time, excess cortisol is affecting every other hormonal pathway, turning your metabolism down and raising your insulin resistance. You're storing a lot of fat, which itself produces estrogen in both women and men, throwing the sex hormones off. Your excess body fat also produces changes in your levels of a protein called sex hormone binding globulin (SHBG). Basically, SHBG shuts off your production of your gender-specific hormones. In men, SHBG will convert testosterone to estrogen. In women, estrogen gets trapped by SHBG and becomes less available to your body. The small amount of testosterone all women naturally produce can then become more dominant. This can lead to excess facial and body hair (hirsutism) and weight gain around the waist. Your body starts to down regulate

your production of estrogen, throwing the hormonal balance off even more.

When your estrogen production is normal and your body's detox pathways are working well, estrogen gets metabolized by your body into what we call calm estrogens, which are protective. But when estrogen production is thrown off, it gets metabolized into what we call angry estrogens. These are the bad estrogens that can trigger breast cancer and other problems. In men, the same thing can happen with testosterone. Bad testosterone by-products may trigger prostate cancer. As I'll explain in the chapter on nutrition, dietary changes and stress reduction can really improve how well you metabolize the sex hormones.

When men get fat in their midsection, they aromatize their testosterone—they're essentially putting estrogen into their bodies and brains. They're not happy. The reverse happens to women. If they're fat, they produce more testosterone and become insulin resistant. They're not happy. In both cases, the brain isn't getting the right hormones any more. In a strange way, the excess of cortisol from stress, war, and famine rewires our entire sex-specific hormonal pathways. Men and women begin to develop characteristics of the opposite sex. In times of war and famine, this is protective as a way to limit fertility when pregnancy might not be a good idea. But in chronic conditions of stress, these hormones really get out of balance. You don't feel much like yourself; in fact, you feel like someone else. This is part of the reason I hear so many of my people say, "I feel like my hormones have taken over my body." In a way, male or female, the hormones have indeed taken over. They are not doing the job they were intended to do.

ENDOCRINE-DISRUPTING CHEMICALS

In our daily lives, we're exposed to a lot of chemicals that turn out to mimic endocrine hormones, especially the steroid hormones such as estrogen. The chemistry is too complicated to go into here, but suffice it to say a mimicker or decoy can throw off any organized system. Think of the classic movie *The Parent Trap*, when two identical-looking teens with completely different personalities switch roles—comic confusion ensues. Endocrine-disrupting chemicals aren't identical, but they are just similar enough to confuse receptors and pathways. There's nothing funny about this, though, because your body doesn't like being confused. Some common chemicals in our environment, such as bisphenol A (BPA), used to make plastics, mimic the shape of part of the estrogen molecule. The chemical molecule binds to estrogen receptors in your cells. It's sort of like putting the wrong key into a lock. The key goes in, but it doesn't open the door. Not only that, but it also gets stuck in the lock and you can't get it out. That means your real estrogen is blocked from entering the receptor because it's jammed up with the wrong key. Your body tries to break down the estrogen mimics, but it doesn't know how, so the key stays jammed in. Over time, more and more doors start locking out your natural estrogen. That throws your estrogen balance off, and the hormone cascade gets thrown off as well. The whole hormonal orchestra gets very confused.

The best way to avoid jamming up your estrogen receptors is to avoid foreign substances that begin with “p”: paints, plastics, pesticides, pollutants, and persistent chemicals. The flip side of what to avoid is what to seek out—and that's color in your diet. Humans, unlike most other animals, have very sharp color vision. Use what

has been given to you to seek out colors and eat them all. Remember, your liver detoxifies your own natural estrogen by-products, and it also detoxifies the unnatural ones. Because the unnatural estrogen mimics are strangers to your body, your liver needs to work harder to deal with removing them. It needs all the help you can give it through good nutrition.

Because of the complexity of the hormone cascade, we always want to look upstream to other foundational causes. And even though there may be a role for replacing hormones in an unbalanced body, you want to look before you leap. If you're treating a downstream condition with a hormone, you may miss or mask a larger upstream imbalance, and in the delicate balance of hormones, missing and masking problems often make them worse. That's why, before addressing hormone replacement therapy, we look at diet, nutraceuticals, botanicals, lifestyle changes, and stress management. When all of those components are in place, and the thyroid and adrenals are working well, then we look to see any biological reasons for a loss of sex hormones in males and females.

For example, in women, menopause is a completely natural process, not a disease. Menopause shifts the hormonal orchestra into playing in a different key. If low estrogen levels are balanced with low stress hormones, the sound is still harmonious. Where it gets out of tune is when low estrogen combines with high cortisol. When these hormones get unbalanced, your liver needs to work harder to detox the by-products, your inflammation level rises, and your digestive tract starts to drift away from efficiency. I call this the Wonder Woman syndrome. Remember how Linda Carter was Wonder Woman in the 1970s? She always had a lot going on: competing in the Paradise Island Olympics, fighting the Nazis, and saving Steve Trevor. She had a high stress life but also had high estrogen, so she

was in balance and looked (and felt) fabulous. Her mother, played by Cloris Leachman, was an older woman with less natural estrogen, but she spent her times back at the palace, watching the Olympics, surrounded and protected by her Amazon warriors. So, although she had low estrogen, she also had low stress. She too was balanced, and she too also looked (and felt) fabulous. It wasn't the presence or lack of estrogen that made all the difference—it was that their cortisol and estrogen were balanced.

Don't get me wrong, hormone replacement therapy for women is absolutely appropriate at times, particularly when hot flashes are very severe and disruptive. Hormone replacement therapy is especially indicated for women who have had surgery of the reproductive organs because their natural path to menopause has been disrupted. The blood flow to those organs has been disrupted or eliminated. The disruption of the blood supply to their ovaries, or the removal of them altogether, can place these women on a more rapid path to losing their estrogen. In a sense, it accelerates their menopause faster and deeper than what is normal and predicted. Hormone replacement therapy can put them back on course to natural menopause and would probably be a safe thing to do. When I do prescribe it, it's always using bioidentical hormones at the lowest possible dose for the shortest possible time. This is mostly because women can feel even miniscule changes in estrogen—we measure estrogen in picograms rather than milligrams. It is as if a few teaspoons of water could affect the temperature in a swimming pool, so we need to treat estrogen changes with great care. The goal here is to age match the course of the natural menopause trajectory, not just elevate estrogen to its previous state. This allows the natural progression of menopause to occur the way it was intended and would have happened if the surgery hadn't disrupted the normal process.

In men, testosterone levels tend to drop slowly with age, though nowhere near as dramatically as estrogen drops in women. Still, the loss of testosterone in a man is a significant health concern especially if, like women who have had gynecological surgery, the drop is unnatural or more rapid than would be expected. Rapid descents can occur from stress, poor diet, centralized fat, and sleep apnea and sleep disturbances. All of these conditions raise cortisol in men, which in turn depresses testosterone production. Again, we look upstream to fix imbalances first. Fixing the larger disruptions in the hormone cascade is the foundational concern. Working to increase testosterone levels takes a solid understanding of the entire hormone cascade. Where appropriate, I will recommend practical botanical testosterone stimulators, like tribulus, but they can only help if we also correct the hormone cascade. I prefer plant-based testosterone stimulators only from a breakdown point of view. Many testosterone stimulators come from extracts of animal glands. In theory, they should work well, but I worry about contamination and purity. The reason we need to look at the entire cascade is to make sure that giving the supplement is appropriate. If I give testosterone supplements to a person with a large waist and the metabolic syndrome, I'm not really helping him. It's more important to deal with his insulin resistance and high blood pressure first.

However, just as for women, the case for hormone supplementation comes when a man's testosterone level is consistently too low and doesn't respond to conventional upstream methods of correction. Sometimes a man's area of production has been imbalanced for such a significant time that the testosterone won't turn back on, which is a very unsafe and unnatural state. That can lead to further problems with inflammation and excess oxidation, which in turn can raise the risk of heart attack and stroke and may even raise the risk of prostate

cancer. In this case, I will use testosterone boosters, such as human chorionic gonadotropin or clomiphine, to stimulate the pituitary to wake up the dormant testicles and raise testosterone. Sometimes, no stimulation will wake them up and direct use of topical or injectable testosterone is the best option. To determine the best dose, I target the therapy based on blood levels. The usual goal is somewhere between five hundred to nine hundred nanograms per deciliter. This is still a relatively low number, but the idea is to achieve age-matched balance, not a short-term high that in the long run can cause a more complicated imbalance.

For men and women, hormone therapy should be used only when all other avenues have been exhausted. Targets for hormone replacement therapy should be aged-matched to achieve the best balance.

SUPPLEMENTS FOR HORMONE BALANCE

A number of supplements can help improve hormone balance.

For raising testosterone in men, we want to use botanicals that inhibit the production of aromatase, an enzyme that helps convert testosterone into estrogen. By slowing down the enzyme, the natural testosterone a man produces stays around longer. I usually recommend folate, vitamin B6, vitamin B12, and vitamin D, along with zinc and selenium. Rosemary and turmeric are very helpful there. So is green tea. Also helpful is lycopene, a phytonutrient found in tomatoes and other red fruits. I also like to use the botanicals tribulus, ashwaganda, and black cohosh.

For raising estrogen in women and improving estrogen detoxification, vitamin A, folate, vitamin B6, vitamin B12, vitamin D,

vitamin E, and vitamin K are all helpful. Botanicals that can help include turmeric, rosemary, and resveratrol. I also use black cohosh and Siberian rhubarb, also known as rhapontic rhubarb.

My female people often ask me about soy as a way to treat menopause symptoms. Specifically, they're interested in soy isoflavones, compounds that are converted in the body into phytoestrogens, which are similar to natural estrogen. The thinking is that the isoflavones fit into estrogen receptors and have a similar effect, acting as a sort of replacement for your missing estrogen. That's the theory, at least, but the reality is different. A very small amount of isoflavones can be helpful, but larger doses may do some harm. I recommend supplements for getting isoflavones, not soy foods. Soy milk is heavily processed and sweetened; other soy foods contain highly variable amounts of isoflavones. An alternative to isoflavone supplements are supplements made from kudzu, which also contains natural isoflavones.

Soy foods and supplements are an emotional issue. Some of my people have strong feelings in favor of soy; others are very opposed to it. I don't take sides. I provide the objective research to anyone who is concerned about soy one way or the other. Soy has some remarkable benefits, but it can also be a bit tricky to use if you don't understand it well. I usually tell my people, a little soy is helpful, but a lot of soy may cause problems.



CHAPTER 8

NUTRITION FOR A BALANCED BODY

The final point on the Star of Wellness is nutrition. This is the point that is the key to direction, which is why it points north. Without balance in this point, all the other points lose direction and fall out of balance. In functional medicine, food is foundational, food is forever, and, most importantly, food is fun—a balanced diet leads to a balanced body. We hear that all the time, but in this chapter I'm going to explain what that really means. Functional medicine recognizes that every individual is different and needs a personalized diet that matches his or her body. For me, nutrition really is the True North of good health. I work with my people diligently to find the right nutritional approach for them.

BALANCED DIET, BALANCED BODY

The right ingredients in the right ratios create the right food plan for every individual. Each of us has our own personalized blueprint, made up of our genetics, our strengths, and our vulnerabilities. Individualizing your diet starts with common ground, however. As a human being you are an individual, but you are human at baseline. Like all humans, you need the basic three macronutrients—carbohydrates, proteins, and fats—and three micronutrients—vitamins, minerals, and phytonutrients. It's true that you are a unique snowflake. Never before and never again will there be another you, but when you look at the snow-capped mountains of the Rockies, at some point you have to agree there are some common factors to snow in general.

I like to look at nutrition in two basic categories: macronutrition (or the big nutrients) and micronutrition (the little nutrients). Macronutrition is made up primarily of carbohydrates, proteins, and fats. Fiber and water play major roles as well. Micronutrients consist of vitamins, minerals, and a wide range of plant-based compounds (phytonutrients) that play a role in many of the chemical pathways and reactions within our body. Both groups are essential components to balanced nutrition.

CATEGORIZING MACRONUTRIENTS

Let's look at the three big nutrients first. In your body, carbohydrates (starch- and sugar-based foods) are mostly used for energy.

Proteins are mostly used for metabolism, cell growth, and making enzymes. Fats are mostly used to create and maintain cell membranes.

We can characterize carbohydrates in many ways, some that are familiar and more that are confusing. We talk about simple carbohydrates and complex carbohydrates, or worse yet, good carbs and bad carbs. We can't make moral judgments on carbohydrates. Rice is just rice; it is not good or bad. A better way to look at carbohydrates is to see how quickly they are converted by your digestion into glucose, a basic carbohydrate source of energy in your bloodstream. The speed at which carbohydrates are converted is separated into high (or fast) or low (or slow) types. To decide how quickly a carbohydrate is absorbed into your bloodstream as glucose, we use a scientific scale called the *glycemic index*. The glycemic index is a bit complicated, but it really comes down to the speed of the glucose conversion based on eating a typical portion of the food. Some carbs are high glycemic: they're quickly converted to glucose. Others are low glycemic: they're converted more slowly. Generally speaking, the faster a carbohydrate enters your bloodstream as glucose, the more refined and undesirable it is. These foods are bad for you for two reasons. First, when a carbohydrate is rapidly converted to glucose, the process is often inefficient and leads to a by-product, such as excess free radicals that can create harmful oxidation. In other words, speed kills. Sometimes we want fast energy, like when we are about to run in a race. In that case, you might be willing to risk the oxidative consequences to get the fast energy. There's a price to pay beyond potential cell damage, which brings me to the second reason to avoid fast carbohydrates. High-glycemic carbs tend to give you rapid blood sugar jumps and uneven energy levels. They put you on the energy roller coaster and make it hard to get off.

Low-glycemic carbs give you slower but steadier energy. They create much more stability and efficiency in the energy exchange needed by your body. They also create a lot less oxidation as they are digested and used for fuel. Low-glycemic carbs tend to keep your blood sugar stable and create balanced and even energy.

Protein is the major building block for structure and function in the body. Proteins get broken down in your body into their basic building blocks, the twenty different amino acids. The amino acids fall into two categories: essential and nonessential amino acids. Nine of the amino acids are essential—you have to have them, and you can only get them from your food. The nine *essential amino acids* (EAA) are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. The rest are nonessential. Your body can build them from other substances in your body, like carbohydrates and additional amino acids. This amazing process happens within the cell and is helpful in times of protein loss or scarcity.

Within the family of essential amino acids, there are three called *branched chain amino acids* (BCAA): leucine, isoleucine, and valine. You need all the essential aminos to build muscle and keep your body composition balanced, but the BCAAs play the biggest role in these functions. To grow muscles, it's especially important to get BCAAs into your system. This becomes even more important as you age because after about age thirty we lose about 1 to 2 percent of our muscle per year. This isn't good for your metabolism, energy, or body composition.

Amino acids are found in all animal foods and many plant foods. The protein in animal foods is complete: it contains all or most of the nine essential amino acids. Animal foods such as eggs and meat are complete proteins. An incomplete protein is missing one or more

of the essential amino acids. Most vegetable foods, such as nuts and beans, contain some but not all of the essential amino acids in various combinations. Corn, for example, is high in methionine but very low in lysine and threonine.

Eating animal foods is a personal choice that has a strong emotional component. You can be perfectly healthy and get all the amino acids you need without ever eating an animal food but only if you have a good understanding of nutrition. I tend to lean on the side of animal foods only because it is easier to get complete proteins that way. However, you can combine plant-based sources of proteins in such a way as to get all the amino acids and therefore, complete proteins. Rice, for example, is very low in lysine, but red beans contain lots of it. If you eat both, you'll get enough lysine from your diet even if you don't eat animal foods. A good rule of thumb is to combine legumes (one type of incomplete protein) with nuts or whole grains (other types of incomplete proteins) to make complete proteins. One problem with this approach is you need a fair amount of nutritional knowledge and cooking skills to make it work. Another problem is that a diet without animal foods tends to be heavy on carbohydrates as a way to get enough complete protein. This can throw off the ratio of the other macronutrients.

The third macronutrient is fat. This is the one that really confuses my people because they have been brainwashed by the idea that a low-fat diet is healthier. Not so. You need dietary fat just as much as you need protein. In fact, dietary fats also come in essential and nonessential forms. You need to get plenty of the essential fats.

The essential fatty acids fall into two categories: linoleic acid, also known as omega-6 fatty acids, and alpha-linoleic acids, also known as omega-3 fatty acids. In general, omega-6 fatty acids promote

inflammation, while omega-3 fatty acids are anti-inflammatory. That might lead you to think that you should leave out the omega-6 fatty acids, but remember, they're essential—you need to get them from your diet. You need to get a good balance of both in your food. These particular fats play a large role in inflammation pathways and in our immune system. When their balance is thrown off, problems arise. Highly processed, inexpensive vegetable oils, such as sunflower and soybean oil, are used in a lot of prepared and processed foods, like frozen dinners and baked goods. These oils are high in omega-6 fatty acids, to the point of distorting a healthy ratio of omega-3 / omega-6 in your body. The ratio is thrown off even more when processed foods like french fries force out healthier fresh foods with natural omega-3 in them, such as fish, whole grains, nuts, and kale.

Fats also come in other categories. This can get complicated and confusing, but it's worth going over all the abbreviations you see on food labels so you can know what you are eating.

Fat falls under categories known as polyunsaturated fatty acids (PUFA), monounsaturated fatty acids (MUFA), saturated fatty acids (SFA), and trans fatty acids (TFA). To really understand these you have to understand biochemistry ... but I may have an easier way. Classically, we see fats based on how they are bonded and hence their stiffness at room temperature. The bonds of these fats are either double bonds or single bonds. The more single bonds a fat has, the more saturated it is, and the fewer single bonds it has, the less saturated. Think of the chains within fats as a bus and the bonds as seats for hydrogen ions, or in the bus analogy, people. If a fat is completely saturated, there are no seats left on the bus. The bus, and the fat, is saturated with people, or hydrogen ions. This tends to make the fat stiff and inflexible. These tend to be the fats we worry about and that influence disease states, such as cardiovascular disease.

These fats are found in cream cheese, cheese, butter, ghee, suet, and fatty meats. Monounsaturated and polyunsaturated fats are more helpful in the body. They're found mostly in nuts, olives, avocados, seeds, fish, algae, leafy greens, and krill. Because there are empty seats on these buses, anyone, or anything, including chemical toxins, can end up sitting in them. Unsaturated fats are a bit more susceptible to oxidative damage and rancidity. They should be kept cooler and stored appropriately.

The last category, trans fatty acids, is of less concern in America recently. These are unnatural unsaturated fats that have been chemically altered to assist with stability. Unfortunately, this alteration made them a hazard and an influence on cardiovascular disease. At one time margarines, Crisco, and certain packaged snack foods had these trans fats. However, in 2013, the US Food and Drug Administration (FDA) issued a preliminary determination saying trans fats aren't safe. This means that now trans fats cannot be used any longer in processed foods.

COMBINING MACRONUTRIENTS

If you eat the Standard American Diet, you're eating 55 to 60 percent carbohydrates, 15 percent protein, and 23 to 30 percent fat. This diet is high in calories from refined carbohydrates and low in nutrition from fruits and vegetables and good fats. Basically, it leaves you overfed and undernourished. All you have to do is look around you to see that this ratio is a formula for weight gain and bad health.

A much better approach is the basic Mediterranean Plan, which has a better balance of the macronutrients: 40 percent carbohydrates, 30 percent protein, and 30 percent fat. This is the plan I recommend

to most of my people. It helps with weight loss if they are overweight, and it is an easy way to get balanced nutrition while also enjoying your food. But even if you're not overweight, this plan helps improve body composition by giving the appropriate amount and ratios of all the macronutrients needed for balanced health and optimal living. In addition, this is the plan that creates the smallest amount of inflammation and shows the most benefit for helping to prevent heart disease, type 2 diabetes, and even cancer.

For some people, a different ratio that I call the Modified Mediterranean Plan is even more helpful because it has fewer carbohydrates: it's 33 percent carbohydrates, 33 percent protein, and 33 percent fat. This tightens the reins on the storage hormone insulin by dropping out some of the calories from carbohydrates. However, it doesn't drop them out so much that you lower your potential for muscle and lean tissue growth. It's a bit more rigorous than the basic Mediterranean Plan, but it's more powerful for weight loss and for helping to normalize blood sugar.

I recommend the ketogenic plan, which minimizes carbohydrates for some patients who need to lose weight rapidly. The ketogenic plan is 5 to 10 percent carbohydrates, 30 percent protein, and usually more than 60 percent fat; however this is most often plant-based, wild-animal, and low-inflammatory fat. It's a good plan for jump-starting weight loss, but it's restrictive and hard to stick with. I recommend it for some people in the short term, but very few of my people need to be on it for more than a few months. After that, I usually transition people to the more manageable Modified Mediterranean Plan.

MICRONUTRIENTS: A LITTLE GOES A LONG WAY

You need micronutrients such as vitamins and minerals only in very small amounts, but you have to have them. For example, there are thirteen vitamins in all, and you need every single one, no exceptions. The amounts of vitamins and minerals, such as calcium, you need are so small that they're measured in milligrams or even micrograms, but without those tiny amounts, your body can't make all the thousands of enzymes and hormones it needs to keep you alive.

Vitamins are organic chemical compounds that you have to get from your diet because your body can't make them on its own. They're not food, they have no calories, and they don't generate energy. Vitamins fall into two basic categories: fat soluble (they dissolve in fat and can be stored by your body) and water soluble (they dissolve in water and can't be stored). The six main B vitamins and vitamin C are water soluble; vitamins A, D, E, and K are fat soluble.

Vitamins have multiple biochemical functions in your body's pathways. Some, such as vitamin D, have far-reaching hormone-like functions and influence mineral metabolism, immunity, and cancer risk. Others play a role in cell and tissue growth and differentiation (such as vitamin A). Others function as antioxidants—especially vitamin E and sometimes vitamin C. The largest group of vitamins, the B complex vitamins, function as enzyme precursors, helpers, and cofactors, and consequently, B vitamins play a large role in the conversion of food into energy.

Because we can't make vitamins (except for vitamin D, which is manufactured in your body after exposure to sunlight), we need to

get them from our food or supplements. A shortage of any vitamin will have downstream effects on every system in your body.

VITAMIN/MINERAL	WHERE TO FIND THEM
Vitamin A	Liver, carrot, sweet potato
Vitamin D	Fatty fishes (catfish, salmon...), egg
Vitamin E	Wheat germ oil, sunflower seeds
Vitamin K	Spinach, kale, broccoli
Vitamin C	Guavas, red pepper, broccoli
Choline	Egg, beef, cauliflower
Thiamin (B1)	Egg, legumes, whole grains
Riboflavin (B2)	Dairy, eggs, greens
Niacin (B3)	Dairy, eggs, fish
Pantothenic Acid	Mushrooms, cauliflower, broccoli
Vitamin B6	Avocado, bananas, legumes
Folic Acid/Folate	Dark greens, legumes, citrus fruits
Vitamin B12	Eggs, soy milk, poultry
Biotin	Tomatoes, romaine lettuce, carrots

MINERALS: BUILDING ON THE ROCKS

A number of minerals, such as calcium, magnesium, and potassium, are also necessary for many functions in the body. Simply put, these are essential rocks that we need to optimize our health. Like vitamins, they have to come from our food and supplements—we can't manufacture them in our bodies. The exact definition and number of essential minerals is a bit hard to pin down, but the generally accepted definition is that an essential mineral is an inorganic substance you need in amounts of more than one hundred milligrams a day. If you need it, but in amounts less than one

hundred milligrams daily, the mineral is considered a trace mineral. The essential minerals, based on their abundance within the body, include calcium, phosphorus, potassium, sulfur, sodium, chlorine, and magnesium. The most important trace minerals include iron, copper, zinc, manganese, iodine, and selenium. Your body also contains a lot of trace minerals that you need in very, very small amounts, such as a boron and vanadium. Minerals often play large roles in chemical and electrical pathways as necessary elements of hormones, enzymes, and neurotransmitters, often in combination with vitamins.

MINERAL	FOOD SOURCE
Calcium	Milk, cheese, yogurt, buttermilk, tofu
Phosphorous	Milk, milk products, meat, fish, poultry, eggs, nuts, dried peas, and beans
Iron	Liver, organ meats, egg yolk, meat, poultry, oysters, whole grains and enriched breads and cereals, dried peas, and beans
Sodium	Salt, meat, fish, poultry, milk, and milk products
Potassium	Fruits, vegetables, meat, fish, poultry, milk, and milk products
Iodine	Seafood, iodized salt
Magnesium	Whole-grain cereal, nuts, dried peas and beans, milk, meat, leafy greens
Copper	All liquids: water, coffee, tea, soft drinks, fruit and vegetable juices, milk, ice

PHYTONUTRIENTS: EAT THE RAINBOW

You definitely need to get vitamins and minerals from your diet or supplements. For optimal health, you also need to get plenty of those

mysterious yet miraculous chemicals known as phytonutrients from your diet. “Phyto” means relating to plants—many of these nutrients are best gotten by eating the plant foods that contain them. What’s marvelous about phytonutrients is that they are color-coded—they are a sort of paint-by-number way to achieve your best health. Eating across the color spectrum is crucial. Aim for at least one to two servings a day from fruits and vegetables of every color: red, orange, yellow, green, blue, purple, white, and tan. Phytonutrients vary by color; they target different areas and pathways in your body. By eating all colors every day, you help your body to reach optimal health and balance. Not only will you be getting plenty of vitamins, minerals, and phytonutrients, but you’ll also never be bored by your food. Aim for eating plant foods in season as much as you can.

PHYTONUTRIENTS	FOUND IN
Allicin	Garlic, onions, jicama
Capsaicin	Cayenne peppers, red peppers
Carotenoids	Carrots, tomatoes, cantaloupe, arugula, spinach, collard greens, kale, mustard greens, swiss chard, turnip greens, broccoli, Brussels sprouts, sweet potatoes, butternut squash, pumpkin, red peppers
Catechins	Green and black teas
Ellagic Acid	Grapes, strawberries, blackberries, cranberries, walnuts
Genistein	Tofu, soy milk, soybeans
Indoles and Isothiocyanates	Collard greens, kale, broccoli, cauliflower, cabbage
Isoflavanes	Kudzu, soybeans, peas, peanuts, legumes
Lignans	Seeds and grains, especially flaxseed
Limonoids	Citrus fruit peels

Lycopene	Tomatoes
Phenols	Black and red berries, celery, cabbage, grapes, eggplant, peaches, nectarines
Phytosterols	Pumpkin, rice, soybeans, yams, all green and yellow vegetables
Polyphenols	Buckwheat, wheat germ
Saponins	Alfalfa, legumes
Zeaxanthin	Kale, daikon, collard greens, green sorrel, arugula

Most importantly, I ask my people to avoid processed foods. Eat from the farm and the forest, not the factory. Factory foods are made from ingredients that have largely been stripped of their nutritional value or have little to begin with: white flour, sugar, highly processed vegetable oils. They're also full of added salt, added sugar (often in the form of high-fructose corn syrup), and additives in the form of artificial sweeteners, artificial colors, and preservatives. These foods are very unnatural and really confuse your body as it tries to deal with the calories, bad fats, and additives. They can make your metabolic pathways start to spin too fast, creating more inflammation and oxidation and putting a strain on your detoxification pathways.

SPICE IT UP

Throughout the world, certain regions are known for the spices in their food. What's interesting is that most cultures that have the healthiest individuals who live the longest also use distinct spices in their cooking. Many of these spices are hot, pungent, and sometimes bitter. They can directly influence our balance through the points of the Star of Wellness.

Unfortunately, the typical American spice rack consists of two spices: sugar and salt. I always tell my people to go around the world with their spices. Each culture has its own protective herbs. Mediterranean countries use thyme, sage, oregano, and rosemary, which help with digestive issues as well as inflammation issues. India is famous for turmeric, a huge anti-inflammatory and detoxifying agent that gives curry dishes their bright yellow color. Chinese and Asian dishes use lots of ginger, which is great for the digestion. Of course, hot peppers are used in almost all cuisines; they enhance metabolism as well as improve digestion.

When you start using a variety of spices, you move away from sweet foods and more toward the savory. These foods are more satisfying and fill you up longer than sweet foods. In my view, the more you exercise your taste buds, the more you'll be satisfied with a variety of foods.

SUPERFOODS

You know that exciting moment when Clark Kent rushes into the phone booth (well, if he can find one now) and changes into Superman? That's how superfoods work. They're mild-mannered on the outside, but underneath they have extraordinary powers for improving our health and vitality. Most superfoods are crammed with phytonutrients, particularly antioxidants. I feel that any deeply colored fruit or vegetable is a superfood, but there are some that are particularly valuable. Berries, for instance, are a good way to get the benefits of eating colorful fruits. They're sweet, they're flavorful, and they're full of phytonutrients, such as anthocyanins, which are powerful antioxidants. Some people like unusual berries such as goji and acai, but all berries are good choices.

Other great superfoods include avocados, mangos, garlic, pomegranate, spinach, kale, red grapes, and cherries. What do all the superfoods have in common? Deep, vivid colors.

My favorite superfood, however, is chocolate. Dark chocolate is full of phytonutrients and antioxidants as well as neurochemicals. One type of phytonutrient, called flavonols, is great for your brain function. Dark chocolate also stimulates your brain's production of calming natural chemicals, such as endorphins. It creates a playground for your brain. It's also a great source of antioxidants. Chocolate is a shotgun full of chemistry, but like a shotgun, chocolate should be used with some caution. As most of us know, it's easy to overdose on this superfood. Keep in mind that dark chocolate doesn't necessarily mean candy. You want to get the nutrients from the chocolate itself, without adulterating it with lots of milk, butter, and sugar. Look for brands that contain at least 70 percent cacao. Try to limit yourself to just a couple of squares a day.

DIETARY SUPPLEMENTS

If you are eating a modified Mediterranean diet and plenty of colorful fruits and vegetables, then you're already getting plenty of vitamins and minerals from your food—the best and most natural way. Some experts argue that the topsoil in our country has been stripped over the years of its nutrients and that consequently, the food of today is less rich in nutrition than food of years ago. I think there's some validity to this theory. Also, some of our foods have been genetically modified. Although some will argue that nutritionally these foods are the same, the fact is that their blueprint is different; it's likely that their chemistry is different as well. Most realistically, however, we can't always eat the way we'd like—less than 5 percent

of all Americans eat even five half-cup servings of fruits and vegetables every day. And if you have a chronic health problem, need to take medications, are recovering from surgery or an injury, or have anything else in your life that is throwing you out of balance, you may not be getting enough of these nutrients, or you might not be absorbing them well.

Today, most of our produce is grown on depleted soil and may not contain much in the way of minerals. And when fruits and vegetables are picked in one place and then shipped thousands of miles, they have lost some of their vitamins and nutritional value by the time they get to you. (This is a good reason to buy locally grown organic produce whenever possible.) I recommend a high-quality daily multivitamin/mineral supplement for all my people in order to supplement the lack of nutrition that is occurring in modern food. However, be careful when choosing your vitamins and supplements because not all of them are created equally. A recent article in the *New England Journal of Medicine*, October 2015, attributed more than twenty-three thousand emergency room visits per year to over-the-counter supplements. Equally bad are the supplements that are too low quality to have any effect at all. Another study in *BMC Medicine* stated, "Most of the herbal products tested were of poor quality, including considerable product substitution, contamination, and use of fillers."⁴ Make sure you choose a company that has independent research on their vitamins and supplements as well as third-party quality checks to the purity of their products. When it comes to your vitamins and supplements, do not compromise with your health and well-being.

4 Newmaster, Steven G., Megan Grguric, Dhivya Shanmughanandhan, Sathishkumar Ramalingam, and Subramanyam Ragupathy, "DNA barcoding detects contamination and substitution in North American herbal products," *BMC Medicine* (2013), 11:222, doi:10.1186/1741-7015-11-222.

THE MODIFIED MEDITERRANEAN FOOD MATRIX

My team and I have created a food matrix to help you figure out the best way to choose your meal components while following the Modified Mediterranean meal plan. If you follow this foundational matrix, you will probably lose some weight if you need to, but it's not a weight-loss diet. It is a lifestyle approach to long-term good health. Even if you don't need to lose weight, the matrix will help you get back to a balanced body composition. It brings together all the other points of the Star of Wellness: it decreases inflammation, increases metabolism, improves detoxification, and reduces oxidative pathways.

The Modified Mediterranean Plan is the foundational plan; we call it the Food Matrix. Using it as a starting point, you can modify it for your current health issue. If you need to reduce your inflammation level, for instance, you would eliminate grains and dairy and replace them with more vegetables, other proteins, and fat. If you need to detoxify, you would add more colorful vegetables.

In its simplest form, the Modified Mediterranean matrix means balancing out your macronutrients and micronutrients. To a degree, this will vary based on your weight, your gender, and your caloric needs. As a starting point, here's what a 1,600-calorie balanced plan would be:

- breakfast: two protein servings, two carbohydrate servings, one fruit/vegetable serving

- midmorning snack: two protein servings, two carbohydrate servings, one fruit/vegetable serving

- lunch: two protein servings, two carbohydrate servings, one fruit/vegetable serving
- midafternoon snack: one protein serving, one carbohydrate serving, one fruit/vegetable serving
- dinner: two protein servings, two fruit/vegetable servings, leafy green salad, no carbohydrates

Here are some points to keep in mind:

- Your protein should be from animal sources—the kind that swim, fly, or run. Eggs are also a great source of protein. Avoid milk, dairy products, and cheese.
- You will be getting healthy fats from your animal protein sources. Add more by using olive oil for cooking and in salad dressings.
- A protein serving is about three ounces.
- A carbohydrate serving is about half a cup.
- Fruit/vegetable servings are about one cup.
- Vary your fruits and vegetables to eat as many colors as possible each day, and aim for two different colors at each meal.

- If you are overfull, keep the ratio the same, but cut back on the serving sizes.

- If you still feel hungry, keep the ratio the same but increase the serving sizes.

WHAT TO DRINK?

The human body is about 60 percent water; your blood is 90 percent water. For overall balance and health, water is essential. Drink plenty of it. Make sure it is clean and pure. Avoid chemicals, and never intentionally put chemicals or flavoring agents in your water. However, some of my people tell me that they get bored with just plain water. Infusion water is a really good way to bring some spice and flavor into your water. I have a simple rule for infusion water: start with one fruit and one spice, and experiment from there. My personal favorite is cucumber, lemon, and mint.

Skip any kind of soda pop, especially the diet kind because of the chemicals and artificial sweeteners in them. Go very easy on fruit juice as well. Choose only natural, unsweetened fruit juice, and cut it in half with water. Herbal teas are great. Any kind of tea, but especially green tea, is a good choice. In the Blue Zones, tea drinkers tend to live longer than do non-tea-drinkers. Coffee in moderation is fine, because it has a lot of antioxidants, but it does tend to create acidic urine and may slow down detoxification pathways.

FOOD IS MEDICINE

Hippocrates, the Greek physician who is the father of medicine, said more than 2,500 years ago, “Let food be thy medicine and medicine be thy food.” When it comes to improving your health, food is still your best option.



CHAPTER 9

SLEEP AND STRESS REDUCTION

When I was a medical student, we didn't learn anything about the importance of sleep for health. It simply wasn't on the curriculum because it just wasn't seen as important—even though new regulations about how many hours students and residents could work had just been put into place. At the time, many of our professors and teaching physicians thought this was going to make us soft. It's just as well sleep wasn't on the curriculum because medical students don't get much sleep anyway.

Only later, when I started practicing functional medicine, did I come to understand how crucial good sleep is for a balanced body and a balanced mind. I came to understand the importance of sleep

for recalibration and for the role it plays in healing, repair, and detoxification. In fact, I've come to agree with the sleep experts: sleep is one of the most important factors for balanced, good health. If you don't get adequate sleep, you handle stress poorly and make poor nutritional choices, and if you don't handle stress well, you sleep poorly, and so on in a downward spiral. When the interplay of these three factors becomes unbalanced, your mental and physical health can suffer.

I've already talked about how chronic stress can damage the body. Over time, the damage accumulates, unless you have some recovery from the stress. This is also known as the *spring theory of stress and aging*. Stress is like a weight that pulls on a spring. If the stress is too great or too frequent, then the spring can lose its natural tension and ability to recoil. Cumulative stress without recovery leads to damage, sometimes irreparable damage, to your body. The key recovery component is sleep. It reduces levels of stress hormones and is vital for detoxification and helping your lymph system do its job.

Sleep also resets the body and helps the adrenal glands to return to normal. It's almost a start-over button for them. The more stress you have, the more sleep you need in order to compensate for the elevated stress-hormone production by the adrenals. Sometimes our circumstances don't allow us to get enough sleep in the short term. It's important to compensate for that in the long term. Too often we put off sleep and push through the stress like some badge of honor. We say silly things like, "I'll sleep when I'm dead." That may be coming sooner than you think if you don't get enough sleep.

SLEEP HYGIENE

Many of my people tell me they're tired all the time because they don't sleep well. When I ask them about their bedrooms, I can understand why. The bedroom is designed for two things; sleep is one of them, and you can guess the other—both are fabulous things to do in the bedroom. When you contaminate the bedroom with other activities, like watching TV, playing video games, checking e-mails, and catching up on office work, the brain gets confused about what the bedroom is for. When it comes to your bedroom and your sleep, do anything that is not related to sleep someplace else.

Some studies show that simply having a television in your bedroom increases your risk for diabetes. This may seem puzzling at first, but when you understand how sleep benefits you, it becomes clear. We know that watching television makes your brain go into a brain-wave state that's somewhere in between the alpha waves of being awake and the delta waves of being asleep. When you confuse the patterns of your brain by watching TV before bed, you put yourself into a sort of partial sleep that can keep you from getting deep sleep when you finally switch off the set. The same thing seems to happen when you do anything with a screen, like play video games or read on an iPad.

Eating is another thing to avoid near bedtime or in the bedroom. Eating gears the body up for producing energy or potentially storing energy. If you eat before bedtime, especially if you eat high-energy foods like carbohydrates, you'll create a disturbance in your sleep. And if you eat in bed, you'll confuse your brain as to what the bed is for. Worse yet, high-glycemic carbohydrates will spike your blood sugar before you go to sleep. This will inevitably lead to a release of insulin to lower your blood sugar. If your blood sugar gets too low,

you will instinctively wake up and disturb the delicate balance of a good and full night's sleep.

Avoiding food at the wrong time and limiting screen time before bed are big factors in good sleep hygiene. Lots of other factors play into the equation. From a practical standpoint, you want your bedroom to be inviting for sleep. You want it to be on the cool side, dark, and quiet. Your mattress, pillows, and bedding should be comfortable for you. Also, wear loose-fitting sleepwear.

Bedtime rituals can be very helpful for getting to sleep quickly. When you were a kid, you had a favorite stuffed animal to hold at bedtime; that bedtime story got your brain ready for sleep. As an adult, the same thing is true. Having a regular bedtime and a regular ritual puts your brain into sleep mode.

Whatever works for you is fine for a bedtime ritual. Some people like a warm bath; others find a cup of hot herbal tea relaxing. Just about all my people find that reading something before bed helps them get to sleep. One bedtime ritual to avoid, however, is the nightcap. Alcohol can help get you to sleep, but it keeps you from reaching the deeper sleep stages. It disrupts the neurochemicals in a way that truly makes you sleep "too hard." It locks you into certain stages of sleep without allowing you to roam throughout all the stages of sleep for the whole night.

Darkness in the bedroom is also very important. If light falls on your retina, your brain is fooled into thinking that it's daytime and you should be awake. The light shuts off your production of the hormone melatonin in the brain. Melatonin helps regulate your sleep/wake cycle, so disrupting it will keep you from falling asleep. Supplementing melatonin can be helpful for sleep, especially if you are shifting time zones. But use the natural sources you have and

turn out your lights. Keep them off even if you get up in the night—locate night-lights strategically to avoid tripping on something in the dark.

SLEEP APNEA

Heavy snoring can seriously disturb your sleep and potentially the sleep of your partner. If it comes from your partner, you'll be kept up or awakened in the night. If it comes from you, it's a warning sign that you might have sleep apnea. This is a serious disorder that causes your breathing to stop or get very shallow in your sleep. Your breathing may stop for anywhere from a few seconds to almost a minute; the pauses may happen thirty times or more an hour. If you have sleep apnea, it is probably because your airway collapses or becomes blocked while you sleep. This makes you snore loudly and then start breathing again with a snort or choking sound. Every time you start breathing again, you experience a sort of mini-awakening. Needless to say, sleep apnea keeps you from getting any deep sleep in the night, so you feel drowsy during the day. The lack of oxygen while you sleep raises your blood pressure and can lead to heart failure and stroke. It is sort of like drowning in the middle of the night—sometimes several times a night. And very much like the cumulative effects of stress, the cumulative effects of low oxygen from sleep apnea have disastrous effects on the body, especially heavily oxygen-dependent areas like the heart and the brain.

How can you tell if you have sleep apnea? If your partner leaves the bedroom at night, there's a 90 percent association with sleep apnea. Being overweight is a major cause of sleep apnea. If you snore heavily and you weigh too much, talk to your doctor about having a sleep study done to diagnose sleep apnea. Weight loss is very helpful,

but unfortunately, it becomes challenging to lose the weight if you're not sleeping well. Many of my people have benefited from using a dental device that moves the jaw forward and makes breathing easier. You can also use a continuous positive airway pressure (CPAP) device. The machine adds pressure to the air you breathe while you're sleeping and keeps the airway open. You need to wear a sort of mask over your nose and mouth. A CPAP device is surprisingly easy to get accustomed to and can really help both you and your partner sleep better.

HOW MUCH SLEEP DO YOU NEED?

How much sleep is enough? We doctors always tell our people to aim for seven to nine hours because that works for most people. Some people are long sleepers, however, and need more than eight hours to feel well rested. Others do fine on fewer than seven hours. Your optimal sleep time is unique to you. A good general rule of thumb is that you need one hour of sleep for every two hours you are awake. The cumulative effect of lack of adequate sleep is called *sleep debt*. As your sleep debt accumulates, you feel increasingly physically and mentally tired. Some experts say we can accumulate sleep debt for up to six weeks without long-term effect, but longer than that can have real health consequences.

If you miss out on your optimal sleep for one or two nights, you can catch up on your sleep debt just by sleeping a bit longer the next night. If you go short on sleep for more than a few days, however, you can't really make up your sleep debt by sleeping much later one morning, unless you really match the time you have missed. I recommend simply trying to get back to your normal sleep schedule

as soon as possible and adding twenty to thirty minutes in at the start of your sleep cycle to start paying off your debt. If you have been building up sleep debt, you will eventually have to pay it back, sometimes with interest. Sleep debt has significant consequences—you want to pay it back now and not fall into eternal sleep bankruptcy.

When you sleep, your brain cycles through five different stages, not so creatively called: Stage 1, Stage 2, Stage 3, Stage 4, and then Stage 5. In Stage 5, you have the rapid eye movements (REM) that are believed to indicate dreaming. You can dream in other stages, but most of your dreaming occurs in REM sleep, and most of your brain gets its best sleep in REM.

Stage 1 sleep is the start of sleep, or light sleep. You sort of drift in and out of sleep here and can be easily awakened. Most of sleep time is spent in Stage 2, which is transitional sleep. Your body temperature drops and your heart rate slows in a relaxed state. Interestingly, that's also when our brains secrete the most melatonin. Stage 3 and 4 are similar stages, except for the differences in classic EEG brain recordings; these are deep-sleep stages, with Stage 4 being deeper than Stage 3. And lastly comes stage 5, or REM sleep, where brain activity and dreaming usually occur while your muscles and other systems are very relaxed.

We cycle through these stages several times every night. To feel rested both physically and mentally, it is important to cycle through these stages completely at least once in the night but preferably more. A sleep cycle is usually around sixty to ninety minutes. In the course of the night, on average you go through the sleep cycle four to six times.

If you're going through a time when you are short of sleep, you can try to make up for the missing sleep cycles by taking a nap. In

a twenty-minute nap you won't be able to cycle all the way through the five stages—you'll probably only get into Stages 1 and 2. Many people find a nap does recharge them, and science shows it can impact sleep debt in a powerful way if done correctly and well. We know that in the healthy Blue Zones of the world, the afternoon siesta is simply part of the day. Will napping work for you? Again, it's very individual, so the only way to know is to try.

SLEEP DISTURBANCES AND NATURAL SLEEP SOLUTIONS

Sleep problems can almost always be handled simply by lifestyle changes and dealing with upstream issues. In fact, I find that many of the medications my people take actually disturb their sleep. Antidepressants and antipsychotics are well known for their disruptive effects on sleep. Bupropion, for instance, often gives people nightmares. Neurochemistry is delicate and poorly understood even by experts, so disturbing the chemistry can disturb a lot. Any drug that stimulates your body or brain will ultimately disrupt your sleep. Most medicines will affect some of the natural chemicals that are necessary to transition into sleep and cycle smoothly through the sleep stages. As a functional medicine physician, I try to help my people get off these drugs. Getting a good night's sleep will do more to help depression than taking an antidepressant drug that gives you bad dreams.

There are three major categories of sleep disturbances, all of which can be treated with sleep aids and sleep hygiene, not drugs.

The first type of sleep disturbance is when you can't get to sleep. This problem is almost always a neuroendocrine problem—your production of the neurotransmitter serotonin is disrupted, or your

melatonin production is disrupted, or you may have low thyroid hormones. More commonly, you have a worried brain—stress means you have a hard time turning off your thoughts.

The functional medicine approach to each possible cause is different. If the problem seems to be in the serotonin and melatonin, we can use natural supplements to increase the levels of these brain chemicals. For low serotonin, I recommend a supplement called 5-hydroxytryptophan (5-HTP) made from a plant called *Griffonia simplicifolia*. Melatonin supplements help restore the natural sleep/wake cycle, especially if it's been disrupted by shift work or travel across time zones.

Botanicals can be very helpful for relaxing you by gently increasing your production of serotonin and melatonin and getting you ready to fall asleep naturally. My people have had success with botanicals such as passion flower, valerian root, lemon balm (melissa), and hops.

If low thyroid function is the issue, we have to deal with the underlying problem, as I explained back in the chapter on hormonal imbalance.

Calcium and magnesium supplements are very helpful as sleep aids, particularly if a worried brain is keeping you up. Research has shown that sleep disturbances, especially in REM sleep, are linked to calcium deficiency. You need calcium to convert the amino acid tryptophan into the sleep hormone melatonin. The main symptom of magnesium deficiency is insomnia and waking up a lot at night. If you want to try these supplements for improving your sleep, talk to your doctor first. It's important to keep the two in a balanced ratio of about twice as much calcium as magnesium. Too much magnesium can really upset your digestion, so be cautious.

A botanical that really seems to help the worried brain to calm down is Chinese skullcap. The botanicals polygala and jujube are also helpful because they decrease anxiety and worry.

The second type of sleep disturbance is not being able to stay asleep through the night. This almost always turns out to be a problem with low blood sugar. When we eat the typical American diet, we get too many refined carbohydrates. That gives us highs and lows in our blood sugar. For about 80 percent of my people who can't stay asleep, low blood sugar in the middle of the night is the problem. They may wake in the night feeling cold and clammy, or they may have night sweats. Either way, they usually feel hungry.

I have one person who was taking pills for his blood sugar. After he lost twenty pounds following the Modified Mediterranean Plan, he told me he was waking up in the night drenched with sweat. This was actually a sign that he was getting better—his blood sugar was stabilizing, so the medication was making it drop too low at night. We solved the problem by stopping the medication. The best solution to nighttime wakening is to stabilize your blood sugar and avoid dropping too low. That's as easy as following the Modified Mediterranean Plan. Stabilizing your blood sugar on the plan can take a while, however. As a short-term solution, I have my people try adding a healthy carbohydrate snack before bed. Ice cream is not a healthy carbohydrate. Neither are cookies. I often suggest an additional meal consisting of the 40:30:30 balance of carbohydrates, proteins, and fats. For this to work, choose low-glycemic-index carbohydrates, specifically plant-based and unrefined carbohydrates.

Some particularly good sources of long-acting carbohydrates for stabilizing sugar come from amylopectin (from short grain rice) and waxy maize (from a special corn called waxy corn). However, if we

are going to stay with just food as our sources, there are some good choices. Practical approaches to stabilizing blood sugar to keep from waking up in the middle of your sleep include nuts, legumes, fruits (especially apples, grapes, peaches, pears and grapefruit), brown rice, sweet potatoes, oats, and, of course, most vegetables.

The third type of sleep disturbance is feeling tired or not rested when you wake up, even though you slept for seven to nine hours. This is usually because there is something wrong with the programming of your sleep cycle. You are sleeping long enough, but the architecture of your sleep is disturbed because you're not cycling through all the sleep stages.

The causes of sleep cycle disturbances can get complicated. They usually have to do not only with just serotonin and melatonin but also other pathways for brain chemicals, such as acetylcholine, GABA, and dopamine. These play a large role in deep sleep and REM sleep. To help with sleep-cycle disturbances, we try to restore the chemical balance. We can try to replace missing serotonin with 5-HTP. The B vitamins, especially folate, vitamin B6, and vitamin B12, are very helpful. Botanicals such as Asian ginseng and Chinese skullcap are very helpful. I also like to use L-theanine, an amino acid found in green and black tea. L-theanine is great for reducing anxiety and relieving stress by increasing the levels of dopamine and GABA in the brain.

STRESS REDUCTION

Stress is a necessary part of life, but stress taken to an extreme without recovery is destructive. Cumulative stress—the dripping faucet phenomenon—is more damaging to your health than are

periods of stress followed by recovery periods. Cumulative stress is unnatural for our systems. Our bodies don't truly know how to deal with it, so we deal with chronic and cumulative stress with the same chemicals and pathways as acute stress, only for a longer time. Sometimes you'll be hit by more stress before you've had a chance to recover from the earlier stress. The stress becomes additive, until you finally reach a breaking point in your health. Remember the spring image. This is where the spring has gone past its recoil point, or K factor, as it is known in physics. In physics, Hooke's law defines how much stress a spring can take. It applies to the biological springs of our bodies as well.

Chronic and cumulative stress can start out by creating a subtle imbalance. If you don't have a chance to recover from a stressful situation and then get hit with more stress, you can get put on a downward spiral. In functional medicine terms, you first have antecedents—the stressful events—then you have a trigger that creates a health problem.

For evaluating chronic stress in my people, I often use a particular stress assessment questionnaire. The details of this questionnaire reveal a lot about people to me. It's pretty detailed, and it's great for helping people identify their stress pathways. Some people have an excitatory, or overactive system, while others have a lethargic, or underactive system; some people respond in their body, and some people respond in their brain. Knowing which way they tend to go points us in the right direction for treatment.

TIRED AND WIRED / WORRIED AND “BLURRIED”

When people are dealing with chronic stress and have high levels of stress hormones, their responses tend to fall into two types: their HPA axis tends to be either overactive or underactive. Within those two groups, some will have a body response, and some will have a brain response.

In the body response, you can be underactive and tired, or overactive and wired. Or, as I like to put it, you can be tired and wired or worried and “blurried” (this makes it easier for me, and you, to remember).

Every individual has a specific blueprint for how they respond to stress. Some people have more reactive adrenal glands than others, for instance. What works to help one person handle chronic stress may not work as well with someone else. The starting point, however, is always the same: adrenal nutrition to replace adrenal deficiency. A majority of the adrenal nutrition centers on B vitamins; most importantly, vitamins B5 (pantothenic acid) and B6 (pyridoxine). Foods rich in these nutrients, as well as larger supplements, help begin the process of healing for the malnourished adrenal glands.

Unfortunately, stress often makes us lose some control and seek comfort in food. It’s our natural default. For many people, that means eating comfort foods, like cookies or ice cream. This also is natural because our first comfort food, breast milk, contains sugar and so we begin to associate sugar with comfort. Also, sugar becomes a way to get quick energy and assists with serotonin production, which is a happiness neurochemical. Unfortunately, poor nutrition may help in the short term, but in the long term, it just makes stress

worse because you're not giving your body the nutrients it needs to compensate for the physical effects of stress. In times of stress, it is particularly important to stick to the Modified Mediterranean Plan and increase your supplementation for your deficiencies. Sometimes that means adding in 5HTP or higher doses of B complex, but often it means getting more sleep and recovery to compensate for the deficiency. A safe bet is to be especially sure to have a lot of color in your diet because now is when you really need those micronutrients to keep your biological pathways open and efficient. If you have enough energy from your macronutrients and enough antioxidants from your micronutrients, you can set up more of a protective barrier against the day-to-day stresses.

Physical activity is also a great way to deal with stress. When you are active, you are actually creating good stress for your body. That trains it to cope with bad stress when it happens. This tends to work best as a preventive effort because once you are in a stressful situation, the last thing you may want to do is become active. However, we have great research to show that the chemistry of exercise matches the chemistry of antidepressants but without the side effects. So if you can, try to move out of your environment, go for a walk, or do some breathing exercises. The movement and chemistry from these simple interventions can start a powerful cascade out of stress and start you back in an upward spiral toward more movement and motion.

It is important also to remember that during stressful times, relaxation is essential. Anything that helps you reset and refocus, both physically and mentally, is great. Your relaxation techniques can be as simple as doing some deep breathing—motion and relaxation in the same event. It really helps by enhancing the oxygen supply to the body. When you're under stress, your body tends to clamp down,

which reduces the supply of nutrients to the body. Relaxing restores the normal flow.

SUPPLEMENTS FOR IMBALANCED ADRENALS

If you are the wired and worried blueprint, the botanicals that can help you are the ones that help calm a fidgety body. These include rehmannia, L-theanine, and schizandra. I believe improving your magnesium/calcium ratio can also help a lot with this.

If you are the tired and “blurred” blueprint, you’re probably also not sleeping well. Botanicals that can help include polygala, jujube, and decaffeinated green tea. Ginseng, cordyceps, and rhodiola will give you more energy without making you feel wired. I also find that the amino acid taurine is helpful—and so are fish oil and proline, one of the nonessential amino acids. The Indian herbs ashwaganda and holy basil are also helpful.

I often use licorice to help the adrenal glands work better if they are exhausted from chronic stress. If the adrenal glands are overactive, ginger is helpful—it has a sort of depressing effect on cortisol. The Chinese herb rehmannia, also known as Chinese foxglove, is helpful for handling the stress response. I find that vitamin B5 and vitamin B6 are very, very helpful for the adrenal glands.

RELAX AND ENGAGE

I recommend any form of meditation and prayer as a great way to reduce stress. Meditation and prayer allow your brain to empty itself from problem solving and focus on something bigger than you.

Meditation can be a focusing aspect of your own energy. For me, meditation is getting in touch with the ethereal and the spiritual. It helps your brain dissipate stress hormones. Prayer is a bit different than meditation but has its roots in it. Prayer is communicating with the Divine. It places you in a state of dependence and trust knowing that Something, or more likely Someone, bigger than you is in control. For some, this means God, for others this may mean electricity and natural forces. The benefits of faith and prayer have been clearly documented by many studies over the last three decades. It is a powerful tool that can be used to achieve balance. I highly recommend meditation and prayer to my people because I know they work.

When you meditate, you get the relaxation response. Your heart rate, your respiration, and your metabolism slow down. It's the opposite of the fight or flight response. That's very healing for the body, the brain, and the spirit within all of us. Meditation styles are uniquely individual. Some people like to do yoga or tai chi, others pray, some like transcendental meditation, and others like to spend time in nature. Everyone is different, but the key is connection and transcendence. Reaching up from a lower state to a higher state and a higher power is the essence of this healing. At our very core, it is what we're made for. It shouldn't be neglected but rather embraced and sought after. It can make all the difference in the world, both inside and out.

In addition to divine connection, social connection and engagement are also great ways to reduce stress. Social engagement doubles your joy and splits your grief, as the saying goes. It lets you share your troubles in a supportive environment while also helping others. It's not just commiserating. Social engagement is partnering and connecting and braiding—intertwining heart, mind, and soul. Obser-

vational studies of individuals that have a strong sense of family and community demonstrate longer, healthier lives and beneficial effects on, or even reversal of, detrimental biomarkers of health.

In one study of depression, the researchers gave the participants beepers. They called them at random times of the day and asked how they were feeling. They found that when the participants were alone, they inevitably would describe their situation as worse than it was. When they were with other people, they would describe their situation as better than it was. Social connections help you recognize that you are part of the bigger picture. In the Blue Zones, we find that social connection and engagement are central to daily life.

The Italian immigrants of Bangor, Pennsylvania, really show us the value of connection. Many of the immigrant residents of this town moved from Rosetta, Italy, to be close to family who had come to America. As a group, they had half the heart disease and lived, on average, ten years longer than Americans within a five-mile range of their town. Researchers who studied this group found that when five generations of an Italian family lived near each other, the strong family and social ties kept everyone physically and emotionally healthier.⁵

Not everyone can have this level of family support, of course, but I encourage my people to find nurturing and constructive relationships with others and move away from toxic and destructive ones. In fact, put this book down and call a friend! See what it does for your life and health!

⁵ Gladwell, Malcolm, *Outliers: The Story of Success*, (Boston: Little, Brown and Company, 2008), 3–11.



CHAPTER 10

UNDERSTANDING YOUR BLUEPRINT

Knowing what makes you “you” is a big help for knowing more about your health. We’re all snowflakes, but when you get lost in the blizzard of people, sometimes healthcare just shovels you to the side. Your uniqueness in regard to your needs, deficiencies, biochemical activity, and environmental irritants must be taken into account to optimize your snowflake—you! When you have a good understanding of your particular blueprint, you can individualize your food, movement, stress, sleep, and relationships and optimize your health.

In functional medicine, we spend a lot of time with people taking a detailed medical history. That helps us to understand the antecede-

ents in your life that have brought you to your current state of health. Some you could control, but others you couldn't. They all affect you and who you are and often who you will become later. They also give us a better idea of what your genetic makeup is and how we can work with your good genes and counteract the less healthy ones. You are the product of both your parents, so knowing about their health history certainly helps. Equally, and probably more powerfully, your environmental factors must be taken into account. Your environment is always changing and influencing your genetics. You may have a definite blueprint, but the final project, say your house, can have multiple variations that fit into that same blueprint. It is your individual expression of your blueprint. And the expression of your blueprint—your genes—is what functional medicine is all about when we focus on your food, motion, stress, sleep, and relationships. Some, though not all, of your environment is under your control and based on your own personal choices.

Important as your personal blueprint is, remember that there is more to you than just the physical. You're more than just your biology and chemistry. You're an individual, and you have the power to make your own individual choices. Predetermination does not mean predestination. You're not necessarily locked into your blueprint. You can modify your genetic heritage by modifying everything we've covered in this book: nutrition, antioxidants, toxic exposure and detoxification, stress management, sleep, and more.

NUTRIGENOMIC TESTING

I will often use nutrigenomic testing to help my people figure out their particular blueprint and individualize their diets. Some of the tests use blood samples to figure out what is circulating in you,

while others use stool samples to see how well you're digesting and absorbing your food and eliminating your waste.

Some of the tests are standard medical tests, such as the ones that look at liver function, detoxification, and inflammation levels. These are easy to do and are almost always covered by your health insurance. If they're not, many of them are not very expensive. A few tests, such as one that analyzes the microbiology of your stool for levels of beneficial bacteria, imbalances, and possible pathogens, aren't routine and may not be covered by your health insurance. I try to be sensitive to the potential financial burden of these tests. They may cost you something out of pocket, but they give an abundance of information to make targeting therapy easier and better. In the end, a little investment goes a long way toward health and balance. We can usually individualize your food plan without needing that level of detail, but we can truly perfect the plan with this additional information.

GENETIC TESTING

We used to believe that the gene component versus the environment component—the nature versus nurture component—was about 50/50. But as we start really looking into disease states, we're starting to believe that it is actually about 10/90. The determination of your disease state may only be about 10 percent genetic and 90 percent environmental. That is both frightening and liberating, if you ask me. Your environment may dictate your gene expression more than you know. Think about it this way: What if you had an identical twin (and some of you reading actually may)? This person has your identical blueprint of life that came from your mom and dad. Imagine that your twin moved away to the city, smoked a pack a

day, drank every evening, and ate fast food as the main component of his diet. Imagine that you, on the other hand, stayed in the suburbs or the country, didn't smoke, drank only once a week, ate a Mediterranean food plan, grew your own fruits and vegetables, and spent weekends and vacations with your family. It doesn't take a lot of imagination to see that at your family reunion, your health and that of your twin might be very different. Your twin might even look much older than you. You would see very clearly that your environment truly matters. That's why it's important to do more to change your environment but not neglect or ignore that 10 percent that comes from your genes.

Today, genetic testing has become a lot more affordable. You can get your basic genome mapped for around a hundred dollars. You don't need a doctor's prescription. Simple kits can be ordered through the mail from companies like 23andMe. The results will give you a good idea about your risk of certain genetic diseases and vulnerabilities. This is particularly useful for expanding on your family health history. Often, my people don't have much detail about the medical history of their parents or grandparents, so getting a better idea of their risks through genomic testing can be really helpful. In particular, knowing your genome can tell you if you have some single nucleotide polymorphisms (SNPs) that are of concern.

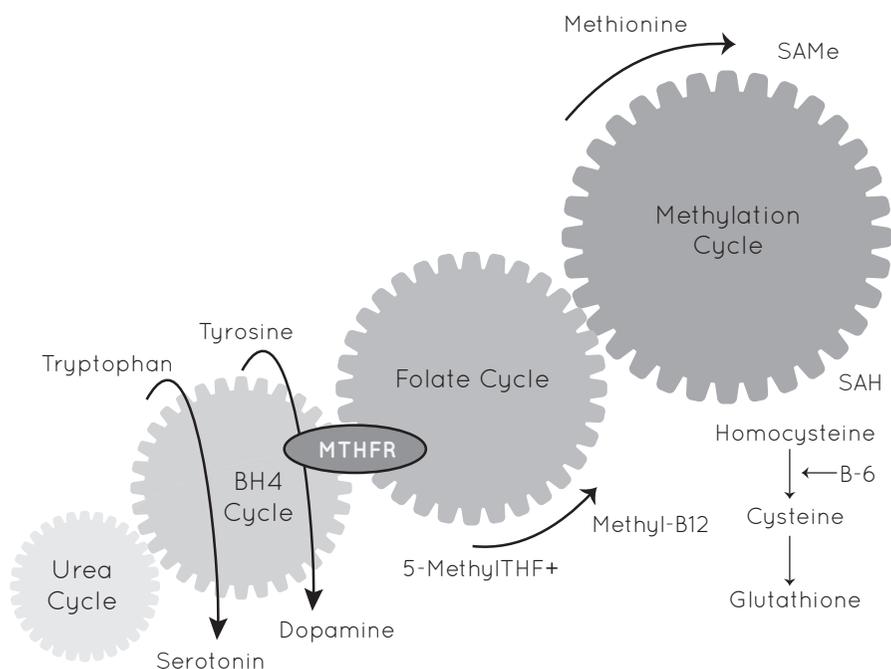
A SNP (pronounced "snip") is a sort of genetic glitch, a variation in a gene that codes for the production of a particular protein. I tend to think of it as the sound scissors makes when they close. Scissors cut out pieces of things, and in this case there is a piece missing from your genes that leaves a hole in a biochemical process. You might end up making less, or even none, of the protein or making it in a slightly different form. As an individual, you have many, many SNPs. Most

are harmless—they're just the normal minor variations that make each person's blueprint different from another's.

Only a handful of diseases, such as sickle cell anemia, are caused by a SNP in just one gene. Some SNPs don't cause a disease on their own but do leave you open to developing health issues later in life. One that I test my people for is a SNP in the gene for making the enzyme methylenetetrahydrofolate reductase, or MTHFR for short. This enzyme is needed to convert the B vitamin folic acid into its active form, methylated folic acid. If you have this SNP, you can't convert folic acid from your food into the active form your body needs. That means that no matter how many leafy green vegetables you eat, you won't be able to efficiently use the folic acid they contain. Methylated folic acid plays a very large role in the detoxification and biochemical pathways within the human body. Being deficient in it means you're more likely to develop anemia, arthritis, heart disease, stroke, and some cancers. You're more likely to have dementia in old age.

If you know you have this particular variant of the MTHFR gene, you can take steps to compensate for it. Specifically, I prescribe methylated folic acid supplements instead of just regular folic acid.

Now, in fairness, it is a lot more complicated than that, and sometimes the simple delivery of the methylated folic acid isn't enough. Many up regulations and down regulations are occurring in methylation and detoxification pathways. And you can see they influence a lot of other pathways too, with the point being that one glitch in the system can truly jam up the gears of these balanced cycles.



Another SNP I ask my female people to test for is the BRCA gene, which can strongly predict a high risk of breast and ovarian cancer that may occur at an early age. People who have a strong family history of these diseases should definitely get tested for it. If you have the BRCA variant, you don't detoxify the breakdown products of estrogen well. As I discussed in the chapter on improving detoxification, bad breakdown products can trigger reproductive cancers even in women without the genetic predisposition. In women who have the BRCA gene, the risk is much, much higher.

We can test for some other SNPs, such as your level of a cytokine called interleukin-6 (IL-6), but I do this only very rarely. Most of the other SNPs we know of may predispose you to a health problem, but we're not really sure what to do about them. It's also possible

that a SNP that seems harmful for one aspect of what it does may be protective in some other aspect.

Although I do recommend genetic testing for some of my people, often a good medical history and a good physical exam can be enough to work with people who may not want to or who are not able to invest the money into genetic testing. Remember, tests alone don't give you any answers; spending time with people does.

Taking it to the next level is a personal discussion to have with your doctor. You don't need to test for the MFTHR gene to start taking a daily supplement of methylated folic acid instead of regular folic acid. All of us need to detoxify every day, so any additional help we can get matters. You also don't need a test to realize you should be up-regulating the colors of your plant foods and getting more of the leafy green ones. The MFTHR test often costs several hundred dollars, and you need someone who can interpret the results correctly; the way I see it, you can buy a lot of methylated folic acid for that amount. A strong family history of breast cancer is enough for you to modulate your estrogen production and have a very serious talk with your doctor—even without knowing you have the BRCA gene.

The beauty of our incredibly complex bodies is that there are multiple redundancies and multiple complementary pathways. If one system has a weak spot or a temporary disruption, others take over. It's only severe disruptions or ones that go on for a long time that cause the system to break down. That's where functional medicine really works well. We take the best of the body-as-machine approach of traditional medicine for fixing bad breakdowns, but we also work to prevent future problems by looking upstream. I like to think of it as the dragon Smaug in *The Hobbit*. Bilbo noticed that Smaug had a chink in his impenetrable armor. It was that vulnerability that

inevitably gets penetrated by an arrow and leads to the destruction of the mighty dragon. In functional medicine, we work to make your armor really strong, but your natural vulnerabilities will always leave some chinks. We use traditional medicine to fix the problem when an arrow gets through, but we use functional medicine to keep your armor strong and protect those vulnerable spots as much as we can.

If we look at people who live in the Blue Zones, they have just as many SNPs as people anywhere else, but they seem to live longer, healthier lives. They have genetic vulnerabilities, but they keep the arrows that come flying at them to a minimum by leading balanced lives, with healthy diets, clean air and water, lower stress, good sleep, and moderate physical activity. They avoid the things that we know can trigger illness, such as smoking and drinking alcohol. You might have SNPs that predispose you to lung cancer, for instance, but if you don't shoot arrows at them by smoking, you will probably never get lung cancer. You may have the genetic predisposition, but you do need the other ingredients to activate it. As we say in functional medicine, genes load the gun, but environment pulls the trigger.

TESTING AROUND THE STAR OF WELLNESS

Because of the way I have set up the Star of Wellness, I tell my people that our testing is a bit of a color analysis. For those of you in the health profession, the Star of Wellness is as easy as color by number when it comes to ordering labs for your people. To find out how my people are doing, I do all my medical testing based on the points of the Star of Wellness. I'm looking for your starting baselines to help us figure out where to go next in improving your health. And

as we make progress, I use these initial testing results to see how well we're progressing and changing from the inside as well as the outside.

In addition to traditional and focused Star of Wellness testing, I also do metabolic testing using indirect calorimetry. This is a very creative way of measuring your general metabolism or basal metabolic rate by analyzing your carbon dioxide production. It's a simple, noninvasive test that's done just by breathing into a tube. The logic behind the test is that there's a fixed amount of oxygen in the air. You breathe that in. Depending on how efficiently your metabolism is working, some of that oxygen gets taken up by your body by being exchanged for the metabolic waste product, carbon dioxide, in your lungs. You'll produce more or less carbon dioxide based on how efficient your metabolism is. We can take that basic information and use it to indirectly determine how efficiently you're burning carbohydrates or fats in your metabolism. That's useful information that tells us not just about your basic metabolism but also something about how well your redox pathways are working. As with many aspects of functional medicine, this test looks at two overlapping points on the Star of Wellness.

Another test I often do is called the EndoPAT. This looks at your endothelial efficiency, or how resilient your blood vessels are. We basically tie a tourniquet around your upper arm to restrict the circulation then look at how well the blood comes back when the tourniquet is removed. This tells me a lot about how fluid your vascular system is and how well you can respond to a stressful situation. It's really helpful for determining your baseline health. Your vascular system is the body's delivery system. It brings nutrition to your cells and takes away the waste products. You want it to be working well.

For looking at inflammation levels, often I will start with C-reactive protein (CRP) levels to assess overall inflammation. This test is a bit general and nonspecific, but it's a good starting point for most people when it's interpreted correctly. C-reactive protein is created in the final common pathway through the liver. It's a bit controversial as a marker for general inflammation because its primary use is for detecting the major inflammation that comes with a heart attack. Some doctors feel it is not very helpful for low-level inflammation or screening for general health. I find that it corresponds pretty accurately to levels of baseline inflammation in my people. Once my people start eating the Modified Mediterranean Plan and making other improvements in their health, such as eliminating dairy and gluten, I can see their CRP levels drop each time we do it. The cost of the test is on the expensive side, but health insurance almost always covers it.

I also usually order a comprehensive stool analysis as a baseline. Because so much of your immune system, and therefore your inflammatory processes, is found in your digestive tract, I want to get an idea of how well it's working. The stool analysis gives us a good picture of your digestive capabilities and enzymes as well as a picture of your microbiome. I find this incredibly helpful in terms of looking at a baseline aspect of an individual's inflammation.

The stool analysis is a key to your insides. In functional medicine, we say, "You are what you eat and don't excrete." The stool analysis lets us see what's going in and then analyze what comes out. When we find too many macronutrients in the stool, we can say you're not digesting your food well, and we start to look for reasons and treatments. When we look at your gut bacteria, we can see what kinds they are, if they're helping you or are harmful, and if your ratio of good guys to bad guys is off. We can see if a bad balance of bacteria

is affecting how well you absorb nutrients from your food and, thus, get an idea of your overall digestive health.

Standard liver function tests are a good way to start checking your detoxification pathways. They give me a picture of how hard your liver is working and let me see your progress over time. Standard liver blood tests are almost always covered by health insurance. If not, they are pretty inexpensive. I use one very specific liver function test for an enzyme called gamma-glutamyl transferase (GGT), also sometimes called gamma-glutamyl transpeptidase (GGPT). This enzyme is really important for detoxification. The results are very sensitive, so it's important to avoid alcohol for twenty-four hours before the test and not eat or drink anything but water for eight hours before. The levels of GGT are an early detection system for impaired detoxification. If your detox pathways aren't working efficiently, this is one of the earliest and most accurate ways to tell.

Similarly, I use tests of kidney function to look at detox pathways because most water-soluble waste products from detoxification get passed out of the body through the urine. The kidney function tests tell me how hard they're working.

I also check your blood levels of a substance called homocysteine—it's a breakdown product of protein metabolism. You need folic acid to keep your homocysteine at normal levels; high homocysteine levels can be a risk factor for heart disease. If your level is high on this routine blood test, it tells me that you might have the MTHFR gene and can't use regular folic acid well. I'll suggest you start taking a daily methylated folic acid supplement.

Unfortunately, detoxification is an extremely complicated process, and often testing only gives us glimpses of the entire picture. Specialized testing and nutrigenomics often are necessary for a complete

understanding of detoxification. However, returning to our idea of the physician as a healer who listens to the person—medical questionnaires like the MSQ and the testing I have reviewed above set the stage for practical and intelligent interventions toward detoxification. This combination of tools and methods relies on the art of medicine, so it is important to get all aspects of the picture to be sure you are moving in the right direction.

Blood tests that supposedly measure your oxidative stress and antioxidant reserve are available, but they're not standard and it is not clear how helpful and accurate they really are. Also, they're costly and must be done by a special lab. Instead, I measure your oxidative status and antioxidants indirectly using standard blood work. Mostly these tests involve looking at the enzymes, by-products, and solution markers of oxidative stress. The markers include cysteine, glutathione, glutathione peroxidase, lipid peroxides, sulfate, superoxide dismutase, and total antioxidant capacity. The results are interesting and helpful but often a bit much for the average person to understand.

One of the internal roots and leading causes of high-oxidative stress in the body is sugar and the inefficient metabolism of refined sugar. The oxidation caused by excess sugar is closely linked to insulin resistance and elevated blood glucose and is a side effect of having the metabolic syndrome. Granted, this is indirect; that is, sugar doesn't directly cause oxidation—it is the inefficient metabolism of the sugar that causes the oxidation products. This is not to say that sugar doesn't cause problems directly (like glycosylation), because it does ... but we are talking about oxidation here. And since we are making our oxidation list complete, let's not neglect the role that smoking, pharmacotherapy, stress, and chemical exposures have on oxidative stress.

Your insulin level is a good surrogate for glucose metabolism and insulin sensitivity and, by way of breakdown pathways, oxidative stress. If you're in the early stages of insulin resistance, the opposite of insulin sensitivity, you're putting out a lot of insulin to force glucose into your cells. That might be working well enough that your blood sugar readings are normal, even though you have become insulin resistant. I like to test for insulin levels in my people so we can detect the early stages of insulin resistance and the metabolic syndrome before they get so far along that they're causing damage. Currently, traditional medicine is looking at this by testing a marker of cumulative blood sugar called hemoglobin A1C. This tends to go up only after insulin has already been high for a while. I find that I can catch subtle changes in insulin resistance by testing insulin first. The earlier you can detect something, the faster and easier you can change directions on it.

I also routinely check blood sugar levels with a fasting blood sugar test and by checking your hemoglobin A1C (HbA1C). The real beauty of the A1C test is that it provides a sort of moving average of your blood sugar over three months or so. Currently it is used as a screening test for diabetes, but once you cross over into type 2 diabetes, usually it is a bit late for prevention, and traditional medicine begins to get its hands on you. Personally, I would rather intervene before the horse leaves the barn. The A1C test basically looks at how much sugar is caramelized onto the hemoglobin in your red blood cells. The higher your blood sugar, the more likely it gets stuck onto the cells. It's a good way of catching blood sugar issues early on, and it's also a good way to measure progress in getting blood sugar under control. For some of my people who switch over to the Modified Mediterranean Plan and make other good changes, we can

see a drop in the HbA1c from one test to the next just three months later.

The other component that is worthwhile in terms of oxidation pathways is cholesterol. In my opinion, this is one of the most confusing areas in all medicine. The official guidelines for cholesterol levels keep shifting to reflect changes in our understanding. All the confusion means my people have heard a lot of misinformation.

Cholesterol is a waxy substance manufactured by your body in your liver. It's not a fat, and it has no calories—your body doesn't burn cholesterol for energy. Instead, it uses cholesterol for a wide range of vital functions, including making your cell membranes; manufacturing the steroid hormones aldosterone, cortisol, testosterone, estrogen, and progesterone; and producing vitamin D in your body. So cholesterol is something you actually need to have. It's not dangerous in and of itself. Waxy cholesterol is carried through your watery blood wrapped up in carrier particles called lipoproteins. Lipoproteins are made of a mixture of fat and protein; the more fat the lipoprotein has, the denser it is. Your body makes at least five different kinds of lipoproteins, but the two most important are low-density lipoprotein (LDL) and high-density lipoprotein (HDL). LDL cholesterol is sometimes called bad cholesterol because high levels in your blood are associated with a greater risk of heart disease and stroke. HDL cholesterol is sometimes called good cholesterol because this lipoprotein acts like a dump truck, carrying cholesterol back to the liver, where it is recycled or turned into bile and eventually excreted. High HDL levels are associated with a lower risk of heart disease and stroke.

As with anything else in your body, you want to have a good balance of HDL and LDL cholesterol. The balance can get thrown

off when the LDL particles get oxidized and become small, sticky, and dense. That's when they can become a problem because they can cause plaque in the arteries that nourish your heart or in the carotid artery that carries blood to your brain. Ruptured plaque or plaque that blocks an artery can lead to a blood clot that blocks the circulation—a heart attack or a stroke. If you have a lot of inflammation from abdominal fat, poor redox pathways because your diet is full of low-quality carbohydrates, and if you also have high blood sugar and insulin resistance, you're creating a lot of sticky, oxidized cholesterol. In other words, you're setting the stage for a heart attack or stroke.

If I see that you have high LDL cholesterol combined with one or more of the other factors, I can assume you're oxidizing a lot and using up your antioxidants quickly, before your body can replace them. I usually also do advanced testing for cholesterol particle size. The smaller and denser your cholesterol particles are, the more likely they are to oxidize and slip into cracks in the lining of your blood vessels, where they start to form plaque. Small, dense LDL particles are associated with insulin resistance and diabetes—one reason people with diabetes are also automatically linked to higher risks of heart disease. So once again, size matters, and we need to look deeper than the standard medical labs to see the whole picture of cholesterol and oxidation.

We can do a lot of very specialized tests for nutritional components in the blood and urine. This can give a good picture of your needs and deficiencies. Standard medical tests look for clinical deficiencies of nutritional components. The ranges are designed to detect severe deficiencies, the kind that cause detectable diseases such as beri beri (thiamin deficiency), pellagra (niacin deficiency), scurvy (vitamin C deficiency), or rickets (vitamin D deficiency). In our modern society, these deficiency diseases are almost unheard of.

Standard medical tests that look at nutrition in this manner don't tell you much because virtually everyone gets at least the bare minimum of vitamins and important minerals from their food, even if their diet is poor. A spectrum approach that looks for nutrient balance and optimization on an individual basis is much more useful. These blood tests go beyond the standard medical nutrition testing to tell us a lot about your individual nutritional state. We can look closely at vitamins and minerals and even essential fatty acids, but these tests aren't usually necessary. I can learn much more about you from looking at your diet and talking with you about your sleep quality, stress levels, and so on.

I routinely have my people do one standard nutritional blood test: vitamin D. This vitamin affects every point of the Star of Wellness. Statistically, low levels of vitamin D are related to an increased risk of death from all causes. I was amazed when I learned this. I could see the connection with low vitamin D and chronic disease and cancer, but in fact, vitamin D protects you against all health-related causes of death. That was enough to make me start taking a daily vitamin D supplement.

You need vitamin D for many crucial functions, including maintaining bone health, maintaining healthy neuromuscular function, keeping the amount of calcium in your blood at normal levels, helping your immune system to function normally, and, you won't be surprised to learn, modulating inflammation in the body. Vitamin D is an oddball among vitamins because it's one of only two you don't have to get from food or supplements (the other is vitamin K, which you can make in small amounts in your intestines). Although there's some vitamin D in a few animal foods such as eggs, fish, liver, and fortified dairy products, your body manufactures it for you. In a complex process that involves cholesterol and your kidneys, sunlight

on your skin is converted to vitamin D. Because the process involves cholesterol, in some ways vitamin D is really more like a steroid hormone.

Almost every one of my people turns out to be low in vitamin D. It's not surprising, because most of us don't spend enough time outdoors to get the sunlight we need to manufacture enough vitamin D. A simple blood test called the 25-hydroxyvitamin D (25-OH D) tells us if your vitamin D levels are normal. Some specialists even believe that the changes in our behavior and environment (like the time we spend indoors and the levels of sunscreen we put on—not to mention the higher levels of air pollution and greenhouse gasses) may now make it impossible to get all the vitamin D you need just from sunlight. You could have a job where you stand naked in the sun all day and still fall short of your needed vitamin D levels. If that's the case, can you imagine what happens to us when we are indoors all day, as most of us are? There's no way any of us today can get enough sun for optimal vitamin D levels. I like my people to have not just normal but optimal levels of vitamin D. To get there, I usually recommend two to five thousand units of supplemental vitamin D in the form of cholecalciferol, leaning toward the higher side of the range most of the time.

Lab test results need to be seen in context. The lab range is a bell-shaped curve. Ideally, all your lab results will fall right in the middle of the bell curve, but often they don't. If you are at the far ends of the curve, in the lower or upper 5 percent, you fall outside the range. Why that is and what to do about it is where interpretation and judgment come in. Sometimes we have to look beyond the standard lab range. This is why functional medicine is truly an art and a science. Your results might show that you aren't in a disease state, but that doesn't mean you are in the optimal range. The goal of

functional medicine is to get you past just not having a disease and to a state of optimal health.

In some cases, when a person has mysterious symptoms or severe fatigue that doesn't seem to have a cause, I'll suspect heavy metal exposure or toxicity. I'll go back and ask the person more about potential exposure to mercury, lead, and arsenic. Often I'll learn that he or she grew up in an industrial area and was exposed to these metals from childhood on or had workplace exposure. Sometimes it's as simple as the fillings in your teeth—older fillings are made of an amalgam that contains mercury. Sometimes, overzealous consumption of tuna can raise mercury levels. In any event, listening to a person's story and how it lines up with their symptoms is important. Urine tests, blood tests, and sometimes hair analysis will usually confirm my suspicions. To take it further, I may do what is called a provocation test. First, we establish a baseline by testing your urine for heavy metals. You then swallow a small amount of a substance called DMSA, which binds to heavy metals in your system. We can then test the urine again to see if it contains heavy metals—or more than it did before the test. If the results show you have an overload of heavy metals, then that can tell me why you're having problems such as high blood pressure or fatigue. If you have osteoporosis or bones that have become thin and brittle, you may also have signs of lead toxicity. Lead binds to bone, so when you lose bone from osteoporosis, you release lead into your system, causing symptoms or making other problems worse. I never let aging be the only reason for a decline in function. I always look upstream for foundational, and sometimes less-than-obvious, reasons.

To check for hormonal imbalances, we can do a range of blood, saliva, and urine tests. These can get pretty complicated and confusing. Each test looks for different components of a specific

hormone or its metabolites. They are not always accurate, and some, like a twenty-four-hour urine collection, are difficult for people to do. I prefer to use blood tests for hormones because they are the closest reflection of what is truly going on with the endocrine glands in question. However, sometimes they're not practical (for example, cortisol varies throughout the day and with various stressors) or don't look at the actual hormones or breakdown products. These tests aren't very helpful, because in the case of testosterone and estrogen, it is equally important to know about the breakdown products. Saliva tests can be very helpful, but the results aren't always reliable. Saliva tests are also challenging to administer. They have to be done by a specialized lab, which can be expensive and inconvenient. Saliva can concentrate hormones if you're taking supplements, which can skew the results too high. Still, saliva tests can provide an additional piece of the hormone puzzle. I use them when I want to get a picture of the rhythm pattern of your hormones across the day. Urine testing is another way to see hormone metabolites or breakdown products. This is probably the most convenient method for patients. It also tends to focus on the breakdown pathways, which can help me figure out what's being made and what's being broken down by the body. If you have severe hormonal imbalances, I'll use some combination of all three types of tests to try to pinpoint the issues.

Fortunately, we rarely need to be that specific. In the end, I find questionnaires are more helpful than labs when it comes to evaluating stress hormones and thyroid hormones. You might fill out the thyroid questionnaire, for example, and answer yes to questions like, "Does anyone closely related to you have thyroid problems?" When we add up your answers, we see you scored a fifty-five when a healthy score is fifteen. That tells me, long before we get around to the complicated blood tests for thyroid function, that there's a

problem that needs looking into. The same is true for analyzing a person's sleep issues. These functional medicine questionnaires are incredibly helpful. I get the answers I need without literally having to draw blood.

What is the best diagnostic tool of all? It's the foundational tool of functional medicine: the person's own story—the patient history. In addition to just talking to my people about how they feel and what's going on in their lives, I always start by asking them to tell me their story in their own words. I used to be afraid that I would miss some vital aspects of information unless I asked a lot of questions. However, taking this approach has led me to discovering more about my patients, not less. After you tell me your own personal story, I tell the story back to you in my words, to make sure I've heard you correctly and not missed anything that is essential to the whole story. This gives you a chance to fill in any gaps. Most importantly, it allows you to know you have been heard by a doctor who is partnering with you for your care. What I have discovered is that when I really listen to my people, they tell me what I need to do.

In addition to just listening to your story, I use the Medical Symptoms Questionnaire (MSQ) created by the Institute of Functional Medicine. It's basically an assessment of your symptoms over the last two weeks that only takes about five minutes to complete. It is very revealing. In fact, I base my concept of the Star of Wellness on the points that are covered in the questionnaire. The MSQ puts all the pieces together. With it, we can begin, not end, the process toward healing and balance.

The information we gain from talking, taking a detailed medical history, doing a physical exam, and doing tests is all for the purpose of gaining knowledge about you and then putting that knowledge

to use. In the pages of your life, we want to use bookmarks and dog ears. Bookmark the areas to emphasize. Dog ear the areas that need to be down regulated. Fold them over so they're hidden. In the end, although your book may have been written by your genes, you have the power to rewrite and edit that book so it can be the epic story of your life, the way you intended, the way you wanted.

I believe you should listen to your healthcare provider, but above all, I believe you should listen to your own body. Your symptoms are like the warning lights and gauges on the dashboard of your car. Look at the gauges to see how you are doing, and don't ignore a gauge that seems to be giving an abnormal reading, even if it's only now and then. And by all means, don't put a smiley face over that check-engine light. Don't believe that one pill or one method will reverse all the problems of your body. That's the time to bring the car to the mechanic and yourself to your functional medicine doctor. By the time the warning light comes on, it may already be too late to avoid the problem. And if the warning light does come on, don't delay. See your functional medicine doctor soon.

Once you have the information you need to improve your health, you can't claim ignorance anymore. Your healthcare provider can give you lots of information, but you have to make the commitment to your own better health. Ideas make you happy, but actions bring about change. You have to take action because once you have the understanding, doing becomes more important than knowing.

I often use the analogy of Dorothy in *The Wizard of Oz*. At the very beginning of her great journey home she is faced with two roads (yes, there is a red brick road next to the yellow brick road). She doesn't know anything about either of the possible paths, so which should she choose? She has to step out in faith onto one of these paths.

She does heed the advice of the great Glinda as well as the common munchkins, but in the end, Dorothy must make a decision and act. She assesses, heeds sound advice, and acts in a way based both on knowledge and faith. It is this action that not only gets her back to her home but also gets her back home completely changed—a better Dorothy than when she left Kansas in the first place. Her life is better because of her choices on her journey. I challenge you to do the same. Faced with forks in your road, gathering more and more information won't necessarily get you on the right road. Only deciding to act will get you past the fork and onto the right road for you.

On the other hand, I don't want my people to get obsessive about their health and spend all their time researching whatever they have or might get. A lot of studies tell us that the more often you visit the doctor, the sicker you are likely to become. That is kind of a scary thought, but think back to Hippocrates, who suggested that all the medicine you need is in your own food. In the end, we search for balance to obtain optimal health.



CHAPTER 11

HELPING YOU TO ACHIEVE BALANCE

To me, the greatest joy of practicing functional medicine is that I get to spend a lot of time with the people who come for my care. We work together to find the source of their health problems and to improve them as naturally as we can using diet, lifestyle changes, botanicals, and traditional medicine as needed.

What I really help these people do is change the direction of their health. It all starts with them. I tell my people, “If you keep doing what you’re doing, you’re going to get more of what you’ve got. And what you’ve got you don’t want, so what you’ve got to do is change.” I hope to invoke and spark change in people. In life, I believe, we are always moving in a spiral. Even when we are not moving, the world

is moving past us, so in a sense, we're moving even when we stand still and do nothing. Most of the people I talk to tell me they feel they're either in a downward spiral or an upward spiral. The key is to change directions and move out of a downward spiral and into an upward spiral.

We do this by initiating change and then seeking balance. Think of it this way: How far does a dog run into the woods? Only halfway—because then he's running out of the woods. Sooner or later, we'll find the balance that gets us out of the woods. Balance comes from change and consistency. That doesn't make sense at first, because change and consistency are opposites. But the process of finding balance starts with change. In order to have something differently, you must do something different. And to that end, in order to have something you've never had before, you must do something you've never done before. So it starts with change. But once your health starts to change, you have to act with consistency to keep the benefits and encourage further improvement.

In physics, we talk about entropy, or the tendency of all systems to gradually decline into disorder. Entropy tells us that everything breaks down, and the natural order of things isn't order, it is disorder and chaos. Our natural tendency is to break down and live in chaos unless we stay consistent with the actions that brought about change in the first place. That's where consistency comes in. One of the key elements in theories of change, especially nutritional theories of changes, is to take actions you can maintain. I don't want my people to swing the pendulum so far and wide that they only create change in spurts and cycles. I help you take actions you can manage, and then add to those actions, and then add to those, and so on. This method creates lifelong and life-sustaining change.

In life, we play the cards we are dealt. But this theory actually changes the game from cards to dominos. One by one, as we make changes, it gets easier and easier to make the next change and the next. It's like the farmer who had a well next to his house that became contaminated. The new well had to be dug a mile away from the house, through rocky terrain and brush. Every day, the farmer made the effort and took the action to walk to the clean well. Over time, the terrain became smoother under the weight of his walking, and the path to the clean water became easier. It's the same for life-giving and life-sustaining change. Change is always difficult at first, but as change becomes consistent, it becomes easier and even enjoyable.

The human body is a beautiful interplay of the physical, mental, and spiritual. Each part requires a different sort of attention and different resources. In the Star of Wellness, I see all the components of each system as interlocking parts that make up the whole. Metabolism, inflammation, detoxification, oxidation, and nutrition are all equally important and equally interconnected. If you understand how these five areas blend beautifully within the three areas of body, mind, and spirit, then you can start entering into the world of prevention, balance, and optimization with intelligence, rather than just treating disease. We need to look at each aspect individually and as part of the bigger system to get a balanced individual. That's what we aim for in functional medicine.

We also need to look at our health in the bigger picture of our relationships and community. We must partner with ourselves, our healthcare providers, and our community. We're not meant to carry our burdens alone. We are meant to endure suffering and experience joy within a community. When one part of our community suffers, we all suffer. And when one part of our community rejoices, we all

rejoice. This attitude and method is equally important to optimal health and balanced living.

When you partner with yourself, you get a good internal sense of when things are going well and when things aren't going well. Pay attention to what your body, your mind, and your spirit are telling you.

When you partner with your functional medicine healthcare provider, you have someone who can help you navigate your health and guide you through the system to a good outcome. A trusted healthcare advisor can be hard to find in today's environment of tests and pharmacotherapy. Keep looking until you find someone who is genuinely interested in learning your story. You will know when you find the right person because it will feel more like a partnership than a simple visit to the doctor.

When you partner with your community, you are listened to, but you also listen to others. I honestly believe that's why God intended us to live in communities. Listen to your community, both when it praises you and expresses concerns. That listening is an important part of your well-being. It is what makes you a caring, compassionate human being and gives meaning to your life.

Embrace your identity within your partnerships. You're different from everybody else that ever was or ever will be. Understand that you have strengths and weaknesses based on your own identity. Work with yourself, your providers, and your community to enhance your strengths and protect your weaknesses.

Embrace simplicity and stillness as well. The best things in life really are free, but I think few of us truly believe that based on our current lifestyle. Many of my people have very complicated and stressful lives; it shows in the complicated, stress-related illnesses they

get. Use your senses to help you simplify, especially when it comes to food and nutrition. Eat food that simply smells good, looks good, and tastes good. You don't have to make things complicated. Just use your eyes to choose the most colorful foods. Focus on the food itself: its taste, texture, smell, and color. Use all aspects of your sense of taste, not just your ability to taste sweetness.

Take joy in eating and nourishing yourself; take joy in resting and communing and balance. When I told this to a person recently, she said, "You make it sound so easy." I said, "You know what? Balance isn't easy. Imbalance is easy. If I take you up on the roof and I push you off and you fall, that's not hard. However, if I put you on an unstable surface on one foot with your eyes closed, that's hard. Balance isn't easy, but it is the best natural state to be in, and it is the intentional state for life to be in. Science calls that homeostasis, I call it balanced living."

Your body naturally seeks homeostasis, the scientific way of saying balance. The word comes from the Greek words *homeo*, which means similar, and *stasis*, which means standing still. Homeostasis contains the components of being still, being in the moment, and loving where you are. That's not an easy task, but it is the essence of being a healthy human. You need to act in a way that creates homeostasis, but that's not where it should end. Homeostasis can also be just accepting the status quo, and there's nothing really attractive about that. Using the techniques and information outlined in this book, you can break through the status quo of your life. You can break through all the way to optimization—and even stay there if you are consistent with your actions.

Remember when I started this journey with you, I asked you about remembering a time when you were lost? Homeostasis and

balance is about being found. Optimization is changing direction and beginning, or continuing, the journey of your best life. And that is a trip guided by the star that you and I want.

PIONEER VALLEY WEIGHT AND WELLNESS CENTERS

I practice functional medicine at the Pioneer Valley Weight and Wellness Centers in Springfield, Massachusetts. My staff and I work to help the people who come to us become engaged, educated, and healthy individuals. We combine many aspects of medicine to do this. I work within both traditional medicine and functional medicine and bring in elements of chiropractic and naturopathic medicine when I think it will help you. Just as I try to help my people achieve balance in their health and their lives, I also balance the many different specialties within medicine and healing. More than most internal medicine specialists, I have a practical working knowledge of most of the major medical specialties in both traditional medicine and naturopathy. I can see where they overlap and know how to use them in combination to help my people most effectively. I am the bridge between those two worlds.

At Pioneer Valley Weight and Wellness Centers, we use the strengths of naturopathy, chiropractic, traditional medicine, and herbal medicine from many traditions to treat our people. We know that each of these areas has its weaknesses as well. We aim to avoid them and instead combine only the strongest aspects of each in our treatment.

When I listen to my people, I will basically start walking down the road of naturopathy—food, stress, sleep, movement, and rela-

tionships. I also pull from aspects of chiropractic to complement the naturopathy. Theories of pressure, balance, and alignment fit in very well with the naturopathic approach. Ultimately, we will walk down this healing road together—that is, of course, until we hit a roadblock. That won't always happen. Sometimes the road in naturopathy and holistic medicine is enough to complete the journey. Sometimes, though, a genetic vulnerability or a chronic environmental factor makes it impossible to complete the entire journey to optimization without help from traditional medicine. That's when I draw on my training in traditional medicine to complement what we're doing with naturopathy. Sometimes medication is needed to act quickly on a serious problem or to help while the slower methods of naturopathy get going. Practically speaking, sometimes you have to settle acute problems with acute methods in order to temper the chronic problems. Once the urgent issue is resolved, then the chronic issues can be addressed.

I freely pull from all medical approaches, engaging the strengths of some to complement the weaknesses of others. That ability to be creative in the service of healing is one of the great joys of my practice. It's what makes our approach at Pioneer Weight and Wellness Center different from the traditional approach (or the classic naturopathy or chiropractic approaches as well). This approach also gives me greater flexibility in treatment than a naturopath or chiropractor has. I can fall back on the power of my training in traditional medicine and utilize some of the dark magic of pharmacotherapy to complement the magical pixie dust of botanicals and supplements. However, in the mix of all this, I never abandon the foundational elements of food, stress, sleep, movement, and relationship—the true foundational medicine approach. I'm able to bring a lot of different approaches together and find the combination that works best for each person.

My father is an emergency room doctor, the very heart and best use of traditional medicine. His approach to medicine seeded the thinking of functional medicine in me. He often told me, “If you listen well enough and long enough, the patient will tell you their diagnosis.” That planted seed began to germinate when I was in medical school. I remember sitting and staring at a patient’s chart and thinking, “I can’t figure this out.” My program director would invariably say, “Go back and get more history.” It wasn’t “get more lab tests” or “do more scans or more physical exams.” It was always, go back and talk more to the person. The advice I got from those two mentors is still with me today.

Over the years, I have come to appreciate that a person’s history is a beautiful mosaic. I often need to step back and see it all to get the bigger picture and find the best answers. Too often in medicine, we focus just on a single illness or issue and lose sight of the person’s overall health. We see one color or one brush stroke and we say to ourselves, “I know what this is.” In reality, we need to step back to truly see the entire picture. As with great artwork, we have to step back to see its true beauty and complexity. The beauty of a painting by Monet isn’t in an individual brushstroke; rather, it is in stepping back and looking at the whole picture and understanding the genius that makes all the brushstrokes fit together.

Too often in medicine, we focus on curing a particular problem and forget about what is going on in the rest of the body. We see the body as a machine that needs a broken piece fixed or replaced. We forget that the body is also an interactive and complementary garden, and disturbing one area may disturb all areas. Sometimes, areas of imbalance and disease are truly caused by far away upstream factors that also need to be discovered, addressed, and balanced.

My dad also used to tell me that when the people get in your way of doing medicine, it is time to find another job. “You need to treat every patient like it’s Monday morning at nine o’clock,” he would say. People must never get in the way or be taken for granted. Sometimes, a person’s story is incredibly complicated. It can’t always be collected in one visit or on one questionnaire or lab report. To practice medicine well, you have to be okay with putting a bookmark in a great novel, putting it down, and picking it up later. That can be frustrating for the person and the provider, but I never want to jump to a premature diagnosis. Sometimes I tell my people that by the end of the first visit we may have more questions than answers. When I set this up as an expectation, people are always happy to partner in our relationship so we can get to the healing, rather than just the diagnosis. I always want to take the time to get your whole story. Together, we then work out a plan for better health.

I call my clinic Pioneer Valley Weight and Wellness to make the point that just as there is an optimal body weight, there is also an optimal body wellness that goes beyond just what the scale says. My practice symbol is the inverted triquetra, interlocking circles containing the three colors of light-blue, green, and red. To me, this symbol represents all three aspects within the human condition: the physical, the mental, and the spiritual. Each attribute is one of the essential components that coexist within every human being. All three have become the focus of our specific approach to balance and wellness for every patient in our medical practice.

The red section represents the physical part of our nature. Red is the most emotionally intense color. It represents the battle we all have against our own maladaptive behaviors that take us away from our goals and higher self. The green section represents the mental part of our nature. Green is the easiest color on the eye: calm and refresh-

ing. It represents the calm renewing of the mind that is necessary for achieving our goals and higher self. The blue section represents the spiritual part of our nature. Blue creates the opposite reaction to red: peaceful and tranquil. It represents the necessary role that God plays in our lives as we grow and change to become all that we are designed to be, in the end reaching our goals and higher self. We frequently use the Star of Wellness as a way to imagine the steps to reach better health. Between our mission, our logo, and our Star of Wellness, we truly have a balanced approach that helps our people get back on course or change the direction of their life and health. We want to help all the people in our community to optimize their health and balance their lives. Ultimately, we want people to assess their own lives and find out where they are. We never want to leave people lost. We want to get them out of the woods and help them find a better, optimized way of living. We help them change direction to move away from sickness and disease and move toward their goals of optimal health and balanced living.

A FINAL NOTE TO THE READER:

TAKING YOUR DIRECTION TO THE NEXT LEVEL

One of the great purposes of *Changing Directions* is to deliver a powerful message to an audience that I would otherwise not be in contact with in my day-to-day practice. The powerful methods of functional and integrative—most recently termed lifestyle—medicine must be shared with the world, especially through the scrutinizing viewpoints of a medical doctor such as myself. Unfortunately, the contents of this book barely scratch the surface of these deep methods of healing. That is why I wanted to include this part in closing. Although the contents of *Changing Directions* has its merit, it does not compare to the power and connection that occurs between the physician/healer and the patient. It is something that all of us needs to truly walk in the way to balanced living and optimal health. I always welcome the opportunity to partner with others in this journey. If this is you, please take the next step and contact me and my team of experts at Pioneer Valley Weight and Wellness Centers.

At the center of our healing model is the patient: YOU! We have gathered a team of providers and lifestyle educators to promote a healthy, balanced, and active lifestyle. We educate people on how to achieve an optimal weight to improve overall health and prevent disease, as well as the risk of disease. We rely on powerful but practical methods of gathering information, and then we organize

that information in a way that makes logical sense to both patient and provider. It is an essential piece of developing a partnership in this journey of health. We pride ourselves on realizing that everyone is an individual ... and everyone responds differently to treatments ... and everyone needs personalized interventions to reach their own individual potential.

We base all of our care on the true foundations of medicine and healing: food, motion, stress, sleep, and relationships. And we have individual experts and providers in each discipline to create time and attention to each pillar of this foundational care to get the maximal benefit of each. What separates us from the typical clinic visit is that we have mastery of holistic methods of medicine combined with mastery of traditional methods of medicine. This is a rare find in a world where these two disciplines are not only separate but are often diametrically opposed. That rare blend is found in my clinic and me.

In the end, you will realize that we have *only scratched* the surface; as many things in life, it is beneficial to go deeper ... all the way down to the actual foundation. My team and I would love to help you achieve your full potential, and it starts with *Changing Directions*—but the journey to balanced health and optimal living is *best* navigated by an expert in that journey. Let me be your guide to an entirely new you: an individual full of vitality and energy. Again, I would love to help you achieve that for yourself. Please contact us at (413) 205-1200, or go to our clinic website at www.pvweightloss.com. Change directions, be balanced, and achieve greatness through balanced living and optimal health.

—Christopher Keroack, MD

APPENDIX



Medical Symptoms Questionnaire (MSQ)

Patient Name _____ Date _____

Rate each of the following symptoms based upon your typical health profile for the past 14 days.

Point Scale 0 – *Never or almost never* have the symptom 3 – *Frequently* have it, effect is *not severe*
1 – *Occasionally* have it, effect is *not severe* 4 – *Frequently* have it, effect is *severe*
2 – *Occasionally* have it, effect is *severe*

HEAD	_____	Headaches	
	_____	Faintness	
	_____	Dizziness	
	_____	Insomnia	
			Total _____

EYES	_____	Watery or itchy eyes	
	_____	Swollen, reddened or sticky eyelids	
	_____	Bags or dark circles under eyes	
	_____	Blurred or tunnel vision	
		<i>(Does not include near or far-sightedness)</i>	
			Total _____

EARS	_____	Itchy ears	
	_____	Earaches, ear infections	
	_____	Drainage from ear	
	_____	Ringings in ears, hearing loss	
			Total _____

NOSE	_____	Stuffy nose	
	_____	Sinus problems	
	_____	Hay fever	
	_____	Sneezing attacks	
	_____	Excessive mucus formation	
			Total _____

MOUTH/THROAT	_____	Chronic coughing	
	_____	Gagging, frequent need to clear throat	
	_____	Sore throat, hoarseness, loss of voice	
	_____	Swollen or discolored tongue, gums, lips	
	_____	Canker sores	
			Total _____

SKIN	_____	Acne	
	_____	Hives, rashes, dry skin	
	_____	Hair loss	
	_____	Flushing, hot flashes	
	_____	Excessive sweating	
			Total _____

HEART	_____	Irregular or skipped heartbeat	
	_____	Rapid or pounding heartbeat	
	_____	Chest pain	
			Total _____

MEDICAL SYMPTOMS QUESTIONNAIRE (MSQ)

LUNGS

- _____ Chest congestion
 - _____ Asthma, bronchitis
 - _____ Shortness of breath
 - _____ Difficulty breathing
- Total** _____

DIGESTIVE TRACT

- _____ Nausea, vomiting
 - _____ Diarrhea
 - _____ Constipation
 - _____ Bloating feeling
 - _____ Belching, passing gas
 - _____ Heartburn
 - _____ Intestinal/stomach pain
- Total** _____

JOINTS/MUSCLE

- _____ Pain or aches in joints
 - _____ Arthritis
 - _____ Stiffness or limitation of movement
 - _____ Pain or aches in muscles
 - _____ Feeling of weakness or tiredness
- Total** _____

WEIGHT

- _____ Binge eating/drinking
 - _____ Craving certain foods
 - _____ Excessive weight
 - _____ Compulsive eating
 - _____ Water retention
 - _____ Underweight
- Total** _____

ENERGY/ACTIVITY

- _____ Fatigue, sluggishness
 - _____ Apathy, lethargy
 - _____ Hyperactivity
 - _____ Restlessness
- Total** _____

MIND

- _____ Poor memory
 - _____ Confusion, poor comprehension
 - _____ Poor concentration
 - _____ Poor physical coordination
 - _____ Difficulty in making decisions
 - _____ Stuttering or stammering
 - _____ Slurred speech
 - _____ Learning disabilities
- Total** _____

EMOTIONS

- _____ Mood swings
 - _____ Anxiety, fear, nervousness
 - _____ Anger, irritability, aggressiveness
 - _____ Depression
- Total** _____

OTHER

- _____ Frequent illness
 - _____ Frequent or urgent urination
 - _____ Genital itch or discharge
- Total** _____

Grand Total _____

Identi-T™ Stress Assessment

Name _____ Age _____ Sex _____ Date _____

Stress is a normal part of life. Every day, we're faced with stimuli, called stressors, which can elicit the body's "fight or flight" response, setting off a cascade of physiological reactions and resulting in emotions ranging from mild to intense. But while occasional stress is natural and even healthy, chronic or acute stress can be harmful.

Please take a few moments to discover your body's response to situations you perceive as stressful. By honestly assessing how you feel, your healthcare provider can create a natural stress relief program for your individual needs.

Directions:

Please read each statement and circle the number 0, 1, 2, or 3 that best describes your feelings or reactions throughout the course of the day. Determine the subtotal score for each section, then determine the total scores for sections A-C and C-E. Some questions may appear redundant between sections. There's a reason for each question. Don't spend much time on any one question.

0 = Never true 1 = Seldom true 2 = Sometimes true 3 = Often true

When under stress for two weeks or longer, I...

Section A:

- 1. Get wound up when I get tired and have trouble calming down..... 0 1 2 3
- 2. Feel driven, appear energetic but feel "burned out" and exhausted..... 0 1 2 3
- 3. Feel restless, agitated, anxious, and uneasy..... 0 1 2 3
- 4. Feel easily overwhelmed by emotion..... 0 1 2 3
- 5. Feel emotional — cry easily or laugh inappropriately..... 0 1 2 3
- 6. Experience heart palpitations or a pounding in my chest..... 0 1 2 3
- 7. Am short of breath..... 0 1 2 3
- 8. Am constipated..... 0 1 2 3
- 9. Feel warm, over-heated, and dry all over..... 0 1 2 3
- 10. Get mouth sores or sore tongue..... 0 1 2 3
- 11. Get hot flashes..... 0 1 2 3
- 12. Sleep less than seven hours a night..... 0 1 2 3
- 13. Have trouble falling asleep and staying asleep..... 0 1 2 3
- 14. Worry about high blood pressure, cholesterol, and triglycerides..... 0 1 2 3
- 15. Forget to eat and feel little hunger..... 0 1 2 3

Total points: _____

Section B:

- 1. Find myself worrying about things big and small..... 0 1 2 3
- 2. Feel like I can't stop worrying, even though I want to..... 0 1 2 3
- 3. Feel impulsive, pent up, and ready to explode..... 0 1 2 3
- 4. Get muscle spasms..... 0 1 2 3
- 5. Feel aggressive, unyielding, or inflexible when pressed for time..... 0 1 2 3
- 6. See, hear, and smell things that others do not..... 0 1 2 3
- 7. Stay awake replaying the events of the day or planning for tomorrow..... 0 1 2 3
- 8. Have upsetting thoughts or images enter my mind again and again..... 0 1 2 3
- 9. Have a hard time stopping myself from doing things again and again,
like checking on things or rearranging objects over and over..... 0 1 2 3
- 10. Worry a lot about terrible things that could happen if I'm not careful..... 0 1 2 3

Total points: _____

Section C:

- 1. Have muscle and joint pains..... 0 1 2 3
- 2. Have muscle weakness..... 0 1 2 3
- 3. Crave salt or salty things..... 0 1 2 3
- 4. Have multiple points on my body that when touched are tender or painful..... 0 1 2 3
- 5. Have dark circles under my eyes..... 0 1 2 3
- 6. Feel a sudden sense of anxiety when I get hungry..... 0 1 2 3
- 7. Use medications to manage pain..... 0 1 2 3
- 8. Get dizzy when rising or standing up from a kneeling or sitting position..... 0 1 2 3
- 9. Have diarrhea or bouts of nausea with or without vomiting for no apparent reason..... 0 1 2 3
- 10. Have headaches..... 0 1 2 3

Total points: _____

Section D:

1. Have trouble organizing my thoughts.....0 1 2 3
2. Get easily distracted and lose focus.....0 1 2 3
3. Have difficulty making decisions and mistrust my judgment.....0 1 2 3
4. Feel depressed and apathetic.....0 1 2 3
5. Lack the motivation and energy to stay on task and pay attention0 1 2 3
6. Am forgetful0 1 2 3
7. Feel unsettled, restless, and anxious.....0 1 2 3
8. Wake up tired and unrefreshed0 1 2 3
9. Experience heartburn and indigestion0 1 2 3
10. Catch colds or infections easily0 1 2 3

Total points: _____

Section E:

1. Feel tired for no apparent reason.....0 1 2 3
2. Experience lingering mild fatigue after exertion or physical activity0 1 2 3
3. Find it difficult to concentrate and complete tasks0 1 2 3
4. Feel depressed and apathetic.....0 1 2 3
5. Feel cold or chilled – hands, feet, or all over – for no apparent reason.....0 1 2 3
6. Have little or no interest in sex.....0 1 2 3
7. Sweat spontaneously during the day.....0 1 2 3
8. Feel puffy and retain fluids.....0 1 2 3
9. Sleep more than nine hours a night.....0 1 2 3
10. Have poor muscle tone.....0 1 2 3
11. Have trouble losing weight0 1 2 3
12. Wake up tired even though I seem to get plenty of sleep.....0 1 2 3
13. Have no energy and feel physically weak.....0 1 2 3
14. Am susceptible to colds and the flu0 1 2 3
15. Feel dragged down by multiple symptoms, such as poor digestion and body aches.....0 1 2 3

Total points: _____

Add points from sections A, B & C	Total for A, B & C: _____
Add points from sections C, D & E	Total for C, D & E: _____

Lifestyle and Health Status:

1. Circle the level of stress you experience on the scale of 1-10, 10 being the worst:
 1 2 3 4 5 6 7 8 9 10
2. What do you consider to be the major causes of your stress (for example — spouse, family, friends, work, finances, wedding, pregnancy, legal, commute):

3. I eat breakfast _____ times a week. My typical breakfast is: _____
4. I take a multiple vitamin/mineral _____ days per week. I take a fish oil supplement _____ days per week.
5. I participate in 30 minutes of physical activity such as walking, aerobics (e.g., running), resistance training (e.g., weights, pilates), sports (e.g. biking), or yoga:
 Daily 5-6 times per week 3-4 times per week 1-2 times per week Less than once a week
6. I smoke _____ cigarettes daily.
 Daily 5-6 times per week 3-4 times per week 1-2 times per week Less than once a week
7. I drink two or more 8 ounce cups of caffeinated coffee or other caffeinated beverages like energy/diet drinks, colas, or black or green teas:
 Daily 5-6 times per week 3-4 times per week 1-2 times per week Less than once a week
8. I drink two or more ounces of alcoholic beverages:
 Daily 5-6 times per week 3-4 times per week 1-2 times per week Less than once a week
9. List your current health problems and any over-the-counter or prescription medications that you are now taking:

Current health problem(s)	Date of onset	List all current medication(s)
_____	_____	_____
_____	_____	_____
_____	_____	_____

