

# REGENERATE

UNLOCKING YOUR BODY'S  
RADICAL RESILIENCE THROUGH  
THE NEW BIOLOGY



Sayer Ji

Founder of [GreenMedInfo.com](http://GreenMedInfo.com)

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# INTRODUCTION

*R*egenerate means to rejuvenate, revitalize, and renew. These words hold great promise, especially for so many of us who feel something is wrong, most often in our bodies but increasingly in our souls. We yearn for a feeling of peace, wholeness, and vitality, but experience our bodies as the fallible and vulnerable structures we have been made to believe them to be. In fact, we have been designed to naturally draw strength, energy, and healing from deep within rather than to succumb like clockwork to the “inevitable” downward spiral of biological time. On the cellular level, our bodies have the innate power and ability to reverse damage, regenerate, and restore a directly felt experience of well being we have lost.

This isn't just wishful thinking. A significant number of new studies in biomedical science confirms that our bodies are radically resilient and that all we need to do to reclaim our health and vitality is to eliminate sources of interference with our bodies' innate, robust self-regenerating capacity. Our physical form represents eons of adaptation to and mastery over constantly changing conditions, including powerful forces of environmental and

biological adversity. Our bodies have emerged from this crucible with veritable superpowers, not the least of which is our seemingly magical and irrepressible capacity for radical resilience.

The New Biology offers a revolutionary and breathtaking vision of the body as resilient, intelligent, and seamlessly interwoven with the larger universal patchwork. As you read this book, you will learn how to engage your body's self-healing mechanisms and unleash your cells' regenerative powers.

On a molecular level, every cell in your body is undergoing a constant process of coming into and out of being, much like the flicker of a flame, and doing it so perfectly that we only experience ourselves on a macroscopic level as immutable, relatively unchanging organisms. Yet there are trillions of changes and microadjustments occurring every moment in each cell, completely regenerating damaged and diseased tissue.

On the most basic level, regeneration follows from removing what the body does not need and adding back what it does.

In **Part I: Your Body and the Miracle of Regeneration**, you will learn about the secret relationship between human and plant evolution, your genes, and the most common health regenerators and disruptors. Contrary to popular dogma, your DNA is not your destiny. You are in the driver's seat and your choices—from the food you eat to your interactions with nature—powerfully impact your health. You will learn about the regenerative powers of your cells and how to optimize them for healing and longevity. You will pick up some fundamental scientific knowledge, like how microRNAs, the potent messengers in food that communicate directly with your cells, can orchestrate your gene expression, and how telomeres, the noncoding pieces of DNA at the end of your chromosomes, directly influence your experience of aging.

**Part II: Rethinking Chronic Disease, Prevention, and Healing** offers startling new information about the Western Pattern Diet—the archetypal grain-centric, chemically processed, industrialized food staples and preferences that emerged in the post-World War II era that has since been exported from the United States to almost every nation in the world—and its



connection to the emergence of chronic conditions that accelerate aging and adversely impact both the length and quality of life, including cancer, Alzheimer's, cardiovascular disease, and metabolic syndrome, clusters of health conditions referred to as "diseases of affluence" and all representing a short-circuiting of the regenerative processes within your body. Because fear is a major impediment to successful healing, Part II addresses the psycho-emotional dimension of cellular degeneration and the role the medical establishment plays in perpetuating these trends.

**Part III: Regenerate Rx** provides you with a road map to better health. You will learn how to detox from the Western Pattern Diet and heal with the foods of the ancestral diet. You will learn how to optimize the effects of the ancestral diet with natural supplements for long-term results and use nature's abundant energy sources to encourage the regenerative process, strengthening your body from the inside out. You will plunge into the joy of intentional movement and learn time-tested techniques for improving your sleep and diffusing stress to decelerate the aging process and help neutralize the underlying conditions that foster chronic disease.

Whether you are seeking to improve your quality of life, reverse a chronic condition, or harmonize your body with your ancestral and evolutionary healing mechanisms, using the principles of the New Biology will transform your body, mind, and soul, and enhance your ability to truly feel deeply alive and well again—experiences that I believe are your natural birthright.

## MY OWN JOURNEY OF HEALING

While today I find myself easily amazed at the extreme intelligence and resilience of the the human body, it took many years for me to experience its vitality firsthand. I came into this world as a sickly infant, and during my journey to recovery, I felt so saddled with hopelessness and dependency on medications that I often doubted that I would make it to adulthood. Yet, in so many ways, I am

stronger now than I have ever been. I've gone from being an overweight inactive asthmatic with a bum hip to a marathon-running natural health advocate who hasn't used a medication of any kind for decades.

My struggle to overcome disease started when I was six months old, at our doctor's office, where my big sister was getting a checkup while my mother held me in her arms. The nurse observed my pale skin and heard my shallow, wheezy breathing, and, instead of fetching my sister, she whisked me from my mother's arms for clinical evaluations and tests. That day, I was diagnosed with severe bronchial asthma and thereafter spent most of my childhood on a never-ending merry-go-round of doctor's appointments and hospital stays, struggling with a multitude of overlapping health issues, from recurrent colds to chronic allergies to severe "asthma attacks" requiring emergency trips to the hospital, at times as often as twice a week.

I received all the vaccines customary at the time—the first battery of which coincided exactly with the onset of my asthma—and was given powerful medications like antibiotics and steroid inhalers, which I continued to take throughout my childhood. When things got really bad, my parents would rush me to the nearest emergency room for an injection of epinephrine, an anxiety-provoking rush of adrenaline intended to dilate the bronchial passageways during an acute asthma attack. Between these shots, my vaccinations, and immunotherapy injections for allergies, I sometimes felt like a human pincushion. But even though my bathroom medical cabinet was overflowing, no remedy lasted, because the root causes of these episodes—which no one seemed to be searching for at the time—remained unaddressed.

When I was six, I had my adenoids removed, an immune organ, whose removal has now been linked to a range of diseases of the upper respiratory tract and increased risk of infectious/parasitic diseases later in life.<sup>1</sup> When I was 12 and 13, I underwent two major surgeries for a relatively rare bone and hip joint condition called slipped capital femoral epiphysis, a condition that we now know occurs more frequently in asthmatics whose



exposure to inhaled corticosteroids has had the unintended effect of disrupting normal bone and cartilage development. Given my physical limitations (to this day, my right femur bone is half an inch shorter than my left) and general lack of vitality, it was often difficult for me to play with the other kids or participate in school gym classes. I was overweight, unfit, and desolate. I felt like an outcast imprisoned within the dilapidated confines of my body. Sometimes my respiratory challenges were so bad that I had difficulty walking up the stairs.

When I was 17, my doctor assured me and my parents that if I had surgery on my sinuses, my breathing would improve. But the surgery left me with worsening nasal obstructions and chronic sinus infections that made it even more difficult to breathe.

These early life experiences of riding the medical merry-go-round left me deeply traumatized, prompting me to disassociate from my body, where so much physical and emotional pain was stored. Not only did modern medicine fail to significantly help me; it seemed to be, at times, actively torturing me. In retrospect, I see how my growing sense of powerlessness was reinforced by a medical system that believed chronic health conditions like asthma were outside one's sphere of control. Asthma was said to simply "run in the family," as if it were a settled matter of shoddy genetics.

At least a dozen doctors examined and treated me as a child and young adult, and not one investigated the environmental conditions, diet, toxicant burden, or mind-body-emotion connection as upstream triggers of my symptoms. It wasn't until my first year in college, when I was exposed to an entirely new realm of alternative health ideas and practices, that I considered the possibility that my asthma had been caused by dietary, behavioral, and emotional factors.

When I learned that cow's milk, far from being the calcium-rich elixir of health that millions have been encouraged to believe, has "mucus-forming properties," I decided to test the idea on myself by removing milk and cheese from my diet. The result was, and has continued to be, nothing less than miraculous. Within days, my lifelong asthma went into complete remission. After 17

years of nonstop asthma medication usage, I put it away—for good. The symptoms of asthma never came back unless I inadvertently consumed even the smallest amount of dairy products. (The one exception is clarified butter, or ghee, dairy products that are made safe by the removal of the antigenic casein protein.)

After a life defined and circumscribed by medical complaints, I felt simultaneously wronged and liberated. Even more exciting than being able to breathe again was realizing that I am not biologically destined to be weak and flawed. Thereafter, I began to deconstruct and question the medical institutions that everyone, myself included, held as the ultimate authorities on health.

I would eventually learn that cow's milk contains white, sticky proteins, such as A1  $\beta$ -casein, and powerful, gene-impacting microRNA molecules, packaged in little particles called exosomes, that are intended for bovine calves. The biological pathways<sup>2</sup> that cow's milk activated in my body presented the symptoms of asthma. Asthma, on some level, was my body trying to communicate a profound mismatch between my body's needs and the inadequacies of the conventional Western diet that I was consuming. The symptoms were not the enemy but were instead harbingers of the solution.

Later, I learned that other gastrointestinal symptoms (such as constipation and acid reflux) that had plagued me were caused not by bad genes or bad luck but by our biological incompatibility with gluten-containing grains like wheat. From that point onward, I became so absorbed by connections between adverse medical conditions, food, and the body's untapped potential for healing that it eventually became my life's work. So far, I have amassed a database of over 10,000 researched health topics that I share with the world via my brainchild, GreenMedInfo.com. I created GreenMedInfo.com with the intention to provide both cynics and believers with the published, empirically validated proof of what countless individuals have experienced firsthand: the transformative power of self-healing through nutrition, nature, and holistic medicine. To help expand public access to an entire arsenal of untapped modalities long revered by ancient medical systems.



To promote informed consent and medical freedom around every allopathic treatment. And most pivotally, to enable you to recapture autonomy in your life and to become the master of your own health destiny.

The New Biology revolution is happening quickly but so quietly that it flies under the radar of most conventional medical and pharmaceutical professionals. In fact, it's been happening in the annals of the most respected medical journals for more than two decades. However, you don't need a science degree to understand or apply the findings. This book distills my gleaned knowledge about how to ignite your body's natural healing powers—the very same ones that Hippocrates described when he said, “Natural forces within us are the true healers of disease.”

I'm writing this book in the hopes that I can help others who are experiencing persistent symptoms or sickness to pause and consider that their bodies, far from being flawed, are sending a message that something they are consuming, breathing, or thinking is toxic or biologically incompatible with wellness. Symptoms are the body's way of signaling distress, lack of equilibrium, and its desperate need for support. To truly heal, it's time to feed, nurture, and tend to your symptoms as you would a crying baby rather than silencing and suppressing them.

As you modify the lens through which you explore your symptoms, two truths will percolate to the surface. First, your birthright is health rather than disease and debility. And second, your illness is an opportunity for consciousness-awakening insights and radical transformation. Wherever you may be on your life's journey, every day you can make choices and decisions that will help make your body more capable of regeneration and radical resilience. Let me show you how.





**PART ONE**

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**YOUR BODY  
AND THE  
MIRACLE OF  
REGENERATION**

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**THE TRUTH ABOUT  
YOUR GENES,  
FOOD AS INFORMATION,  
AND YOUR BODY'S  
ALCHEMICAL PHYSIOLOGY**





# THE NEW BIOLOGY REVOLUTION

## DNA, MicroRNA, and the Gene Expression Connection

If you are like most dis-eased Americans, you aren't feeling so well. You may have been diagnosed with at least one chronic disease—diabetes, hypertension, arthritis, or acid reflux being the most common—or suffering in silence from numerous other common afflictions like depression and anxiety.

Statistics issued by the Centers for Disease Control (CDC) rank chronic disease as the leading cause of death and disability in the United States today. According to the CDC, 7 out of every 10 deaths are caused by chronic diseases, and an astounding 75 percent of our annual health care expenditure is directed at managing this ever-expanding epidemic.<sup>1</sup> I am betting that you're not interested in a lifelong commitment to popping prescription pills as a method of palliative management. And I hope you don't think that your body is inherently defective and destined to be broken beyond repair. Instead, I'm here to tell you that there is another

way, and new science substantiates that promise with intelligent, elegant, and sophisticated research.

To understand the source of my optimism about your body's potential, consider how far your body has come. The cells of your body exist because of an incredibly resilient germline lineage that has been replicating in all living things since the beginning of biological time on this Earth, and possibly much further back. These germline cells—sperm in men and ova in women—represent a quasi-immortal and unbroken biological thread of a near-infinite number of cell divisions connecting us to the last universal common ancestor (LUCA), which is estimated to have emerged some 3.5 to 3.8 billion years ago in the vicinity of the hydrothermal vents on the primordial ocean floor.

Relative to the somatic, or body, cells to which they give rise, these germline cells are “deathless” in the sense that their biological information has been transmitted from generation to generation for billions of years without interruption and will continue to be passed down through our offspring and descendants to come. The stem cells produced from their union are instrumental in renewal and regeneration of damaged cells in your body right here, in this instant. No pharmaceutical intervention will ever come close to the self-healing abilities of the stem cells contained within every tissue of your body.

The fundamental takeaway, as we will explore, is that your body contains a seed of immortality—and this is not a metaphor but literal. It is manifested in the tireless regenerative capacities of your many stem cells and has access to a near-limitless amount of energy that comes from a source beyond the caloric content of your food. This is the core of the New Biology, a scientific revolution that is radically changing our understanding of the human body. With the New Biology, a diagnosis doesn't have to be a life-long sentence. Drugs are not your only viable option. The exquisitely intelligent healing properties of the right kinds of food and your body's ability to harvest its own inner reservoir of regenerative energy are far more powerful than any medical prescription that you've been issued. This is not what the multi-billion-dollar,

fee-for-service, profit-driven medical-pharmaceutical-industrial complex wants you to know. With the primary objective of generating a perpetual cycle of revenue by selling drugs, they are driven to create lifetime users rather than promote wellness.

The good news is that our drug-based disease management system is largely replaceable by open-source, biocompatible (made of the same natural compounds as your body), freely extracted botanical medicine as well as dietary and lifestyle intervention. The highly empowering message—that your body can regenerate and heal itself of the most feared diseases of our time—is no longer being trumpeted only by herbalists and energy medicine practitioners; it has now also been accredited by medical professionals.

## THE BIRTH OF THE NEW BIOLOGY

When I was in college, inhaler-free for the first time after having removed cow's milk products and wheat from my diet, I was excited to learn more about the reasons why such a minor dietary change could result in what amounted to a full remission of a lifelong and, at times, life-threatening condition. I chose to dive deep into science and medicine but found that superficial exploration of the diet-health relationship alone could not explain my experience. Food, after all, was never designated a significant role beyond its calories and nutrient count. It is the constant questioning of such deep-seated assumptions that led me down the rabbit hole into the study of philosophy, a discipline that entails systematically deconstructing and deprogramming all areas of human knowledge and experience. Through the help of incredible professors, especially my mentor, the great American philosopher Dr. Bruce Wilshire, and our shared interest in a special branch of empirically grounded philosophy known as phenomenology, I turned my attention to scientific and medical literature and started to notice a new way of thinking on the subject of the body and healing. It may not have been validated fully through the



old scientific methods, but it was compelling enough to demand further inquiry. This is what led me down the path to the material and concepts that inspired the creation of this book.

In the decades since then, I have been especially wary of the rise and increasing ideological dominance of “scientism,” the belief that all forms of knowledge should be judged by the long-held assumptions and methods of the physical and biological sciences and that what cannot be proven on these terms is not relevant or does not exist.

To truly grasp the specter of scientism, which materialized during the 17th-century Scientific Revolution, we must understand how that movement elevated rationale, logic, and reasoning at the expense of other human faculties such as creativity, imagination, intuition, and direct experience. The accompanying idea that science alone has access to the ultimate, objective truth ignores the implicit biases, conflicts of interest, competing agendas, and cultural ideologies that have influenced the outcomes of medical research and even the development of scientific language itself.

Scientism leads to what I call “medical monotheism,” or the belief that there is only one true and right way to interpret and practice medicine, whereas alternative or competing methods are deemed heretical and steeped in quackery, despite the evidence of their being safer, more effective, and more readily available. This groupthink approach has entrenched itself within the biomedical establishment, making it career suicide for any professional to cite research or findings that defy or disprove popular medical opinion, much less apply alternative modalities like homeopathy or nutritional interventions instead of the establishment’s prescribed standard of care. The medical establishment will go to enormous lengths to prove that natural medicine is ineffective at best and dangerous at worst. In our time, physicians have been indoctrinated and trained to match conditions with drugs and play symptom whack-a-mole, often making it impossible to discern patterns that have not already been stamped for approval by their peers. This is what is often called “consensus medicine” or

“eminence-based medicine,” which is based upon the often arbitrary and agenda-driven agreements of a group of highly influential individuals who have “always done it this way” instead of using the evidence at hand.

The maligning of anything but pill-for-an-ill medicine dates back to the 19th century, when natural medicine fell from grace. Back then, chiropractors and doctors who practiced natural healing methods, including hydropaths, naturopaths, and homeopaths, were preeminent over other medical professions. They became a relic in the aftermath of the Flexner Report, published in 1910. This survey to assess the American medical educational system, commissioned by the council of the American Medical Association (AMA), demonized these healers as quacks and charlatans. In order to gain a monopoly over the medical landscape, the AMA spearheaded a systematic smear campaign to delegitimize schools of medical practice that did not advocate drug-based treatments in their curricula, giving legal credence and institutional sanction only to medical schools that did.

This homogenization in licensure and medical education coincided with the funding of the earliest medical schools by oil magnate John D. Rockefeller and the rise of petroleum-based pharmaceutical drugs, in which Rockefeller had a vested financial interest and which became the bedrock of allopathic medicine (a form of medicine that focuses on suppressing symptoms of disease with drugs and surgery, in neglect of addressing their root causes). With these developments, medical doctors, formerly relegated to lower rungs on the social ladder, ascended the hierarchy to the position they now occupy—idolized as the guardians of privileged knowledge.

In theory, the cornerstone of the medical establishment’s approach is “evidence-based medicine,” or conclusions that were reached and treatment algorithms that were enacted based on well-designed, well-conducted research. The reality is that the scientific literature itself is fraught with controversy, as articulated by Richard Horton, editor-in-chief of *The Lancet*, who stated, “The case against science is straightforward: much of the scientific literature, perhaps half, may simply be untrue.”<sup>2</sup> Likewise, the former



editor-in-chief of the high-impact journal the *New England Journal of Medicine* arrived at similar conclusions: “It is simply no longer possible to believe much of the clinical research that is published, or to rely on the judgment of trusted physicians or authoritative medical guidelines. I take no pleasure in this conclusion, which I reached slowly and reluctantly over my two decades as an editor.”<sup>3</sup>

Industry funding is a major impediment to unbiased results, as analyses have shown that industry-sponsored trials report positive outcomes significantly more often than trials financially backed by the government, nonprofits, or nonfederal organizations.<sup>4</sup> In a publication, bias known as the “file drawer” phenomenon, negative and null trials, or results that are unfavorable to drugs are more likely to be suppressed.<sup>5</sup> There is also widespread rigging of data—deliberate manipulation of outcomes and use of statistical sleight-of-hand—wherein the outcomes of trials are being corrupted by commercial interests.<sup>6</sup> And then there is the issue of industry bribery of journal editors. One retrospective observational study revealed that 50.6 percent of journal editors accept payments from industry sources, with an average payment of \$28,136 and some payments approaching half a million dollars, meaning that the editors of the most influential journals in the world, who steer the scientific dialogue, are effectively on the take.<sup>7</sup> In addition, a 2007 national survey published in the *New England Journal of Medicine* found that 94 percent of physicians had ties to the pharmaceutical industry, with physicians receiving free meals, reimbursement for medical education or professional meetings, consulting, lecturing, and enrolling patients in clinical trials.<sup>8</sup>

The influence of pharmaceutical reps, who have been shown to maneuver the direction of physician prescribing practices, cannot be underestimated either. If many medical doctors and researchers are bought, if tampering with and distorting research findings is ubiquitous, and if publication of studies favors promising candidate drugs,<sup>9</sup> the edifice of evidence-based medicine begins to crumble. When the judge and jury are bought off, it is no longer possible to trust the recommendations that are established as standard of care.



Given these tactics, it takes a discerning eye to wade through the catacombs of scientific databases, analyze study methodology, ascertain study quality, assess conflicts of interest, and separate the proverbial wheat from the chaff. Thanks to my librarian mother and biology professor father, I was, early on, made familiar with resources like MEDLINE, the government database of over 30 million citations for biomedical literature, which offered me my first glimpse into high-quality peer-reviewed research around my own health issues. And perhaps thanks to this background, I had an uncanny knack for finding non-industry-funded clinical pearls within the immense ocean of published literature containing promising information that conventional medicine was unenlightened about, or even actively suppressing.

Ultimately, I made this deep digging into and re-examination of medical literature my life's work, spending thousands of hours as an informed health advocate and activist, sifting through hundreds of thousands of studies to find, index, and share information that would arm me and others. My goal was always to explore, find, and share the science of natural healing. This involves shining a spotlight on the unintended, adverse effects of conventional medical drugs and practices, known as iatrogenesis, while also uncovering natural, evidence-based alternatives that work in harmony with human physiology.

My ultimate purpose is to help people regain confidence in their bodies' self-healing abilities and to underscore that when it comes to the majority of complaints, all the medicine you need has resided within you all along. Most people that I interact with are at least curious about alternatives to pharmaceutically driven allopathic medicine—but they do not want to, nor should they, take my or anyone else's information on faith alone. Just as they are growing increasingly skeptical of the advice and treatment algorithms of conventional, drug-based medical doctors, they are also leery of falling prey to the latest fad supplement or tabloid diet. Beyond anecdotal evidence, people want robust scientific evidence and strategies that can help them.

So much of the medical literature today is obscured by the highly technical and esoteric “medicalese.” My mission is to help readers overcome this barrier. On GreenMedInfo.com, you will find a database of biomedical literature covering over 10,000 different health topics, with over 50,000 citations from high-quality scientific literature. These articles are authored by respected, established experts and are indexed for easy access and searchability, including by medical condition and therapeutic substances and actions. Also included in the database is a compendium of my own writing that translates innovative new research into common language.

It still amazes me how many people around the world have come to use our website—over 150 million visits in total—since its humble beginnings as a passion project from my home garage back in 2007. In order to maintain a zone free of conflict of interest as best as I can, I have chosen to run the site without ads. Still, despite the growing popularity of independent sites like my own, people find themselves overwhelmed by the immense volume of often conflicting health information on the Internet. Now more than ever, we need trusted sources of information who can reduce the noise-to-signal ratio and who can deliver simplicity out of the teeming mass of complexity and contradiction.

You now have in your hands my life’s work and vision, a product of two decades of perpetual research, relentless inquiry, and rigorous self-exploration. Here you will find pivotal concepts that I find truly exhilarating and revolutionary, including key findings of the New Biology and New Biophysics.

Put simply, the New Biology unveils three foundational facts about human health that have highly empowering implications:

1. **DNA does not control your destiny.** Epigenetic factors, or factors beyond the control of your genes (such as diet, lifestyle, environmental exposures, and mindset), almost exclusively determine your life-span and quality of life.
2. **Food is not just fuel and building blocks for the body; it’s also a messaging system that delivers**



**critical information to the body.** In fact, certain foods and lifestyle practices can unlock immense self-regenerative energetic resources within your cells, optimizing DNA expression and making them more important in affecting your health than any other single factor.

3. **The cells of your body are capable of seemingly miraculous feats.** Your cells access “free energy” from the environment, facilitating low-energy nuclear transformation of elements and radical self-regeneration through recruitment of stem cells derived from an ancient, nearly immortal cell line. When properly directed through diet and lifestyle, they can reverse both chronic disease and biological age.

Let's begin by rethinking the idea that has been drilled into all of us since grade school: that DNA is your personal blueprint for your health and disease destiny.

## **DNA IS NOT A BLUEPRINT**

Since you first gazed upon textbook images of the DNA double helix, comprising two strands winding around one another in a twisted ladder, you have probably believed what you were taught: that DNA is a blueprint, as if your body were a car and enfolded in the DNA were instructions for how to build the chassis, engine, and windshield wipers. In Western medicine, the locus of causality and the sphere of blame are turned inward: the body is viewed as a passive recipient of genetic instructions and disease as primarily a matter of hereditary misfortune.

A person with breast cancer might resign herself to the explanation that her diagnosis was the result of “bad genes.” However, in Eastern cultures and ancient medical systems, such as Indian Ayurvedic medicine and traditional Chinese medicine, there is an



intuitive appreciation for the way environmental variables intersect with individual constitution and decisions to produce disease. They attribute disease origin to a combination of factors, such as temperament, diet, and lifestyle habits, and envision disease as the by-product of imbalances operating at a larger scale, including fluctuations in climate, the seasons, and the cosmos. Psychosocial factors, such as discord in families and community, also play a role. In contrast, the determinism of modern science undermines efforts at self-healing and regeneration through its fatalistic view of human biology as being at the mercy of our genetic code.

When I first met my friend Jennifer, she was in her late 20s, and her health was on a steep decline from cystic fibrosis. She is considered to have one of those rare and damning genetic conditions, having been born with a mutation of the cystic fibrosis transmembrane conductance regulator (CFTR) gene. She was on antibiotics and steroids, saddled with skin, respiratory, and digestive problems, and chronically underweight. She also suffered from Type 1 diabetes subsequent to pancreatic damage, a major complication of cystic fibrosis.

Jennifer decided to radically shift her diet away from pro-inflammatory foods, such as wheat, dairy, and sugar. Instead, she consumed an abundance of green, leafy vegetables, good fats, and targeted supplements, including broad-spectrum enzymes and probiotics, which gave her body relief from the increased mucus production that is symptomatic of cystic fibrosis. She incorporated blood sugar-stabilizing foods, exercise, and mind-body techniques into her regimen and ate functional foods like turmeric, soy, and cayenne. Rodent studies had shown “miraculous” partial or full correction of the CFTR gene product misfolding when subjects were exposed to the phytochemicals found in these plants.

Changing these lifestyle factors has been exactly how Jennifer continues to defy the odds. The average life-span of someone with this kind of genetic variation is only 37 years. Today, at 49, Jennifer is alive, highly functional, and healthier. And she is just one example.

## THE PROBLEM WITH THE GENES—CAUSE—DISEASE MODEL

Tens of thousands of people worldwide who have been diagnosed as having chronic, progressive, or incurable ailments defy the odds, demonstrating the regenerative potential of the human body. And we shouldn't be surprised. The New Biology reveals that it is no longer accurate to assert that our genes cause disease any more than it is correct to claim that DNA is sufficient to account for all the proteins in the human body. The DNA-as-blueprint assumption originally postulated that there should be one gene per protein, but in recent decades, through the Human Genome Project, scientists have discovered only 20,000 to 25,000 protein-encoding genes, a number that pales in comparison to the 100,000-plus proteins found in the human body. The latest estimates, in fact, have pared this number down to about 18,000. In the face of these findings, it has become impossible to maintain the simplistic concept that there is a linear, one-way path from genes to disease.<sup>10</sup>

Instead, the old gene-disease narrative is being supplanted by epigenetics, a school of thought that focuses on the factors “above” the genes as the primary determinant of the way in which our genetic material is interpreted, translated, and expressed. Epigenetics accounts for how a liver cell is different than a brain cell or a muscle cell. All three share the same 3 billion base pairs that make up our genetic code, but epigenetic mechanisms, such as regulatory proteins and post-translational modifications, have a great say in which genes are expressed and which are silenced, resulting in the unique phenotype, or outward appearance, of each cell.

Environmental variables can either activate or inhibit genes by influencing complex biochemical processes, and these changes can be transmitted to daughter cells upon cell division.<sup>11</sup> Something as simple as getting adequate B vitamins from your food will directly affect whether you can silence certain key genes necessary for health (a process known as methylation, or the attachment of one-carbon tags to DNA molecules that effectively “turns off” the expression of that gene). Moreover, a huge number



of factors that are often totally within your control will influence epigenetic expression. Whether you are sedentary, pray, smoke, meditate, do yoga, eat plants, have an extensive network of social support, or are alienated from your community, all your lifestyle choices play into your risk for disease through epigenetic mechanisms. In fact, the conclusions of the Human Genome Project ushered in “nutrigenomics,” a novel field of research that studies the reciprocal interaction between genes and nutrients at a molecular level. Bioactive compounds in food, for example, can modulate cellular signaling pathways, regulating key molecules like nuclear factor kappa beta (NFκB), a transcription factor that is the gateway to production of inflammatory messengers.<sup>12</sup>

On a smaller scale, biochemical processes encompassing the release of hormones and other cellular messengers, oxidative stress (excess free radicals), inflammation, lipid peroxidation (the “rusting” of fats), body morphology (deposition of belly fat, for example), and the proliferation of our gut microbiota exert effects on our patterns of genetic expression. Other macro-level epigenetic influences include psychological stress, socioeconomic status, geopolitical variables, educational attainment, occupational elements, urban or rural residence, and climate. These factors issue directives to our DNA and contribute to our genetic expression in either favorable or unfavorable directions. In practical terms, this means that controllable variables such as diet and lifestyle practices; exposure to pathogens, radiation, chemical contaminants, and pollutants; medical interventions; and even mind-set and emotions coalesce to determine how epigenetic factors are articulated.<sup>13</sup>

Rather than succumb to analysis paralysis, let this research rescue you from the clutches of a genetically divined fate. According to a recent review paper published in *PLOS ONE*, genetic factors aren't to blame in many chronic diseases.<sup>14</sup> Studies connect cancers of nearly all types, neurobehavioral and cognitive dysfunction, respiratory illnesses, autoimmune disorders, reproductive anomalies, and cardiovascular disease to epigenetic mechanisms.<sup>15</sup> The burgeoning field of epigenetics offers us a new paradigm in



which nurture, not nature, can be envisioned as the predominant influence when it comes to genetic expression.

## YOUR HABITS NOW AFFECT YOUR PROGENY LATER: MICRORNA AND GENE EXPRESSION

The arrival of epigenetics has overturned one of the most sacred tenets of modern genetics, the Weismann barrier, which proposes that movement of hereditary information from genes to body cells is unidirectional, and the information transferred by egg and sperm to future generations remains independent of body cells and parental experience.

Animal research has shown that parental experience is epigenetically imprinted not only onto first-generation offspring but also potentially onto a countless number of future generations. Take, for instance, one study that traced the transient exposure of pregnant rats to the insecticide methoxychlor, an estrogenic compound, and the fungicide vinclozolin, an antiandrogenic compound. Exposure to these two chemicals resulted in male infertility and decreased sperm production and viability in 90 percent of the males of all four subsequent generations that were tracked.<sup>16</sup> Scientists speculate that these adverse reproductive effects were mediated by changes in DNA methylation patterns in the germline cells, suggesting the transmission of epigenetic change to future generations. The authors of this research conclude, in the journal *Science*:

The ability of an environmental factor (for example, endocrine disruptor) to reprogram the germ line and to promote a transgenerational disease state has significant implications for evolutionary biology and disease etiology.<sup>17</sup>

The immediate implication is that endocrine-disrupting, fragrance-laden personal care products and commercial cleaning supplies may trigger fertility problems in multiple future

generations. The broader and more hopeful implications of this research, however, are that germ cells (egg and sperm) exhibit a dynamic plasticity and adaptability in response to environmental signals that can be communicated to future generations. In other words, your actions now may affect your descendants and the future of humanity for better or for worse.

Other studies indicate that characteristics of the parental sensory environment experienced before conception, such as trauma or famine, can remodel the sensory nervous system and neuroanatomy in subsequently conceived generations through epigenetics. This is best illustrated by a study in which researchers wafted the cherry-like scent imparted by the chemical acetophenone into the chambers of mice while administering electric shocks, conditioning the mice to fear the scent. Despite having never encountered the chemical before, mice in the two successive generations shuddered significantly more in its presence when compared with the control group.<sup>18</sup>

It has been well established that maternal famine or undernourishment in the time around conception is associated with a host of health risks in the offspring, including major affective disorders such as schizophrenia, congenital anomalies in the central nervous system, decreased intracranial volume, and higher risk for obesity, hypertension, and heart disease later in life.<sup>19</sup> In a similar vein, children of Holocaust survivors have shown the intergenerational effects of stress and tragedy by exhibiting altered profiles of stress hormones, which has predisposed them to anxiety, depression, and post-traumatic stress disorder (PTSD).<sup>20</sup>

How long epigenetic changes persist remains to be determined, but animal models provide us with clues that they endure longer than ever predicted—epigenetic memories of environmental change lasted at least 14 generations in one study of nematode worms.<sup>21</sup>

This body of research is game changing in that it shows that the flow of genetic information, once thought to be strictly vertical and insulated from the world, also flows horizontally and bidirectionally. New studies are overturning the conventional logic

that genetic change only occurs over an elongated time range of hundreds of thousands and even millions of years. Research continues to illuminate that genetic information can be transferred through the germline cells of a species instantaneously in *real time* through the medium of exosomes.

### **MicroRNAs, Exosomes, and the Gene Expression Connection**

Unlike messenger RNAs, whose job is to carry instructions from DNA into ribosomes where they are transcribed into proteins, microRNAs turn on and off the expression of a wide range of our genes through silencing messenger RNA.<sup>22</sup> MicroRNAs are transported in virus-sized exosomes, or specialized, membrane-enclosed, nano-sized vesicles secreted by all plant, animal, bacterial, and fungal cells. MicroRNAs survive the digestive process intact and function like software, altering the expression of the hardware that is our protein-coding genes. Not only are microRNAs instrumental in regulation of gene expression, but the difference in sophistication between higher life-forms such as humans relative to, say, earthworms (with whom we share about the same number of protein-coding genes: approximately 20,000) has been attributed to the higher level of RNA complexity within the so-called dark matter of the genome—which constitutes the approximately 98.5 percent of the human genome that does not code for proteins. The most important takeaway with respect to these biomolecules, however, is that our genetic and epigenetic integrity may be wholly contingent upon the gene-regulatory microRNAs imbedded in our diet.



In one groundbreaking experiment, human melanoma tumor cells genetically engineered to express genes for a fluorescent tracer enzyme were transplanted into mice.<sup>23</sup> Experimenters discovered that information-storing molecules containing the tracer, including exosomes, were released into the animals' blood. The exosomes were also shown to deliver RNAs to spermatozoa (mature sperm cells) and remain stored there. The implication is that the RNA carried to sperm cells by exosomes can preside over gene expression in a way that changes the observable traits and disease risk, as well as the morphology, development, and physiology of the offspring. This miRNA harbored in exosomes may be the means by which both environmental assaults and health-promoting influences are epigenetically relayed to future generations.

## **RADICAL RESPONSIBILITY AS THE KEY TO HEALTH**

Research into microRNAs and exosomes challenges the traditional Mendelian laws of genetics and its chromosomally based theory of inheritance, which maintains that genetic inheritance occurs exclusively through sexual reproduction and that traits are passed to offspring through the chromosomes contained in germline cells and never through somatic (body) cells. This research confirms that traits that are the by-product of our lifestyle, experiences, and exposures can separate from chromosomal genes and be transmitted to progeny, resulting in persistent phenotypes (observable characteristics, traits, or diseases) that endure across generations.<sup>24</sup>

According to scientific literature, hazards of modern agriculture, the industrial revolution, and contemporary living—including radioactivity, heavy metals, pesticides, tobacco smoke, polycyclic aromatic hydrocarbons from vehicular exhaust, hormones, infections, and deficiencies in essential nutrients—are known or suspected drivers behind epigenetic processes.<sup>25</sup>

Serendipitously, however, the remedy is in nature's pharmacopeia. Exercise, mindfulness, and bioactive components in fruits and vegetables (such as sulforaphane in cruciferous vegetables, resveratrol from red grapes, genistein from soy, diallyl sulphide from garlic, curcumin from turmeric, betaine from beets, and catechins in green tea) can optimize your body's innate resilience.

The air we breathe, the food we eat, the thoughts we allow, the toxic compounds to which we are exposed, and the experiences we undergo may continue to reverberate through our progeny long after we are gone. This breathes new life into the principle of seven generation stewardship taught by Native Americans, which mandates that we consider the welfare of seven generations to come in each of our decisions. Not only should we embody this approach in practices of environmental sustainability, but we would be wise to consider how all the conditions to which we subject our bodies may translate into ill health effects and diminished quality of life for a number of subsequent generations.

Our genes have a memory, and, as Deepak Chopra says, our cells are constantly eavesdropping on our thoughts. We must reframe our relationships, our mental monologues, our narratives, and our habits in the face of this radical insight. As articulated by British geneticist Marcus Pembrey, "we are all guardians of our genome."<sup>26</sup>

## THE PROBLEM WITH EVOLUTIONARY MISMATCH

Epigenetics account for the multiple ways in which we reside in the realm of evolutionary mismatch and the myriad means by which we have deviated from the environment in which our physiology has adapted over the course of evolutionary history. Also known as paleo-deficit disorder,<sup>27</sup> *evolutionary mismatch* refers to the collective deficiency of ancestral influences in the modern, industrialized landscape. Paleo-deficit disorder runs the gamut from reduced opportunities for privacy and solitude to decreased tactile

contact with a variety of natural vegetation to reduced exposure to birdsong, daylight, and phytoncides, the allelochemical, volatile organic compounds emitted by plants that give the forest its characteristic aroma.<sup>28</sup> It is no coincidence that our career stress, our sedentary desk jobs, our sleep deficits, our processed and adulterated food, our exposure to industrial chemicals and pharmaceutical drugs, our lack of social support, and our minimal contact with nature all constitute the primary risk factors for disease.<sup>29</sup> These lifestyle factors, which are largely under our control, determine whether our genetic blueprints express health or disease.

## OVERTURNING THE ONE GENE, ONE DISEASE HYPOTHESIS

It is imperative that we reframe the way in which we perceive genetic variants, which are generically referred to as mutations. Gene mutations, also known as single nucleotide polymorphisms (SNPs), are not catastrophic curses but code adjustments that occur in at least one percent of the population and that often evolved in the interest of self-preservation. Their higher incidence implies a neutral or beneficial effect that maintains their presence in the gene pool.<sup>30</sup> For instance, it is widely accepted that the gene anomalies that lead to some red blood cell disorders (hemoglobinopathies) such as thalassemia and sickle cell disease may provide resistance against malarial infections.<sup>31</sup> Carriers of these mutations have a survival advantage in regions where malaria is endemic, which has led to persistence of this genetic signature in the human genome.

From an evolutionary medicine perspective, the CFTR gene in cystic fibrosis may similarly protect against cholera by blocking the same molecular pathway exploited by the cholera toxin that can cause severe diarrhea.<sup>32</sup> This would explain why an apparently highly lethal gene could survive and is still present in 5 percent



of Caucasians; namely, it helps CFTR carriers survive through the reproductive window required for them to pass on their genes.

But these gene variations do not occur in a vacuum. The environment has a lot to do with how our genetic inheritance manifests. For instance, the pathological expression of the CFTR may be triggered by nutritional deficiencies (like a lack of selenium) in the womb or early in life.

In addition, approximately 20 to 30 percent of the world's population has been found to carry the HLA-DQ locus of genetic susceptibility to celiac disease on chromosome 6, yet only a small percentage—approximately 1.4 percent of people worldwide<sup>33</sup>—exhibit the classical symptoms of celiac disease. Research suggests that enteroviral infections, such as rotavirus, and the composition of gut bacteria may act as triggers for the expression of the celiac genes.<sup>34</sup> A constellation of modifiable lifestyle factors, including dietary patterns, stress levels, urban versus rural residence, having pets in the home, antibiotic treatments, use of a dishwasher compared to hand-washing dishes, and early life exposures (e.g., being born in a hospital or at home and breastfeeding duration) converge to impact our microbiota, our immune systems, and therefore the ability of “pathogenic forces” to activate these latent celiac genes.

Yet the biggest misconception revolves around the role that the breast cancer susceptibility genes, *BRCA1* and *BRCA2*, play in breast cancer risk and prognosis. Popular culture and the mainstream medical establishment target *BRCA1* and *BRCA2*, genes that interfere with the repair of radiation-induced DNA damage, as harbingers of inevitable breast cancer. This assertion has led some, including celebrity Angelina Jolie, to have their breast tissue and ovaries excised prophylactically in the hopes of avoiding an early gene-determined death. The primary justification for preemptive mastectomy and ovary and fallopian tube removal—salpingo-oophorectomy—is the belief that heredity determines risk, reflecting an ironclad faith in the inevitability of gene-driven cancer vis-à-vis a fundamentally powerless subject. Medical literature, however, is highly equivocal on the meaning of *BRCA* status.

According to the prestigious British medical journal *The Lancet Oncology*, women with either gene are not more likely to die from treatment-resistant breast cancers, such as triple-negative cancer, than other women who are diagnosed with the disease. In fact, the opposite holds true: they have higher survival rates than women without the *BRCA* mutations who were treated for breast cancer.<sup>35</sup> In addition, thousands of polymorphisms in the *BRCA1* and *BRCA2* genes have already been identified and characterized on a molecular level, some of which are inversely related to breast cancer risk, adding much more complexity to the picture of statistical risk and actionable treatments than is currently present in the traditional medical establishment. The “*BRCA* causes breast cancer” narrative is brought further into question by the identification of polymorphisms such as the *BRCA1* subtype *K1183R*, which paradoxically increases breast cancer survival.<sup>36</sup> It is therefore possible that some of these *BRCA* polymorphisms might even predispose you toward greater resilience and health and reduced breast cancer mortality despite the conventional view that *BRCA* is a monolithic, inexorably lethal “mutation” that you either have or don’t.

Adding fuel to the fire, the rhetoric around *BRCA* in a cancer-phobic patient with a family history of cancer fans the flames of fear, resulting in aberrant secretion of stress hormones, which further magnifies risk in a vicious cycle.

## SYMPTOMS AREN’T LIFE SENTENCES

The silver lining of this research is that you are the principle director of your body’s fate, no matter your genetic endowment. Indeed, the New Biology unfolds the reality that DNA is not the locus for disease risk but a personalized resiliency warehouse. By reframing sickness through this lens, we can derive solace from the fact that every symptom manifestation, every genetic variant, and even the materialization of disease processes serves a sacred and inherent purpose. The coughing, sneezing, and runny nose that accompany



a respiratory virus, for instance, are your body's attempt to expel and cleanse itself of toxicity. The fever your body produces in response to what we conceptualize as a pathogenic infection renders the body temperature inhospitable to the overgrowth of potentially virulent microorganisms; that is, the fever, in most cases, is a sign of a healthy immune system and *is* the medicine.

Genetic variants stick around the human genome because they enhance evolutionary fitness. For example, some of the genes implicated in autoimmune diseases such as celiac disease originated in Neanderthal lineages that interbred with *Homo sapiens* when primitive hominids immigrated from sub-Saharan Africa to northern Europe through western Asia.<sup>37</sup> The result of this interbreeding is that humans picked up many of the Neanderthal genes in a process called haplotype introgression. These same Neanderthal genetic proclivities that augment risk of autoimmune conditions also likely promote fat deposition and other metabolic and immune adaptations that optimize survival in cold climates. Thus, even detrimental genetic profiles can serve a protective purpose when viewed within the larger context.

## UNLOCKING YOUR INNATE REGENERATIVE CAPACITY

Most people consider the body to be little more than a vehicle, materially distinct from the mind that resides within, passively carrying them through life and only eventually requiring the intervention of a doctor-mechanic to fix, or at least manage, the symptoms of suffering with a battery of diagnoses and medications. This reductionism is a fatalistic relic of René Descartes, the 17th-century French philosopher and mathematician who split body and soul asunder, reducing the soul to the “ghost in the machine.” With this dualistic and mechanistic model, our feelings, our perceptions, our desire for meaning are relegated to an afterthought. By the same token, in the Newtonian model of



physical objects, our body-machines are deemed inevitably destined for decline, frailty, and debility due to their tendency toward increasing disorder rather than order.

But we are not inanimate objects. We are living organisms, and the New Biology shows that our bodies are a veritable repository of self-healing mechanisms, always regenerating, tending to states of order against the downward spiral of entropy.

Take, for example, your small intestine. Every four to five days, your small intestine gets a new epithelial cell lining orchestrated by stem cells that have the ability to repopulate the entire intestinal tract.<sup>38</sup> Around every two months or so, the stratified epithelium layer of your skin, or epidermis, completely turns over as a result of the stem cells residing in the deepest, basal layer.<sup>39</sup> Even the prospect of cardiac cell regeneration is now a confirmed reality with the discovery of endogenous cardiac progenitor cells in the heart, blood, and bone marrow that are capable of replenishing the cells of the heart, including cardiac endothelial cells, myocytes, and smooth muscle cells.<sup>40</sup> Furthermore, the brain has been shown to regenerate neurons post-injury.<sup>41</sup>

## **FOOD IS INFORMATION: THE MAGIC OF HUMAN/PLANT CO-EVOLUTION**

Virtually everything we are comes from the things we eat, breathe, apply to our skin, or drink. But food provides more than building blocks for the body-machine and fuel for its engines. The materialistic view that food is merely caloric content interspersed with macronutrients and micronutrients is another biological atomism relic of the Newtonian-Cartesian model. Within this view, food and life are understood from the epistemological, decompositional (bottom-up) approach, where the focus is on the indivisible and elementary vital units instead of the relationship between the units. Unfortunately, this approach obliterates the study of systems and dynamics and decimates any focus on synergy and the interactions between elements.

The New Biology has shown that food's value extends far beyond physical sustenance. Its model embraces the connectivity and proportionality embedded within our bodies and within the biosphere as a whole. Food is not just a caloric measure but an essential courier of biologically indispensable information—by way of microRNAs—on which the health and vitality of your cells depend. After eons of co-evolution with plants that provided food for our species, our biological systems are intimately intertwined. This discovery has profound implications, reinforcing the importance of eating an evolutionarily appropriate, whole foods-based diet reminiscent of what our hunter-gatherer ancestors would have eaten. The smooth operation of our physiology is literally predicated upon interfacing with microRNAs found in fruits and vegetables, as well as other ancestral foods, including grass-fed meats. (While I do not believe it is absolutely necessary to eat meat, both for ethical and physiological reasons, the therapeutic properties of high-quality, ethically raised and slaughtered meat, are undeniable, and when consumed with gratitude and moderation may be literally life-saving in certain individuals.) Today, our industrialized food culture divests us of the deeply rooted evolutionary symbiosis between the animal and plant kingdoms, as well as the biological information plants provide, putting us at greater risk for a wide range of diseases.

## THE TREE OF LIFE IS REALLY A WEB

The discoveries about microRNAs should shake up the way we think about food. One human study found that exosomal microRNAs from rice impact cholesterol receptors,<sup>42</sup> suggesting a new way that food can profoundly impact blood lipid profiles and cardiovascular health, as well as demonstrating that microRNA has the potential for cross-kingdom regulation of gene expression. That is, plants and animals can “talk” to one another's genes with profound impacts on their expression. This finding essentially undermines the notion that the human species is hermetically



sealed off from other taxonomic kingdoms. The microRNA-mediated interkingdom communication, which involves cross talk and information sharing between bacteria and archaea (both prokaryotes) and plants and animals (both eukaryotes) confirms what Eastern cultures have known since time immemorial: we are *one* with all living things. When we deviate from our nature, we are destructive to ourselves.

In the New Biology, the distinct taxonomic categories merge into an open-ended spiral of mutualistic and reciprocal interactions. The traditional view of the tree of life as having separate and distinct branches of species falls short of the interconnected reality of life on earth. If plants communicate with animals, fungi with bacteria, and so on and so forth via microRNAs, these disparate compartments dissolve, suggesting a radical holism with all lifeforms that exist.

This new view of food as a unifying string that nourishes us *informationally* in the interdependent web of life has electrifying implications, namely that our deepest biological needs and health depend on the types and qualities of food information we are consuming. The difference between a GMO, sewage- or petrochemical-fertilizer-grown, agrochemical-sprayed, and irradiated tomato versus one grown biodynamically in natural soil, without pesticides and synthetic fertilizers, is not immediately discernible when examined through the rubric of protein, carbohydrate, mineral, or vitamin content. But when assessed from the perspective of their informational, qualitative differences, the two tomatoes are on opposite sides of the spectrum. And we can rewrite the functionality of our genomic hardware to be health-promoting or health-degrading depending on the software-like changes in our RNA profiles resulting from the food we choose to consume.

In the New Biology, food is essentially an epigenetic modifier of gene expression, contributing significantly to orchestrating which genes are turned on and which are turned off. This also means significant changes to staples within our food chain have a powerful impact on our physiological fate.



## **The Dangers of Transgenic RNAi**

In 2017, Dow Chemical Company, in partnership with Monsanto, America's most powerful agricultural biotechnology corporation at the time, received EPA approval to produce corn genetically modified to make an RNA-based pesticidal agent that lethally targets a metabolic pathway within the corn rootworm, known within the industry as the "billion-dollar bug." Branded as SmartStax PRO, the newly minted proprietary GMO plant produces a small, double-stranded RNA that disrupts a critical gene within the rootworm, causing its demise. Although this technology promises specificity—one RNAi molecule change equals one gene suppressed—it ignores the infinite possibilities of unintended, off-target adverse effects of transgenic RNAi that could affect human health and vitality. Even industry-sponsored research shows that hundreds of plant RNAs have a perfect complementary match to human genes as well as those of other mammals. The dire implication is that the consumption of RNAi corn could shut down dozens of essential genes required to maintain human and animal health.<sup>43</sup>

## HOW THE PLANTS YOU EAT HAVE YOUR BACK

The microRNA and phytochemical profiles of whole foods can differ greatly from the industrially produced foods that dominate the Western Pattern Diet. In an organically grown plant exposed to natural stressors, the levels of respective polyphenols such as resveratrol and quercetin can be magnitudes higher than in its industrially produced counterpart.

We can observe this directly in drought-stressed wild strawberries, which have a higher antioxidant capacity and phenol content<sup>44</sup> and taste better in contrast to the industrially produced variety. Droughts require plants to develop their inner defenses against animal herbivores, pathogenic microorganisms, and other prevailing environmental threats, which activate a repertoire of antioxidants that are highly beneficial to our bodies once we ingest them.<sup>45</sup> For example, one study in the *Journal of Agricultural and Food Chemistry* found organic tomatoes to contain statistically significantly higher levels of health-promoting phenolic compounds compared to conventional varieties. According to study author Rosa Maria Lamuela-Raventós, “The more stress plants suffer, the more polyphenols they produce.”<sup>46</sup> Because nitrogenous fertilizers are not used in organic farming, the plants tend to generate higher levels of their own antioxidants.<sup>47</sup>

One framework for understanding this informational dimension is known as the xenohormesis hypothesis, which proposes that animals and fungi have evolved to sense signaling and stress-induced molecules in the plants they consume in order to mount a preemptive defense to environmental adversity and increase the probability of their survival.<sup>48</sup> Plants that produce compounds in response to impending scarcity of resources or dangerous environmental conditions, such as drought or other weather extremes, provide the animals that consume them with chemical cues, which activate resilience factors and pathways in their bodies. Nonnutritive polyphenols produced by stressed plants activate fungal and animal sirtuin enzymes, which extend

the life-span of the organism that consumes the plant, suggesting that human sirtuin enzymes could also have evolved to respond similarly to plant stress molecules.<sup>49</sup> In this way, an interspecies system of signaling and reciprocity is established, creating an elegant evolutionary, supportive symbiosis between the seemingly divergent plant and animal kingdoms.

Taken cumulatively, this innovative body of research rolls out the red carpet for the emergence of a New Biology with trajectory-altering implications. The discovery that our bodies obtain information from food, including the very real gene-regulatory microRNAs that are embedded in all the foods we consume, has revolutionary implications for the way we understand food quality and the human body's requirements of it beyond the age-old fixation on caloric content and the measurable presence of certain minerals, nutrients, and vitamins. This also means that, with the presence of certain foundational, information-laden foods in your diet, your health will be positioned to thrive.

This notion thrusts traditional culinary practices and family recipes into a newfound light. Although often dismissed as superstition or folk medicine, food preparation techniques and ancient culinary formulas represent advanced means of self-care that have been historically refined, carefully cultivated, and passed on as ancestral wisdom. Recipes passed down through the generations are epigenetic inheritance systems, culturally encoded, time-tested instructions for what we should or should not eat, perhaps providing as much biologically critical information as the sequence of base pairs in your genome.

When we consider traditional plant-based culinary and indigenous medical practices through the lens of their informational contributions to our health, it's no wonder that food and botanical medicine provides the foundation for medical systems worldwide. A 2017 report by Kew Gardens in the United Kingdom found that 28,187 plant species are known to be used as medicines throughout the world,<sup>50</sup> and for good reason. Not only do they work, but, if used properly, they're safer and more accessible and are intrinsically biocompatible, working in harmony with your own biomolecules,



as opposed to synthetic pharmaceuticals, the majority of which are petrochemical derivatives and recognized as foreign to your body.

Of course, plants have long been the raw material for drug development. Since 1981, in fact, of all drugs introduced since 1981, 63 percent (537 of 847 small molecule-based pharmaceuticals) were derived from natural products or had a natural product-inspired design.<sup>51</sup> In one sense, pharmaceutical medicine could be considered “plant-based,” though the pharmaceutical industry’s patent-based model almost invariably generates toxicity through the unnatural alteration of compounds. And arguably, biomedical science has played a role in validating time-honored natural remedies that have been passed down generation to generation, so much so that the vast body of folkloric medical knowledge still forms the basis for the majority of the world’s primary health care system. Furthermore, “alternative medicine” modalities, which encompass the original medicine practices to which our species owes its present-day survivorship, are gaining traction, even within the walls of the patented, synthetic, and chemically based Western medical establishment.

## THE EVOLUTIONARY MISMATCH OF THE WESTERN DIET

We all know the human body requires certain foods to function properly and that nutritional deficiencies can lead to serious health problems. Without the information-rich berries, vegetables, roots, tubers, and naturally raised animal products that have been part of the ancestral human diet for countless millennia, the biological rug will be pulled out from under us and lead to rapid health deterioration. Scientists call this “evolutionary mismatch.” In the same way that you wouldn’t expect a fish to be able to live out of water, you wouldn’t expect humans to survive if they were to be suddenly extricated from their evolutionarily compatible nutritional environment.

## WHEAT AS AN EXAMPLE OF EVOLUTIONARY MISMATCH

Wheat is one of the worst offenders in the Western Pattern Diet. Not only is modern wheat hybridized to contain higher levels of gluten and the endocrine-disrupting starch known as amylopectin, contaminated with agrochemicals including pesticides and glyphosate, but from an evolutionary perspective, the seeds of cereal grasses that yielded wheat only entered the human diet 500 generations, or 20,000 years, ago. This is a mere blip on the evolutionary scale, and not nearly enough time for our physiology to adapt to their consumption in a manner that would promote health.

We are only now learning about the fragile biological system of the microbiome, the gut bacteria that regulate our metabolism and maintains our health. The introduction of grains from the grass family of plants would have been foreign to the anatomically modern humans who, according to “out of Africa” hypothesis, originated from the tropical rainforests of the African subcontinent and subsisted on insects, tubers, fruit-bearing plants, and the flesh of hunted animals. Approximately 60,000 years ago they migrated from Africa into the Northern latitudes, where vegetation would have been sparse or nonexistent during winter months. It took another 40,000 years to develop the adequate cooking and processing technology required for the consumption of grass seeds.

To a casual observer, this dietary shift might seem inconsequential. One might surmise that grains simply represented a more accessible, mass-cultivated alternative caloric fuel source of carbohydrates, protein, lipids, minerals, and vitamins. Yet replacing the roots, tubers, and forageable vegetation of the Paleolithic period with the cereal grains of the Neolithic required a dramatic shift in physiological adaptation.

In an effort to deter animals and ensure the continuance of the plant species, grass seeds were cultivated with a vast armory of antinutrients, including toxic lectins, phytates, alpha-amylase and trypsin inhibitors, and phytochemicals, which then, in turn, disrupted mammalian physiology. Although heralded since time



immemorial as the “staff of life,” grains could perhaps be more aptly described as a cane, precariously propping up the human body that is starved of the nutrient-dense, low-starch vegetables, fruits, edible nuts, seeds, seafood, and meats these crops have so thoroughly displaced. As a result of this shift from the ancestral Paleolithic diet to what has evolved into the contemporary Western diet, we are now running on the wrong nutritional operating system for our natural, time-tested biological hardware.

## THE WESTERN DIET AS A VECTOR OF DEATH

Culturally, we are still under wheat’s spell. In more ways than one, wheat resembles a drug, creating cycles of cravings and withdrawal that are often conflated with hunger. It can be argued that given the presence of pharmacologically active narcotic peptides, wheat is addictive, generating a ceaseless cycle of cravings and dependence. Twentieth-century German raw food advocate and philosopher Arnold Ehret may have been correct when he said, “We dig our graves with our teeth.”<sup>52</sup>

For evidence of how disastrous this evolutionary mismatch has been to the health of our species, one only has to look at our present-day rates of chronic disease. Consider the statistics about disease at the turn of the 20th and 21st centuries. According to an article in the *New England Journal of Medicine*, the most common causes of death in 1900 were infections, such as pneumonia, flu, and tuberculosis. In 2010, the leading killers were heart disease and cancer. With the improvement in hygienic practices, nutrition, living conditions, and sanitation infrastructure, mortality from infectious disease declined, whereas mortality rates from chronic diseases have skyrocketed. Concurrent with the escalating rates of these chronic inflammatory conditions, our diet has become dominated by processed, manipulated, additive-laden, and laboratory-generated synthetic substances. These hyperpalatable foods, with their lab-tested combinations of salty, savory, and



sweet, override normal homeostatic pathways and kick the hedonic or reward-based regulation systems into action,<sup>53</sup> increasing the motivational incentive to overeat and ultimately become addicted to these foods.

### **The Western Pattern Diet Features and Diseases**

Our current harmful dietary pattern, which researchers call the Western Pattern Diet, is characterized by the following toxic foods:

- Processed, factory-farmed, GMO-fed animal products
- Conventional dairy products from grain-fed, antibiotic- and hormone-raised cows
- Highly refined grain products, including gluten-containing grains, contaminated with agrochemicals
- Industrialized vegetable oils from genetically modified corn, cottonseed, canola, and soybeans
- Trans fat-containing desserts containing refined sugars and flours
- Prepackaged foods with chemical additives, preservatives, and colorants
- Refined sugars and high-fructose corn syrup

The Western Pattern Diet contributes to many chronic diseases but has been specifically studied to determine its contribution to more than 20 distinct conditions, including various deadly cancers. In fact, it's so effective at proliferating

## REGENERATE

disease and degeneration that lab researchers use it to induce disease in experimental animals. These are just some of the disease labels linked to the Western Pattern Diet:

- Acne
- Attention Deficit Disorder
- Bone fractures
- Breast cancer
- Cardiac hypertrophy (enlargement of the heart)
- Colon cancer
- *E. coli* infections
- Insulin resistance
- Lipid peroxidation (which makes the fats in your body rancid)
- Liver disease
- Low sperm count and quality
- Neurodegenerative disease
- Osteoporosis
- Oxidative stress
- Pancreatic cancer
- Prostate cancer
- Sepsis
- Types 1 and 2 diabetes

## WHAT NOT TO EAT: THE WORST OFFENDERS

At a rudimentary level, food is digested, assimilated, and repackaged into the very foundations of our physiology, the biochemical machinery of our cells. What we eat, drink, and inhale, then, are critical determinants of the structural and functional integrity in our bodies. Seeds planted in fertile soil will metamorphosize into beautiful flowers, while those potted in eroded, nutrientless topsoil will be vulnerable to sickness in the form of infection and pests; our bodies are no different in the way we react to the substrate in which we grow.

But how do we mute all the contradictory recommendations in the diet-sphere to glean what may be the perfect diet? This question is the platform for a multi-billion-dollar industry of competing egos, interests, and ideals, with a never-ending procession of new fad diets and lose-weight-quick schemes bandied about year after year as the next best thing. Most adopt a strategy irrespective of ancestral heritage, biochemical individuality, or physiological landscape. Whether keto or low-carb, vegan or macrobiotic, the problem is the same: proponents are extrapolating what worked for them or what was effective for a select cohort of subjects. The nuances, complexities, exceptions, and contingencies of different human populations fall by the wayside.

Your best bet, then, is the time-tested, tried-and-true process of self-experimentation, oftentimes in the form of an “elimination diet,” where you whittle your food consumption down to a blueprint of ancestrally appropriate, minimal-allergenicity, and minimal-antigenicity foods (foods least likely to provoke an immune response) for approximately a month. Then you sequentially reintroduce noncompliant foods one at a time to gauge your individual tolerance. By removing offending agents such as gluten, dairy, soy, corn, alcohol, and refined sugar from your diet, you effectively clear the static noise, enabling the messages your body dispatches in the form of food reactions to be heard loud and clear.



That being said, there is a generic template that, if followed, can deliver positive outcomes for the majority of people. The first step includes permanently removing foods that were not part of any traditional dietary culture, including genetically modified foods and foods that were produced with the use of agrochemical synthetic inputs such as petrochemically derived fertilizers and pesticides.

The second step is eliminating or reducing the consumption of cow's milk. While there is a history of animal husbandry that stretches back at least a millennium among certain populations, including Northern Europeans, the consumption of cow's milk products is a novel trend for most other ethnicities. This explains why so many adult humans of African or Native American descent do not produce the enzyme lactase for breaking down milk sugar (lactose) as adults. A more insidious culprit behind countless other adverse metabolic symptoms is a sticky protein known as A2  $\beta$ -casein and the more toxic A1 form, both of which are found in the world's bovine dairy products. Even in the rare case that you find raw, organic, A2 milk from a cow, it will still contain exosomes that were intended for a calf and which may therefore disrupt normal cell-to-cell communication and epigenetic regulation in humans.<sup>54</sup> Through the vehicle of bovine microRNA-containing exosomes, cow's milk dairy is a Trojan horse carrying immunoregulatory cargo that tips the balance in favor of inflammation.

The final step of the template is eliminating or reducing grain-derived products. Gluten-bearing wheat, rye, and barley are particularly pernicious gateways to the "leaky gut syndrome," a condition resulting from the erosion of the intestinal barrier. These biologically incompatible foods should be removed from the diet to cultivate the conditions ideal for healing and regeneration.

Fortunately, traditional foods that were of the variety that could be foraged or hunted long before the advent of modern cultural inventions like farming and animal husbandry provide the architectural blueprint our bodies need to construct our intricate body-ecosystems from the bottom up. In ethnographic studies of

remaining hunter-gatherer tribes, untouched by the influence of globalization and virtually free from the afflictions of modernity, we can witness the preservation of these health-imbuing foods and practices through the lineages, underscoring their consistently health-promoting legacy.

## WHAT TO EAT: START WITH CHICKEN SOUP

One example of our evolutionarily inscribed wisdom that makes us gravitate to certain foods is our natural yearning for a steaming hot bowl of chicken soup when we have the flu. The prized peasant food of traditionally prepared chicken soup, made with bone-in animal carcass, vegetables, and herbs, is the impetus behind the newfound popularity of those bone broth bars that are cropping up across the country. Although it is oftentimes written off as a mere comfort food, chicken soup is the archetypal traditional home recipe that is an ideal and easy starting point for improving your diet.

The word *recipe* has ancient roots in Latin and originally meant “take,” an exhortation by the medical doctor to the pharmacist that patients take the medicine as ordered. *Recipe* was used in the Middle Ages to mean a medical instruction or prescription, inspiring the pharmaceutical abbreviation Rx.

Chicken soup is an example of a time-tested, medicinal home recipe in all senses of the word. It helps support, optimize, and elevate our genetic expression. A paper in the journal *CHEST* found that chicken soup may elicit therapeutic effects in patients with pneumococcal pneumonia,<sup>55</sup> and chicken soup has also been shown to thin mucus secretions and relieve the inflammation in the upper respiratory tract that can precipitate fever, chills, muscle aches, and fatigue.<sup>56</sup> Its Japanese counterpart is a jellied soup known as chicken nikogori, a potent antioxidant with the ability to scavenge free radicals, which have been implicated in the unpleasant symptoms of both acute and chronic illness. Add



wheat-free soy sauce to nikogori, and it's even more effective.<sup>57</sup> Or add ginger, one of the reigning champions in the arsenal of anti-inflammatory home remedies, which inhibits production of prostaglandins, leukotrienes, and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), biomolecules behind the cardinal signs of inflammation such as pain, redness, heat, and swelling.<sup>58</sup> Ginger also contains microRNAs that stimulate the growth of beneficial *Lactobacillus* bacteria in the gut and metabolism and reduces inflammation.<sup>59</sup>

Chicken soup, like virtually all food-based medicine, doesn't generally have side effects—only side benefits. It engenders a regenerative effect that stands in stark juxtaposition to the degeneration induced by synthetic chemicals produced by drug companies. Chicken soup contains easily assimilated protein found in the tendons, ligaments, and other flexible tissues that are often degraded during the cooking process, and it is a good source of easily absorbed minerals, including magnesium, calcium, potassium, silicon, sulfur, and phosphorous. In addition, it is rich in collagen and glycosaminoglycans like hyaluronic acid, glucosamine, and chondroitin sulfate, all of which elicit regenerative effects in joints, tendons, ligaments, and other connective tissues.

Chock-full of glutamine, the preferential fuel source of the cells lining the gastrointestinal tract, chicken soup helps to heal leaky gut syndrome. Bone broth generated from simmering the bone-in carcass for several hours contains glycine, an amino acid that is the prerequisite for the synthesis of our nucleotides, neurotransmitters, and the master antioxidant of our bodies, glutathione, as well as an important component of the bile and gastric acid required to emulsify dietary fats and break down proteins, respectively. Another amino acid liberated from the gelatin in bone broth, proline, is a prerequisite for wound healing and the fine-tuned construction of your connective tissue, as well as your skin, cartilage, bone, and vascular system.<sup>60</sup>

In the case of acute disease, functional foods like chicken soup can support our bodies in their endeavor to heal—promoting resolution of acute illness and setting the stage for reversal of the pathogenesis of chronic illness. Other foods can send your genes



the equivalent of healing “text messages,” providing a schematic and guide map for what your body has always known how to do—*heal*.

You’ll learn all about these regenerative foods in this book. You’ll also learn about targeted foods tailored for regeneration of specific organs, including the heart, brain, gut, pancreas, and liver. You will become familiar with the degenerative habits, activities, and environmental factors that you should avoid, and you will be directed to participate in the ones that stabilize your genome as well as your epigenome. Armed with this information, taking charge of your body—and navigating back home to yourself—will become second nature.



# FOOD AS INFORMATION

Living Water, Epigenetic Pathways,  
and the Wisdom of the  
Ancestral Diet

**F**ood delivers powerful healing properties that scientists have spent decades analyzing in detail. Take an apple, for example. This amazing fruit is brimming with pharmacologically (or better yet, nutrigenomically) active compounds, most notably ascorbic acid, also known as vitamin C. Another compound it contains is phlorizin, over a dozen polyphenols, potent antioxidants concentrated in the skin of the apple and known to elicit multitargeted effects that reduce the impact of high blood sugar in animal models.<sup>1</sup> But this strictly material layer of nutritional analysis barely touches the surface when it comes to appreciating the informational complexity of food.

Apples contain structured water molecules with a hexagonal crystalline configuration (H3O2) that's halfway between liquid and crystal. Named "the fourth phase of water" by Washington University professor Dr. Gerald Pollack, the micro-clustering



pattern of structured water is capable of holding and transmitting both energy and information.<sup>2</sup> In fact, all raw plant, animal, fungal, and bacterial cells contain this structured water, each with a configuration as unique as a snowflake, assuming it has not been desiccated and denatured through cooking, processing, or the gamma irradiation-based food preservation process known as “cold pasteurization.” “Raw” is a key word here. Raw fruit juice has a high concentration of naturally structured water, which accounts for a good portion of the anecdotal and scientific evidence regarding its healing benefits. Processed juice, on the other hand, is said to contain dys-information (*dys-* is a word-forming element meaning “bad, ill; hard, difficult; abnormal, imperfect,”) that may misdirect the expression of our genes and harm our physiology.<sup>3</sup>

Virtually all water in uncooked and unprocessed plant food possesses beneficial genetic-expression-modifying information. This is a profound departure from looking at water as a fundamentally material, inert bystander in biological systems, as has been the case for centuries. Additionally, within the biological tissue of which they are composed, all foods contain the noncoding RNA molecules known as microRNAs, which affect the expression of the majority of genes in our bodies and stimulate biological pathways conducive to our species’s health and wellness. Packaged in exosomes, which are roughly the size of a virus (~65 nanometers), microRNAs survive digestion, whereupon they penetrate systemic circulation in the body and affect the structure and function of all our tissues.

One example of the healing potential of microRNAs comes from a study of Chinese honeysuckle (*Lonicera japonica*), a traditional remedy for colds and flus. An animal study demonstrated that a microRNA isolated from this honeysuckle is delivered straight to the lungs, the area of active influenza infection, via the bloodstream. Once there, it targets and inhibits the replication of influenza A virus.<sup>4</sup> The authors of the study additionally proposed that ingestion of the Chinese honeysuckle decoction confers medicinal benefits by enhancing the dietary uptake of other microRNAs.

With every bite of food you take, you are deliberately choosing which messages you want to send to your genome. By simply being thoughtful and intentional with the foods you eat, you can remove interference in the moment-to-moment cellular regeneration that should *and will* naturally occur.

In this chapter you'll learn how regenerative foods communicate on the smallest levels, through micromolecules and via your microbiome. To understand the major role of these tiny players, let's go back to DNA and reexamine its role as the code at the center of life.

## RETHINKING THE ROLE DNA PLAYS IN OUR HEALTH

Since the 19th century, when Charles Darwin revolutionized humanity's perception of its evolutionary past, present, and future, we've been taught that all organisms are separate from one another and locked into a ruthless system of survival of the fittest. This competitive arms race for resources, territory, and self-preservation yields two distinct groups: winners and losers. In this model, our genes are independent players, hermetically sealed within the chromosomes and concerned only with the solitary task of propagating themselves to the next generation. DNA (deoxyribonucleic acid) is the conductor of this abstract symphony of life, in which our place—and our fate—has been predetermined.

Not unlike the Copernican Revolution, which, in the 16th century, dislodged Earth from the center of the universe and threatened rigid social and political conventions, the New Biology dethrones DNA as the center of life, heralding an alternative vision. In this vision, human molecules, cells, tissues, and organs are absorbed in dynamic flux, communication, and feedback. They are capable of constant change, working harmoniously within a networked biosphere that unifies each individual with the whole. Most importantly, the New Biology inaugurates the radical notion



that the body can directly access biologically useful energy from the quantum vacuum. In this reenvisioning, biological structures have access to an all-pervading vacuum energy, once described as an ether, and this quantum energy field is operative at subatomic, atomic, molecular, and supramolecular levels.

A particular groundbreaking facet of the New Biology is food's importance as a source of indispensable information, its function reaching far beyond its nutritional composition of varying macronutrients and micronutrients to help epigenetically modify the expression of the majority of our genome.

## MASTER MOLECULE OF HEREDITY VS. THE INTERDEPENDENT MODEL OF SYSTEMS

Which human organ do you view as most imperative to life? Some instinctively feel that the brain is the most important organ, because without it cognition would not be possible. Some say it is the heart, which keeps our circulation flowing, or the liver, which stands vigil, filtering the blood. But the answer is *none of the above*. They're all requisite for the intelligent design and operations of our somatic form. These organs are interdependent parts of overlapping systems, superimposed and interwoven into the intricate tapestry of our physiology. Like the notes in a musical composition by Bach, their beauty results from the composite and synergistic way in which they interact.

Consider this: for other domains of science, such as the study of aquatic, marine, and land-based ecosystems, we acknowledge a sophisticated interconnectedness among animal and plant species. Yet this awareness dissipates when we venture more deeply into the human body, down to the level of macromolecules. When it comes to DNA, biologists have abandoned the idea of an interdependent model of systems, embracing instead a hierarchical, linear process to create an origin story of life. In this "central



dogma of biology," DNA makes RNA, which makes proteins. DNA, as the supreme biomolecule of life, oversees the genesis of all other biological constituents in a top-down, authoritative fashion. This model traces a one-way trajectory from DNA to RNA to proteins.

However, in truth, a more accurate model would be a bidirectional loop within a web. The New Biology shows us that DNA is not actually at the center of life but is instead one isolated facet of a complex biological economy composed of subsystems, none of which can be ascribed primacy or recognized to exert a privileged level of causation. The New Biology goes even further than that, demonstrating that *there is no center*. Science overwhelmingly shows that life is self-organized, emerging from a network of interpenetrating and interdependent relationships, each with its own niche, specialized in purpose and fundamental to the larger whole. This exquisitely calibrated organization has long been recognized by traditional Eastern philosophies that envisioned all phenomena, from the infinitesimal goings-on of the human body to the macro-level oscillations of the climate, the rhythms of the seasons, and the movements of the planets as a holofractal unity. No one dimension supersedes or holds dominion over another; life operates in an oscillating dance of give-and-take, expansion and contraction, and ebb and flow.

If we utilize a simple linguistic shift from "DNA controls the production of proteins" to "cells use DNA to make proteins," a different narrative emerges.

## DNA and Your Health Destiny

This is what the New Biology says about the relationship between DNA, disease, and aging:

- *You*, not your DNA, have control over your health destiny.
- The symptoms of disease are often your body's intelligent response to being exposed to something that is unhealthy or inappropriate. It is always better to look for the disease's root cause than to suppress the symptoms.
- The accelerated decline that we associate with aging is not necessarily predestined by our genes, and it's neither normal nor inevitable.

There is a better way for our bodies to tap into the energy all around us. We need to seek to understand *all* parts of the system in which we live—not just DNA. These include our miraculous microbiome, a sophisticated, life-sustaining microbial reservoir that we are only beginning to learn about.

## MICRORNAs FOR REGENERATION

The New Biology contends that what you consume profoundly impacts you in *real time* via the machinery of microRNAs. In fact, noncoding RNAs make up more than 80 percent of transcripts from our genome.<sup>5</sup> RNA is the only biomolecule present in all of life, making it a better candidate for being a universal biomolecule than DNA itself.

RNA can be difficult to study because it can't be extracted easily from cells, being so crucial to their function. Structurally, RNA is similar to DNA. However, it is single- rather than double-stranded, and is therefore much more chemically reactive and unstable. More importantly, it can assume an expanded repertoire of three-dimensional molecular shapes relative to DNA, giving it versatility in structure and function.<sup>6</sup>

RNA and DNA nucleotides are composed of different sugars, ribose in the case of the former and deoxyribose in the case of the latter, and carry slightly different base pairs, with the pyrimidine base uracil (U) found in RNA where thymine (T) occurs in DNA. In most cells, only two chemical modifications to DNA are possible, acetylation and methylation, which are the underlying mechanisms behind epigenetics, which you will remember is the activation or silencing of genes by environmental inputs such as diet and lifestyle. On the other hand, at least 66 chemical modifications can be made to RNA;<sup>7</sup> the roles of these modifications remain largely a mystery.

The explanation underlying these molecular differences between DNA and RNA is that the latter was the first to arrive on the scene, which means that life effectively began with RNA, likely predating the emergence of the first cells. In a transposition of conventional wisdom, then, DNA might have evolved as a specialized form of RNA—adopting chemical inertness and structural rigidity in order to serve as a more reliable warehouse for the safe-keeping of heritable information.

For the purposes of this discussion, we will focus in on microRNAs, which are the premier regulators of gene expression and the conduits for free information exchange among the plant, animal, and microbial kingdoms, not unlike cellular phone towers bouncing signals from one seemingly disparate region to the next. MicroRNA, as described by University of Gothenburg professor Jan Lötval, can zip around from cell to cell inside the bubble-like exosomes—nanoparticle-sized vesicles that are produced when the membranes of cell-sorting compartments bud or pinch off.<sup>8</sup> Exosomes, which contain a mix of proteins, bioactive lipids,



and noncoding RNA, may have originally developed as a way for plant cells to talk to one another and to deploy a concerted first-line immune defense when under threat.<sup>9</sup> The exosomes liberated from edible plants when we ingest them may also serve as a portal through which our own digestive tracts can sense and communicate directly with the external environment.

Conventional wisdom holds that cells exchange messages through the secretion of hormones, cytokines, and neurotransmitters, which come from one cell and bind to receptors on neighboring receiving cells to produce physiological effects. But a newly discovered form of exosome-mediated communication suggests that the cargo transported by exosomes can be transferred directly to recipient cells without any intermediaries.<sup>10</sup>

The concept that microRNAs influence the expression of the majority of the human genome<sup>11</sup> and may also serve as a channel for cross-species communication<sup>12</sup> is highly biologically plausible since trillions of digested, plant-derived exosome nanoparticles navigate through our digestive systems on a day-to-day basis, interfacing with the mucosal lining of our gastrointestinal tracts.<sup>13</sup> Previous studies have also highlighted that food-derived microRNAs that piggyback on exosomes have been found to reside in the blood and tissues of animals.<sup>14</sup> MicroRNAs within plants share “molecular homology” with human RNAs, meaning that they look like and can mimic the effects of human RNAs. The significance of these diminutive, noncoding RNAs should not be underestimated. Because they can silence or activate mammalian gene expression, they may influence the course of development, aging, and various disease states.<sup>15</sup>

The animal model brought validity to the concept that exosomes and the microRNAs they contain are instruments of cross-species communication.<sup>16</sup> When administered to mice, exosome-like nanoparticles from grapes penetrated the intestines and triggered enhanced production of intestinal stem cells.<sup>17</sup> This is meaningful because stem cells are a one-way ticket to regeneration. Known as “multipotent progenitor cells,” stem cells can differentiate into and replace specialized cell types through a process called mitosis,

or cell division, as part of an internal repair system. This ability stands in sharp juxtaposition to terminally differentiated cells of the heart, blood cells of the circulatory system, and neurons of the nervous system, which do not normally proliferate, or multiply—and they also differ from stem cells in that only the latter are capable of long-term self-renewal.

In a study published in the *American Society of Gene and Cell Therapy* journal, researchers issued mice a toxic agent known to cause ulcerative colitis, an autoimmune disease of the colon. They then gave the mice exosome-like particles from grapes. Under ordinary conditions, mice given the toxic substance would have quickly developed colitis. But these mice did not. The mice lived twice as long as the mice that didn't receive the grape substance, suggesting that administration of the grape-derived particles protected them from development of chemically induced ulcerative colitis due to activation of these stem cells. The particles preserved normal histology, or microanatomy of the intestines, in the face of these toxic chemical agents, and they “promoted dramatic proliferation of intestinal stem cells and led to an intense acceleration of mucosal epithelium regeneration and a rapid restoration of the intestinal architecture throughout the entire length of the intestine.”<sup>18</sup> The grape particles were also completely safe for the mice, with zero side effects.

The shining gem uncovered by this study is that exosomes, which are present in a variety of plant foods we consume, may exert additive or synergistic effects in course-correcting our own biology, nudging it gently back to the mean or boldly stimulating tissue regeneration by activating our body's own reserve of stem cells. Conversely, one could argue that many acute and chronic diseases could be caused by a lack of dietary exosomes from ancestral foods. Exosomes have been isolated and characterized from an assortment of edible plants, including carrots, grapefruit, and ginger root, all of which have the power to lightly prod deviant biochemical pathways back to the straight and narrow.<sup>19</sup>

For instance, a microRNA derived from broccoli was found to be present in human sera and to inhibit growth of breast cancer



through its effect on the gene *TCF7*.<sup>20</sup> Exosome-like nanoparticles from ginger, on the other hand, were found to increase levels of a potent anti-inflammatory signaling molecule, interleukin 10 (IL-10), which tamps down excess immune system reactivity.<sup>21</sup> Flavonoid compounds from berries, known as anthocyanidins, delivered via milk-derived exosomes significantly suppressed both the growth and proliferation of chemotherapy-resistant ovarian cancer cells, suggesting that phytonutrients, or plant chemicals with health benefits, are more effective when carried by exosomes.<sup>22</sup>

While berry anthocyanidins have anticancer properties on their own, their bioavailability, or the proportion ingested that enters systemic circulation and elicits an active effect, is poor, and they are inherently unstable in the absence of attachment to exosomes.<sup>23</sup> Exosomes may therefore be mother nature's delivery service that safeguards healing noncoding RNAs and bioactive plant compounds until they arrive at their final destination.

Exosomes and the microRNAs that they shuttle are some of the reasons why fruits, vegetables, herbs, and spices that come directly from the earth into your kitchen or medicine cabinet set the stage for healing. Because microRNAs can travel horizontally across species—from fruit to mouse, or vegetable to human—they can send messages that tell genes when to express themselves and when to remain quiet. It doesn't take eons to make these changes; they can alter your genes in real time, and these changes can be passed down to your progeny, and from them to their progeny and so forth.

MicroRNAs shuttled about in their environmentally protected extracellular vesicles provide a viable scientific explanation for interspecies cross talk and for the interconnectedness between all the domains of life. Their discovery shows that the systems of the body, like the kingdoms of life and the ecosystems of the planet, all operate on the principles of harmony, symbiosis, balance, and holism. Rather than existential islands unto ourselves, we are united in a grand and awe-inspiring wholeness.



## MEET YOUR MIRACULOUS MICROBIOME

Since the late 1800s, when Robert Koch and Louis Pasteur tackled the challenge of foodborne infections, microorganisms have been uniformly demonized by the scientific community and pigeonholed as the singular causative agents behind diseases. Up until recently, the enduring legacy of germ theory, which promulgates the idea that specific germs are the sole cause of specific diseases, is that we have envisioned ourselves to be in a perpetual war against these microorganisms' hostile intrusion. Our conditioning has led us to perceive the microscopic world as the culpable party behind the plagues and pandemics that have snuffed out so much of humanity in singular episodes. Within this conceptual framework, the immune system has been fashioned as the militant armed force against the invasion, and vaccines and antibiotics our only true defense against certain destruction.

The relatively recent discovery of the microbiome, however, is completely redefining the role of microbes in our bodies and shifting the entire frame of reference for our species's self-definition. It turns out that some microbes are hardly the adversary; in fact, they are crucial to protecting us from disease and dysfunction.

A deceptively diminutive term, *the microbiome* refers to our unfathomably complex array of microscopic microbial inhabitants that together weigh only three or four pounds. Yet the microbiome's power is immense, as it contains 99.9 percent of our genetic material. Comprising bacteria, viruses, fungi, and archaea that reside in their respective niches on and inside our bodies, our microbiome is instrumental to digestion and assimilation of nutrients, detoxification of cells and organs, control of the immune system, competitive inhibition of pathogens, reinforcement of the gastrointestinal mucosal barrier, and production of neurotransmitters.<sup>24</sup> Indeed, we relegate life-sustaining functions to these friendly bacteria, including the breakdown of extremely toxic chemicals.<sup>25</sup>

The discovery of the microbiome has radical implications because it undercuts the theory that microbes are a leading cause

of disease and death. In fact, mortality from infectious disease—measles, scarlet fever, whooping cough, diphtheria, and polio—had declined precipitously due to improved living conditions, nutrition, hygiene, and sanitation infrastructure even before the use of antibiotics and vaccinations became widespread in the mid-20th century. Magic bullet medical interventions designed to combat germs were credited as being the primary factor in extending the human life-span and putting a discernible dent in the burden of human suffering from communicable disease. These medical interventions conceived from germ theory became the foundation of the allopathic medical paradigm that continues to be exalted as the be-all, end-all of human health.

Yet billions of years have primed our physiology to interface with virtually endless microbial challenges and prepared our body tissues for intimate contact with bacterial, fungal, protozoal, helminth, and viral co-inhabitants. Through our evolutionary past of hunting, foraging, and subsisting off the land, our bodies have undergone millions of years of immunologic evolution with the elements, soil, and fermentation, all of which have attuned us to countless interactions with the microbial world that have served to guide the trajectory of future immune responses, thereby fostering our dependence on microbes as some of our greatest allies.

Our bodies resemble plants in that our susceptibility to pests, or opportunistic infections, escalates when we aren't provided with the proper inputs, such as when our ecosystems are in a state of disharmony, when our microbial soil is depleted, and when our micronutrient status is compromised. The modern pressures of a sedentary lifestyle; pharmaceutical drugs; occupational stress; ultra-processed, nutrient-poor foods; electromagnetic pollution; man-made toxicants; and circadian rhythm-disrupting blue light cause our microbial diversity to suffer, in turn opening the door to sickness.

The ways in which we deviate from our evolutionarily encoded template are the ways in which our microbiomes suffer. When we unnecessarily forgo the fundamental inoculation of microbes that comes with vaginal birth in favor of Cesarean



section, for instance, we are sacrificing the postnatal transmission of maternal flora that seeds the baby's microbiome—one of the most critical exposures in molding the composition of the infant's microbial ecosystem. When we opt for bottle-feeding our babies instead of providing them with the gut-mammary transfer of mom-derived bacteria, gene-regulatory microRNAs, and prebiotic sugars designed to encourage bacterial growth in the infant, we set the stage for the bacterial imbalance known as dysbiosis, the precursor to a dysfunctional immune system, which is a breeding ground for infectious challenges. Breast milk contains special sugars known as oligosaccharides, including lactose and 1,000 other distinct nondigestible molecules that provide a substrate for bacterial fermentation<sup>26</sup>—in other words, one of the explicit purposes of breast milk is to allow our microbiomes to flourish. Babies with microbiota underdevelopment are at an increased risk of autoimmunity, allergies, asthma, allergic rhinitis, late-onset sepsis, coronary artery disease,<sup>27</sup> and obesity. The pattern of early seeding of the microbiome can even predispose babies to vaccine injury, with certain signatures of dysbiosis—absence of bifidobacteria in particular—leading to systemic inflammation and a greater likelihood that vaccines will cause adverse effects.<sup>28</sup>

Although how we are born and our initial feeding methods are not under the realm of our control—in some cases, Cesarean birth is the only option and breast milk is unavailable—other variables that either impede or cultivate microbial diversity fall well within our purview. These include avoiding gut-disrupting antibiotics, eating organic fruits and vegetables, managing stress, and minimizing exposure to toxicants in our home environment.

When we malign all bacteria as microorganisms to be feared and eradicated, we indiscriminately target commensal and virulent microbes alike. We do so with antibiotics, hand sanitizers, chemical cleaning agents, triclosan-laden antibacterial soaps, and gut-disrupting pharmaceuticals like acid-blocking drugs and over-the-counter pain relievers. While they are purportedly designed to heal, these prescriptions inevitably destroy the system that has evolved to protect us.



Being stalwart guardians of our microbiomes is of utmost importance if we are making the health of our future generations, which is perhaps the most fundamental evolutionary imperative we have, a priority. Because our microflora consists of a selective array of commensal microorganisms that ultimately originated from the environment—the air we breathe, the soil we interact with, and the water and food that we ingest—our mission must encompass a wider breadth and a more far-reaching scope if we are to save our microbiomes from certain demise.

## THE MICROBIOME AS A KEY TO EVOLUTIONARY SURVIVAL

A growing body of microbiome research is challenging the prevailing genome-centric story of human evolution, namely that extremely gradual changes in the protein-coding nucleotide sequences of our DNA are primarily responsible for the survival of our species over the ages. This is exemplified by a study published in the journal *Nature* that found that Japanese subjects had a strain of bacteria in their gut that were loaded with both the genes and enzymes required to digest the polysaccharides found in sea vegetation, which are normally indigestible to humans.<sup>29</sup> Absent from the human genome, these genes were found to originate from a strain of the marine bacteria *Bacteroidetes*, *Zobellia galactanivorans*, which naturally lives on the red marine algae commonly consumed in East Asia as nori—the dried and roasted sea vegetable that is formed into a sheet and used as the green wrapper of a sushi roll. These bacterium-derived genes fall outside the bounds of the human genome and are not found in the gut bacteria of North Americans.

The human genome contains an informational blueprint capable of producing a mere 17 carbohydrate-active enzymes (CAzymes),<sup>30</sup> a small armament developed over millions of years to help us digest terrestrial plants. The average human microbiome far outpaces our own carbohydrate-digesting ability, containing as

many as 16,000 different CAzymes. In other words, our microbiome is a treasure trove of carbohydrate-digesting enzymes, allowing us additional biosynthetic pathways to process new food supplies.

The astounding diversity of CAzymes found within strains like the human gut symbiont *Bacteroides thetaiotaomicron*, which alone contains 261 carbohydrate-digesting enzymes known as glycoside hydrolases and polysaccharide lyases, begs the question of how this immense diversity evolved. The *Nature* study provides a novel explanation: human gut flora acquiring new genes from microbes living *outside* the gut, presumably through the phenomenon of horizontal gene transfer. In particular, the researchers showed that genes coding for porphyranases, agarases, and associated proteins needed to degrade marine vegetation were transferred to the gut bacterium isolated from Japanese individuals.

The implication is that when a population eats a food like nori for long enough, the useful genes from marine bacteria residing on nori can be shunted into already-existing bacterial strains in their guts. Bacteria in our guts can therefore enlarge, elaborate upon, and compensate for deficits in our “hardwired” genetic capabilities. Through shifts in our microbiome, our entire physiology can adapt to changes and challenges in our environment and nutritional milieu. The immense plasticity of our microbiome, therefore, improves our ability to survive and remain in harmony with our natural environment.

Another example centers around the ability of our commensal flora to mitigate some of the ill effects of consuming gluten-containing grains. One reason these popular Western foods are so problematic is that they contain what is colloquially referred to as “gluten,” a mixture of addictive, hard-to-digest, and immunologically problematic proteins rich in proline also found in rye, spelt, and barley.<sup>31</sup> The primary issue with them is implicit in the word *gluten*, which means “glue” in Latin. The words *pastry* and *pasta*, in fact, derive from “wheat paste,” the original concoction of wheat flour and water that made such good plaster in ancient times. Gluten’s adhesive and difficult-to-digest

qualities come from the high levels of disulfide bonds it contains. These sturdy sulfur-based bonds, also found in human hair and vulcanized rubber, resist digestion and decomposition and give off a sulfurous odor when burned.

Wheat is a hexaploid species, the by-product of three ancestral plants becoming one, containing no less than six sets of chromosomes and 6.5 times the number of genes found in the human genome. Thus, it is capable of producing no less than 23,788 different proteins.<sup>32</sup> Clearly the monolithic term “gluten” is misleading, as any one of these proteins is capable of inciting an antigenic response, wherein the immune system identifies the protein as other and launches an innate or adaptive immune response, sometimes attacking self-structures in a case of friendly fire.

One saving grace that has ameliorated some of the effects of wheat consumption is our gut bacteria. Research reveals that a wide range of bacteria in the guts of Westerners are capable of degrading thousands of difficult, if not impossible to digest, proteins in modern wheat.<sup>33</sup> Indeed, without the help of these gluten peptide–degrading microbes, the sudden Neolithic introduction of gluten-containing grains into the human diet may have had even more catastrophic health consequences.

### **Tending to Your Microbiome**

Cultivating practices that protect and nourish our microbiome are just as important as our efforts to reduce exposures to genotoxic chemicals and radiation that damage our genetic material. It is also incumbent upon us to understand that antibiotics, literally translating to “against life,” in the form of both pharmaceutical prescription drugs and the thousands of pervasive, man-made chemicals that kill microbial life, have devastating and perhaps irreparable consequences to beneficial microbes when used indiscriminately or unconsciously—such



as with the fluoridation and chlorination of city water or the bacteria-destroying use of the broad-spectrum, glyphosate-based herbicide Roundup on a mass scale.

Each of us is eating for one hundred trillion microorganisms with every bite we take.<sup>34</sup> Especially important is the incorporation of dietary fiber in the form of microbiota-accessible carbohydrates or prebiotics, which can be readily found in foods such as Jerusalem artichokes, onions, garlic, leeks, asparagus, green bananas, cocoa, jicama, almonds, blueberries, carrots, cassava, pumpkin, and taro.<sup>35</sup> Prebiotics are a special class of fiber that resists hydrolysis by gastric acidity and mammalian enzymes and is instead selectively fermented by the intestinal flora, augmenting the growth or activity of flora that confers a health benefit to the body.<sup>36</sup> Also important is the avoidance of microbiome-disrupting foods such as synthetic additives, colorants, and flavorings; artificial sugars; grain-fed meats; oxidized and genetically engineered vegetable oils; hybridized wheat; glyphosate-laden food crops; and processed dairy, the consumption of which has increased in parallel with the escalating prevalence of “diseases of affluence,” including metabolic syndrome, coronary artery disease, osteoporosis, and cancer.

When considered as a whole, microbiome research peels back the layers of our very essence and lays bare one gleaming, iridescent fact: we must make a conscious effort to get out of our own way to preserve and leverage our relationship with the natural world. We are not separate or superior to the environment, nor are we detached from the ecology of it. Our genetic potential is optimized in the presence of biologically appropriate nutriment that supports our mutualistic and indivisible interdependence with all the plants, animals, and microbes on Earth.

The seemingly supra-human genetic capabilities of our gut microbiome may have been the primary determinant in our

species's survivability because they allowed our species to adapt quickly to changing environments and available diets. Research is only just beginning to bring to light how profoundly the microbiome can and does extend our genetic capabilities.

## THE CONNECTION BETWEEN MOTHER AND NEWBORN

The latest research into the role of the microbiome in sustaining physiological resilience undermines germ theory *and* presents a challenge to traditional gender dynamics.

We've long known that both men and women pass on nuclear DNA in the form of chromosomes. Yet only women can pass on the DNA that is found within mitochondria, the organelles traditionally considered the energy factories of the cells.

Because we are all designed to gestate in the womb and enter the world through the birth canal, from which the neonate's microbiome is derived and established, it follows that most of our genetic information is maternal in origin. Even when the original colonization eventually changes and is superseded by environmentally acquired microbial strains in infancy, childhood, adolescence, and adulthood, the original composition and subsequent trajectory of microbial changes is a direct by-product of the mother's terrain. Like a gardener planting the seeds, tending to her plot, and provisioning the conditions for growth, the mother is the guiding force for which foliage and greenery will flourish and thrive within the baby. As such, the microbiome of the mother is the bedrock of the baby's microbiome.

The conditions surrounding gestation, therefore, are important because the maternal-to-fetal microbiome trafficking in utero, maternal diet, and mode of birth take on vastly greater importance than previously imagined.

## HONEY, PLEASE PASS THE GENOME

With scientific advances, we have reached a critical juncture where certain long-buried pearls about our physiology are being revealed, unfolding in shimmering opalescence before our eyes. The central tenet—and the one that may be most shocking—is that we are more microbe than human. Not only are we meta-organisms, with the vast majority of our genetic information being microbial in nature, but when we peel back the curtain on the “private” genetic contribution of our own cells, we find that the human genome itself is almost one-tenth retroviral in origin.<sup>37</sup>

Even our mitochondria, popularized in high school classes everywhere as the “energy powerhouses” of the cell, are alien in origin. According to the endosymbiotic theory, mitochondria were once ancient, free-floating proteobacteria that surrendered their independence by becoming subcellular organelles, leading to the evolution of eukaryotic cells that presently make up our bodies.

The distant past, therefore, is embedded within the present; our cells are enriched with billions of years of biological information, and depending on what we eat or do not eat, the information either remains latent or is activated in an expertly executed schematic. Each cell in our bodies, along with all the cells in all living creatures on the planet today, derives from a last universal common ancestor (LUCA) estimated to have lived some 3.5 to 3.8 billion years ago in the primordial ocean. This was echoed by Charles Darwin, the father of evolution, who said that “probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed.” Thích Nhất Hạnh, a Vietnamese Buddhist monk, peace activist, and global spiritual leader, articulated the same insight when he wrote these words: “If you look deeply into the palm of your hand, you will see your parents and all generations of your ancestors. All of them are alive in this moment. Each is present in your body. You are the continuation of each of these people.”<sup>38</sup>



Our degree of reconciliation with our evolutionary past—and hence our level of alignment with the molecular and energetic fabric that is the essence of who we really are—will determine our ability to cultivate health and resist illness. One of the pillars of stepping back into alliance with our authentic selves is eating the food our body expects to encounter, the sustenance it has been conditioned over the millennia to use as fuel. Hippocrates’s proclamation that “we are what we eat” was true not only in physical terms—the food we eat produces molecular building blocks from which our bodies are constructed—but also in microbial terms.

The billion-dollar question, of course, is this: What did our ancestors eat? The stereotype of the caveman revolves around a meat-heavy dietary template. Animal products were indeed important in our evolutionary past, but not in the way that you might think. A turning point in evolution for our hominid predecessors was the inclusion of high-quality, easily digestible nutrition from coastal and inland freshwater seafood, which dovetailed with the rapid expansion of gray matter in the cerebral cortex of the brain. A staple of the mid–Upper Paleolithic period, freshwater or marine sources of protein made up between 10 and 50 percent of the diet early modern humans consumed. The inclusion of this protein and fat was concurrent with the development of many hallmarks of abstract thought, such as pottery figurines, knotted textiles, burial decorations, and personal ornamentation.<sup>39</sup> Our large human brains, especially their frontal lobes, expressed capacity for executive thought, critical thinking, problem-solving, memory retention, toolmaking, language, and learning. All this may be directly attributable to the easily assimilated long-chain fatty acid in seafood known as docosahexaenoic acid (DHA), which is important for membrane-rich brain tissue.

But Paleolithic humans ate a variety of other forageable foods, too, including honey. According to Alyssa Crittenden, a behavioral ecologist and nutritional anthropologist at the University of Nevada, Las Vegas, honey was a central food for early humans. Excavated rock wall art from around the world displays likenesses of early humans climbing ladders to smoke out and collect honey

from honeycomb-filled hives. Crittenden also notes that traditional hunter-gatherer populations in Africa, Australia, Asia, and Latin America incorporate honey and bee larvae as integral parts of their diets.

The idea that honey may be a cornerstone for our species's microbial health is substantiated by a study published in the journal *PLOS ONE*, which discovered the presence of lactobacillus species in honeybees, suggesting an 80-million-year or older history of association.<sup>40</sup> In our fostering of an ancient co-evolutionary relationship with honey, it has become an integral facet of our microbial identity, where our own immune systems and microbial populations may share dependency on honey-based microbes.

Honey contains a range of beneficial microbial life-forms contributed by bees and the plants they forage, including the lactic acid-producing bacteria lactobacilli, which support the immune systems and behavioral patterns of individual bees and the hive as a whole. When eaten raw, honey may contribute health-promoting bacterial strains to our bodies. Strains of lactic acid bacteria, for instance, can improve chronic constipation,<sup>41</sup> reduce childhood dental caries<sup>42</sup> and eczema,<sup>43</sup> reduce nosocomial (hospital-acquired) infections,<sup>44</sup> reduce infectious complications in elective liver donors,<sup>45</sup> decrease the duration of respiratory infections in the elderly,<sup>46</sup> alleviate symptoms of irritable bowel syndrome,<sup>47</sup> and reduce the incidence and severity of the life-threatening condition necrotizing enterocolitis in very low-birth-weight infants.<sup>48</sup>

Honey has also been shown to heal wounds<sup>49</sup> and burns,<sup>50</sup> reduce radiation-associated pain in cancer patients, improve cholesterol profiles,<sup>51</sup> and enhance DNA repair in residential populations chronically exposed to pesticides.<sup>52</sup> One of nature's ultimate medicinal substances, it is as effective as the mouthwash chlorhexidine in reducing plaque formation,<sup>53</sup> treats nocturnal cough better than the over-the-counter cough suppressant dextromethorphan,<sup>54</sup> has superior efficacy to standard hydrogel therapy in the treatment of venous ulcers,<sup>55</sup> and has efficacy against urinary tract infections.<sup>56</sup> It can even help



address the antibiotic-resistant infection known as methicillin-resistant *Staphylococcus aureus* (MRSA).<sup>57</sup>

Since Paleolithic times, the topography of our inner microbial soil has become completely ravaged. Most recently, the daily barrage of synthetic dietary inputs and battery of antimicrobial toxicants has plunged us into a post-industrial chemical soup. It is plausible, however, that honey could help heal these wounds and that ancestral foods infused with equally ancient symbiotic bacteria could help us recover and “travel back” in biological time to a far more stable state of health. Consuming honey and other real, microbiota-impregnated foods may be absolutely necessary for the continued healthy expression of our DNA, establishing vital anchors for the informational integrity of our species identity.

### **The Life Bridge: Our Bodies Are Connected to Earth through Microbes**

The American herbalist Paul Schulick aptly named the interstitial layer of microbial communities within the soil and our guts a “life bridge,” which can be visualized as a bridge that connects our bodies via microbes directly to the Earth, as well as between the ancient past and the present, forming an inseparable whole. Think about ancient farming practices that use wild soil from old growth systems as a microbial inoculant in newer farming land to produce vitally nourishing food. These old-growth microbial communities, perhaps a by-product of millions of years of co-evolution, could contribute a wide range of biotransformed soil metabolites for a plant’s nutritional needs, as well as infuse the edible plants themselves with strains of bacteria, fungi, and viruses important to our own health.



When we allow our evolutionary compass to guide us home to ourselves, we naturally gravitate toward certain foods and avoid others. In the next chapter, we will explore some of the frontiers in the science of food and energy and learn how to assess new inventions, sidestep those that make us sick, and navigate toward the inputs that best align with what our bodies need and crave at a cellular level.



# THE NEW BIOPHYSICS OF ENERGY SYNTHESIS

How the Body Harvests Nature's  
Alternative Energy Sources to Power  
Cellular Pathways, Build Resilience,  
and Promote Our Evolutionary Edge

**F**ood is an important energy source, but it is not the only one that powers your body. Until recently, we have regarded the body as a mostly glucose-burning or glucose-fermenting biomachine, with a convenient backup system for fat burning. Most people believed that the majority of our body's energy is stored and transferred by mitochondria in the form of ATP (adenosine triphosphate) and that ultimately all our energy needs can be met by our food. The New Biology, however, is revealing that sunlight, melanin, water, and chlorophyll all provide alternative sources of energy. Like plants, humans can capture energy through the direct transformation of environmental energy into metabolic energy. There is also exciting



evidence indicating that the human body can access zero-point energy directly from the quantum vacuum. In this chapter, I'll also explain how certain dietary and lifestyle choices can make it easier for our bodies to access these alternative forms of energy.

## **WATER: YOUR BODY'S MOLECULAR BATTERY**

We know that cells can regenerate, microRNAs can communicate genetic information from food to your body, and the microbiome extends and complements our cells' genetic capabilities. We know that our bodies are innately intelligent and that most disease symptoms are compensatory adaptations seeking to re-establish equilibrium. Water plays a critical role in this paradigm.

Water makes up two-thirds of the human body by weight and 99 percent of our bodies' molecules by number. Although essential to life and a variety of biological functions such as enzymatic activities, protein-folding dynamics, and myriad cellular responses, water is often thought of as inanimate background material relative to nucleic acids and proteins, the latter of which are considered the most valuable players in the central dogma of biology. Scientists have been limited by the assumption that the phenomenology of water can be explained through the principles of surface tension, capillary action, condensation, evaporation, sublimation, and Brownian motion (the erratic motion of particles suspended in a fluid that occurs due to collision with molecules in the surrounding medium). But we have yet to explain some of the vagaries and mysteries of water's behavior, such as how the so-called Jesus lizard walks on water's surface, how electrodes inserted into two adjacent beakers of water cause a bridge of water to form between them that can be sustained indefinitely (even when the beakers are separated by a few centimeters), or the Mpemba Effect, a process through which hot water can occasionally freeze faster than cold.