Discover the Foods Scientifically Proven to Prevent and Reverse Disease

HOW NOT TO DIE

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with GENE STONE

FEATURING **DR. GREGER'S DAILY DOZEN:**
WHAT TO EAT TO ADD YEARS TO YOUR LIFE

HOW NOT TO DIE

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SCIENTIFICALLY PROVEN TO PREVENT
AND REVERSE DISEASE

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with Gene Stone

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Frances Greger

Preface

It all started with my grandmother.

I was only a kid when the doctors sent her home in a wheelchair to die. Diagnosed with end-stage heart disease, she had already had so many bypass operations that the surgeons essentially ran out of plumbing—the scarring from each open-heart surgery had made the next more difficult until they finally ran out of options. Confined to a wheelchair with crushing chest pain, her doctors told her there was nothing else they could do. Her life was over at age sixty-five.

I think what sparks many kids to want to become doctors when they grow up is watching a beloved relative become ill or even die. But for me, it was watching my grandma get better.

Soon after she was discharged from the hospital to spend her last days at home, a segment aired on *60 Minutes* about Nathan Pritikin, an early lifestyle medicine pioneer who had been gaining a reputation for reversing terminal heart disease. He had just opened a new center in California, and my grandmother, in desperation, somehow made the cross-country trek to become one of its first patients. This was a live-in program where everyone was placed on a plant-based diet and then started on a graded exercise regimen. They wheeled my grandmother in, and she walked out.

I'll never forget that.

She was even featured in Pritikin's biography *Pritikin: The Man Who Healed America's Heart*. My grandma was described as one of the "death's door people":

> *Frances Greger, from North Miami, Florida, arrived in Santa Barbara at one of Pritikin's early sessions in a wheelchair. Mrs. Greger had heart disease, angina, and claudication; her condition*

was so bad she could no longer walk without great pain in her chest and legs. Within three weeks, though, she was not only out of her wheelchair but was walking ten miles a day.[1]

When I was a kid, that was all that mattered: I got to play with Grandma again. But over the years, I grew to understand the significance of what had happened. At that time, the medical profession didn't even think it was possible to reverse heart disease. Drugs were given to try to slow the progression, and surgery was performed to circumvent clogged arteries to try to relieve symptoms, but the disease was expected to get worse and worse until you died. Now, however, we know that as soon as we stop eating an artery-clogging diet, our bodies can start healing themselves, in many cases opening up arteries without drugs or surgery.

My grandma was given her medical death sentence at age sixty-five. Thanks to a healthy diet and lifestyle, she was able to enjoy another thirty-one years on this earth with her six grandchildren. The woman who was once told by doctors she only had weeks to live didn't die until she was ninety-six years old. Her near-miraculous recovery not only inspired one of those grandkids to pursue a career in medicine but granted her enough healthy years to see him graduate from medical school.

By the time I became a doctor, giants like Dean Ornish, M.D., president and founder of the nonprofit Preventive Medicine Research Institute, had already proven beyond a shadow of a doubt what Pritikin had shown to be true. Using the latest high-tech advances—cardiac PET scans,[2] quantitative coronary arteriography,[3] and radionuclide ventriculography[4]—Dr. Ornish and his colleagues showed that the lowest-tech approach—diet and lifestyle—can undeniably reverse heart disease, our leading killer.

Dr. Ornish and his colleagues' studies were published in some of the most prestigious medical journals in the world. Yet medical practice hardly changed. Why? Why were doctors still prescribing drugs and using Roto-Rooter-type procedures to just treat the symptoms of heart disease and to try to forestall what they chose to believe was the inevitable—an early death?

This was my wake-up call. I opened my eyes to the depressing fact that there are other forces at work in medicine besides science. The U.S. health care system runs on a fee-for-service model in which doctors get paid for the pills and procedures they prescribe, rewarding quantity over quality. We don't get reimbursed for time spent counseling our patients about the

benefits of healthy eating. If doctors were instead paid for performance, there would be a financial incentive to treat the lifestyle causes of disease. Until the model of reimbursement changes, I don't expect great changes in medical care or medical education.[5]

Only a quarter of medical schools appear to offer a single dedicated course on nutrition.[6] During my first interview for medical school, at Cornell University, I remember the interviewer emphatically stating, "Nutrition is superfluous to human health." And he was a pediatrician! I knew I was in for a long road ahead. Come to think of it, I think the only medical professional who ever asked me about a family member's diet was our veterinarian.

I was honored to be accepted by nineteen medical schools. I chose Tufts because they boasted the most nutrition training—twenty-one hours' worth, although this was still less than 1 percent of the curriculum.

During my medical training, I was offered countless steak dinners and fancy perks by Big Pharma representatives, but not once did I get a call from Big Broccoli. There is a reason you hear about the latest drugs on television: Huge corporate budgets drive their promotion. The same reason you'll probably never see a commercial for sweet potatoes is the same reason breakthroughs on the power of foods to affect your health and longevity may never make it to the public: There's little profit motive.

In medical school, even with our paltry twenty-one hours of nutrition training, there was no mention of using diet to treat chronic disease, let alone reverse it. I was only aware of this body of work because of my family's personal story.

The question that haunted me during training was this: If the cure to our number-one killer could get lost down the rabbit hole, what else might be buried in the medical literature? I made it my life's mission to find out.

Most of my years in Boston were spent scouring the dusty stacks in the basement of Harvard's Countway Library of Medicine. I started practicing medicine, but no matter how many patients I saw in the clinic every day, even when I was able to change the lives of entire families at a time, I knew it was just a drop in the bucket, so I went on the road.

With the help of the American Medical Student Association, my goal was to speak at every medical school in the country every two years to influence an entire generation of new doctors. I didn't want another doctor to graduate without this tool—the power of food—in her or his toolbox. If my grandma didn't have to die from heart disease, perhaps no one's

grandparent did.

There were periods where I was giving forty talks a month. I'd roll into town to give a breakfast talk at a Rotary Club, give a presentation at the medical school over lunch, and then speak to a community group in the evening. I was living out of my car, one key on my keychain. I ended up giving more than a thousand presentations around the world.

Not surprisingly, life on the road was not sustainable. I lost a marriage over it. With more speaking requests than I could accept, I started putting all my annual research findings into a DVD series, *Latest in Clinical Nutrition*. It's hard to believe I'm almost up to volume 30. Every penny I receive from those DVDs, then and now, goes directly to charity, as does the money from my speaking engagements and book sales, including the book you're reading now.

As corrupting an influence as money is in medicine, it appears to me even worse in the field of nutrition, where it seems everyone has his or her own brand of snake-oil supplement or wonder gadget. Dogmas are entrenched and data too often cherry-picked to support preconceived notions.

True, I have biases of my own to rein in. Although my original motivation was health, over the years, I've grown into quite the animal lover. Three cats and a dog run our household, and I've spent much of my professional life proudly serving the Humane Society of the United States as the charity's public health director. So, like many people, I care about the welfare of the animals we eat, but first and foremost, I am a physician. My primary duty has always been to care for my patients, to accurately provide the best available balance of evidence.

In the clinic, I could reach hundreds; on the road, thousands. But this life-or-death information needed to reach millions. Enter Jesse Rasch, a Canadian philanthropist who shared my vision of making evidence-based nutrition freely accessible and available to all. The foundation he and his wife, Julie, set up put all my work online—thus, NutritionFacts.org was born. I can now reach more people while working from home in my pajamas than I ever could when I was traveling the world.

Now a self-sustaining nonprofit organization itself, NutritionFacts.org has more than a thousand bite-sized videos on nearly every conceivable nutrition topic, and I post new videos and articles every day. Everything on the website is free for all, for all time. There are no ads, no corporate sponsorships. It's just a labor of love.

* * *

When I started this work more than a decade ago, I thought the answer was to train the trainers, educate the profession. But with the democratization of information, doctors no longer hold a monopoly as gatekeepers of knowledge about health. When it comes to safe, simple lifestyle prescriptions, I'm realizing it may be more effective to empower individuals directly. In a recent national survey of doctor office visits, only about one in five smokers were told to quit.[7] Just as you don't have to wait for your physician to tell you to stop smoking, you don't have to wait to start eating healthier. Then together we can show my medical colleagues the true power of healthy living.

Today, I live within biking distance of the National Library of Medicine, the largest medical library in the world. Last year alone, there were more than twenty-four thousand papers published in the medical literature on nutrition, and I now have a team of researchers, a wonderful staff, and an army of volunteers who help me dig through the mountains of new information. This book is not just another platform through which I can share my findings but a long-awaited opportunity to share practical advice about how to put this life-changing, life-*saving* science into practice in our daily lives.

I think my grandma would be proud.

Introduction

PREVENTING, ARRESTING, AND REVERSING OUR LEADING KILLERS

There may be no such thing as dying from old age. From a study of more than forty-two thousand consecutive autopsies, centenarians—those who live past one hundred—were found to have succumbed to diseases in 100 percent of the cases examined. Though most were perceived, even by their physicians, to have been healthy just prior to death, not one "died of old age."[1] Until recently, advanced age had been considered to be a disease itself,[2] but people don't die as a consequence of maturing. They die from disease, most commonly heart attacks.[3]

Most deaths in the United States are preventable, and they are related to what we eat.[4] Our diet is the number-one cause of premature death and the number-one cause of disability.[5] Surely, diet must also be the number-one thing taught in medical schools, right?

Sadly, it's not. According to the most recent national survey, only a quarter of medical schools offer a *single* course in nutrition, down from 37 percent thirty years ago.[6] While most of the public evidently considers doctors to be "very credible" sources of nutrition information,[7] six out of seven graduating doctors surveyed felt physicians were inadequately trained to counsel patients about their diets.[8] One study found that people off the street sometimes know more about basic nutrition than their doctors, concluding "physicians should be more knowledgeable about nutrition than their patients, but these results suggest that this is not necessarily true."[9]

To remedy this situation, a bill was introduced in the California State

Legislature to mandate physicians get at least twelve hours of nutrition training any time over the next four years. It might surprise you to learn that the California Medical Association came out strongly *opposed* to the bill, as did other mainstream medical groups, including the California Academy of Family Physicians.[10] The bill was amended from a mandatory minimum of twelve hours over four years down to seven hours and then doctored, one might say, down to zero.

The California medical board does have one subject requirement: twelve hours on pain management and end-of-life care for the terminally ill.[11] This disparity between prevention and mere mitigation of suffering could be a metaphor for modern medicine. A doctor a day may keep the apples away.

Back in 1903, Thomas Edison predicted that the "doctor of the future will give no medicine, but will instruct his patient in the care of [the] human frame in diet and in the cause and prevention of diseases."[12] Sadly, all it takes is a few minutes watching pharmaceutical ads on television imploring viewers to "ask your doctor" about this or that drug to know that Edison's prediction hasn't come true. A study of thousands of patient visits found that the average length of time primary-care doctors spend talking about nutrition is about ten seconds.[13]

But hey, this is the twenty-first century! Can't we eat whatever we want and simply take meds when we begin having health problems? For too many patients and even my physician colleagues, this seems to be the prevailing mind-set. Global spending for prescription drugs is surpassing $1 trillion annually, with the United States accounting for about one-third of this market.[14] Why do we spend so much on pills? Many people assume that our manner of death is preprogrammed into our genes. High blood pressure by fifty-five, heart attacks at sixty, maybe cancer at seventy, and so on.… But for most of the leading causes of death, the science shows that our genes often account for only 10–20 percent of risk at most.[15] For instance, as you'll see in this book, the rates of killers like heart disease and major cancers differ up to a hundredfold among various populations around the globe. But when people move from low- to high-risk countries, their disease rates almost always change to those of the new environment.[16] New diet, new diseases. So, while a sixty-year-old American man living in San Francisco has about a 5 percent chance of having a heart attack within five years, should he move to Japan and start eating and living like the Japanese, his five-year risk would drop to only 1

percent. Japanese Americans in their forties can have the same heart attack risk as Japanese in their sixties. Switching to an American lifestyle in effect aged their hearts a full twenty years.[17]

The Mayo Clinic estimates that nearly 70 percent of Americans take at least one prescription drug.[18] Yet despite the fact that more people in this country are on medication than aren't, not to mention the steady influx of ever newer and more expensive drugs on the market, we aren't living much longer than others. In terms of life expectancy, the United States is down around twenty-seven or twenty-eight out of the thirty-four top free-market democracies. People in Slovenia live longer than we do.[19] And the extra years we are living aren't necessarily healthy or vibrant. Back in 2011, a disturbing analysis of mortality and morbidity was published in the *Journal of Gerontology*. Are Americans living longer now compared to about a generation ago? Yes, technically. But are those extra years necessarily healthy ones? No. And it's worse than that: We're actually living fewer healthy years now than we once did.[20]

Here's what I mean: A twenty-year-old in 1998 could expect to live about fifty-eight more years, while a twenty-year-old in 2006 could look forward to fifty-nine more years. However, the twenty-year-old from the 1990s might live ten of those years with chronic disease, whereas now it's more like thirteen years with heart disease, cancer, diabetes, or a stroke. So it feels like one step forward, three steps back. The researchers also noted that we're living two fewer functional years—that is, for two years, we're no longer able to perform basic life activities, such as walking a quarter of a mile, standing or sitting for two hours without having to lie down, or standing without special equipment.[21] In other words, we're living longer, but we're living *sicker*.

With these rising disease rates, our children may even die sooner. A special report published in the *New England Journal of Medicine* entitled "A Potential Decline in Life Expectancy in the United States in the 21st Century" concluded that "the steady rise in life expectancy observed in the modern era may soon come to an end and the youth of today may, on average, live less healthy and possibly even shorter lives than their parents."[22]

In public health school, students learn that there are three levels of preventive medicine. The first is primary prevention, as in trying to prevent people at risk for heart disease from suffering their first heart attack. An example of this level of preventive medicine would be your

doctor prescribing you a statin drug for high cholesterol. Secondary prevention takes place when you already have the disease and are trying to prevent it from becoming worse, like having a second heart attack. To do this, your doctor may add an aspirin or other drugs to your regimen. At the third level of preventive medicine, the focus is on helping people manage long-term health problems, so your doctor, for example, might prescribe a cardiac rehabilitation program that aims to prevent further physical deterioration and pain.[23] In 2000, a fourth level was proposed. What could this new "quaternary" prevention be? Reduce the complications from all the drugs and surgery from the first three levels.[24] But people seem to forget about a fifth concept, termed primordial prevention, that was first introduced by the World Health Organization back in 1978. Decades later, it's finally being embraced by the American Heart Association.[25]

Primordial prevention was conceived as a strategy to prevent whole societies from experiencing epidemics of chronic-disease risk factors. This means not just preventing chronic disease but preventing the risk factors that lead to chronic disease.[26] For example, instead of trying to prevent someone with high cholesterol from suffering a heart attack, why not help prevent him or her from getting high cholesterol (which leads to the heart attack) in the first place?

With this in mind, the American Heart Association came up with "The Simple 7" factors that can lead to a healthier life: not smoking, not being overweight, being "very active" (defined as the equivalent of walking at least twenty-two minutes a day), eating healthier (for example, lots of fruits and vegetables), having below-average cholesterol, having normal blood pressure, and having normal blood sugar levels.[27] The American Heart Association's goal is to reduce heart-disease deaths by 20 percent by 2020.[28] If more than 90 percent of heart attacks may be avoided with lifestyle changes,[29] why so modest an aim? Even 25 percent was "deemed unrealistic."[30] The AHA's pessimism may have something to do with the frightening reality of the average American diet.

An analysis of the health behaviors of thirty-five thousand adults across the United States was published in the American Heart Association journal. Most of the participants didn't smoke, about half reached their weekly exercise goals, and about a third of the population got a pass in each of the other categories—except diet. Their diets were scored on a scale from zero to five to see if they met a bare minimum of healthy eating behaviors, such as meeting recommended targets for fruit, vegetable, and

whole-grain consumption or drinking fewer than three cans of soda a week. How many even reached four out of five on their Healthy Eating Score? About 1 percent.[31] Maybe if the American Heart Association achieves its goal of an "aggressive"[32] 20 percent improvement by 2020, we'll get up to 1.2 percent.

* * *

Medical anthropologists have identified several major eras of human disease, starting with the Age of Pestilence and Famine, which largely ended with the Industrial Revolution, or the stage we're in now, the Age of Degenerative and Man-Made Diseases.[33] This shift is reflected in the changing causes of death over the last century. In 1900 in the United States, the top-three killers were infectious diseases: pneumonia, tuberculosis, and diarrheal disease.[34] Now, the killers are largely lifestyle diseases: heart disease, cancer, and chronic lung disease.[35] Is this simply because antibiotics have enabled us to live long enough to suffer from degenerative diseases? No. The emergence of these epidemics of chronic disease was accompanied by dramatic shifts in dietary patterns. This is best exemplified by what's been happening to disease rates among people in the developing world over the last few decades as they've rapidly Westernized their diets.

In 1990 around the world, most years of healthy life were lost to undernutrition, such as diarrheal diseases in malnourished children, but now the greatest disease burden is attributed to high blood pressure, a disease of overnutrition.[36] The pandemic of chronic disease has been ascribed in part to the near-universal shift toward a diet dominated by animal-sourced and processed foods—in other words, more meat, dairy, eggs, oils, soda, sugar, and refined grains.[37] China is perhaps the best-studied example. There, a transition away from the country's traditional, plant-based diet was accompanied by a sharp rise in diet-related chronic diseases, such as obesity, diabetes, cardiovascular diseases, and cancer.[38]

Why do we suspect these changes in diet and disease are related? After all, rapidly industrializing societies undergo multitudes of changes. How are scientists able to parse out the effects of specific foods? To isolate the effects of different dietary components, researchers can follow the diets and diseases of large groups of defined individuals over time. Take meat, for example. To see what effect an increase in meat consumption might

have on disease rates, researchers studied lapsed vegetarians. People who once ate vegetarian diets but then started to eat meat at least once a week experienced a 146 percent increase in odds of heart disease, a 152 percent increase in stroke, a 166 percent increase in diabetes, and a 231 percent increase in odds for weight gain. During the twelve years after the transition from vegetarian to omnivore, meat-eating was associated with a 3.6 year decrease in life expectancy.[39]

Even vegetarians can suffer high rates of chronic disease, though, if they eat a lot of processed foods. Take India, for example. This country's rates of diabetes, heart disease, obesity, and stroke have increased far faster than might have been expected given its relatively small increase in per capita meat consumption. This has been blamed on the decreasing "whole plant food content of their diet," including a shift from brown rice to white and the substitution of other refined carbohydrates, packaged snacks, and fast-food products for India's traditional staples of lentils, fruits, vegetables, whole grains, nuts, and seeds.[40] In general, the dividing line between health-promoting and disease-promoting foods may be less plant- versus animal-sourced foods and more whole plant foods versus most everything else.

To this end, a dietary quality index was developed that simply reflects the percentage of calories people derive from nutrient-rich, unprocessed plant foods[41] on a scale of zero to one hundred. The higher people score, the more body fat they may lose over time[42] and the lower their risk may be of abdominal obesity,[43] high blood pressure,[44] high cholesterol, and high triglycerides.[45] Comparing the diets of 100 women with breast cancer to 175 healthy women, researchers concluded that scoring higher on the whole plant food diet index (greater than about thirty compared to less than about eighteen) may reduce the odds of breast cancer more than 90 percent.[46]

Sadly, most Americans hardly make it past a score of ten. The standard American diet rates eleven out of one hundred. According to estimates from the U.S. Department of Agriculture, 32 percent of our calories comes from animal foods, 57 percent comes from processed plant foods, and only 11 percent comes from whole grains, beans, fruits, vegetables, and nuts.[47] That means on a scale of one to ten, the American diet would rate about a one.

We eat almost as if the future doesn't matter. And, indeed, there are actually data to back that up. A study entitled "Death Row Nutrition:

Curious Conclusions of Last Meals" analyzed the last meal requests of hundreds of individuals executed in the United States during a five-year period. It turns out that the nutritional content didn't differ much from what Americans normally eat.[48] If we continue to eat as though we're having our last meals, eventually they will be.

What percentage of Americans hit all the American Heart Association's "Simple 7" recommendations? Of 1,933 men and women surveyed, most met two or three, but hardly any managed to meet all seven simple health components. In fact, just a single individual could boast hitting all seven recommendations.[49] One person out of nearly two thousand. As a recent past president of the American Heart Association responded, "That should give all of us pause."[50]

The truth is that adhering to just four simple healthy lifestyle factors can have a strong impact on the prevention of chronic diseases: not smoking, not being obese, getting a half hour of exercise a day, and eating healthier—defined as consuming more fruits, veggies, and whole grains and less meat. Those four factors alone were found to account for 78 percent of chronic disease risk. If you start from scratch and manage to tick off all four, you may be able to wipe out more than 90 percent of your risk of developing diabetes, more than 80 percent of your risk of having a heart attack, cut by half your risk of having a stroke, and reduce your overall cancer risk by more than one-third.[51] For some cancers, like our number-two cancer killer, colon cancer, up to 71 percent of cases appear to be preventable through a similar portfolio of simple diet and lifestyle changes.[52]

Maybe it's time we stop blaming genetics and focus on the more than 70 percent that is directly under our control.[53] We have the power.

* * *

Does all this healthy living translate into a longer life as well? The Centers for Disease Control and Prevention (CDC) followed approximately eight thousand Americans aged twenty years or older for about six years. They found that three cardinal lifestyle behaviors exerted an enormous impact on mortality: People can substantially reduce their risk for early death by not smoking, consuming a healthier diet, and engaging in sufficient physical activity. And the CDC's definitions were pretty laid-back: By not smoking, the CDC just meant not *currently* smoking. A "healthy diet" was defined merely as being in the top 40 percent in terms of complying with

the wimpy federal dietary guidelines, and "physically active" meant averaging about twenty-one minutes or more a day of at least moderate exercise. People who managed at least *one* of the three had a 40 percent lower risk of dying within that six-year period. Those who hit two out of three cut their chances of dying by more than half, and those who scored all three behaviors reduced their chances of dying in that time by 82 percent.[54]

Of course, people sometimes fib about how well they eat. How accurate can these findings really be if they're based on people's self-reporting? A similar study on health behaviors and survival didn't just take people's own word for how healthy they were eating; the researchers measured how much vitamin C participants had in their bloodstreams. The level of vitamin C in the blood was considered a "good biomarker of plant food intake" and hence was used as a proxy for a healthy diet. The conclusions held up. The drop in mortality risk among those with healthier habits was equivalent to being fourteen years younger.[55] It's like turning back the clock fourteen years—not with a drug or a DeLorean but just by eating and living healthier.

Let's talk a little more about aging. In each of your cells, you have forty-six strands of DNA coiled into chromosomes. At the tip of each chromosome, there's a tiny cap called a telomere, which keeps your DNA from unraveling and fraying. Think of it as the plastic tips on the end of your shoelaces. Every time your cells divide, however, a bit of that cap is lost. And when the telomere is completely gone, your cells can die.[56] Though this is an oversimplification,[57] telomeres have been thought of as your life "fuse": They can start shortening as soon as you're born, and when they're gone, you're gone. In fact, forensic scientists can take DNA from a bloodstain and roughly estimate how old the person was based on how long their telomeres are.[58]

Sounds like fodder for a great scene in *CSI*, but is there anything you can do to slow the rate at which your fuses burn? The thought is that if you can slow down this ticking cellular clock, you may be able to slow down the aging process and live longer.[59] So what would you have to do if you wanted to prevent this telomere cap from burning away? Well, smoking cigarettes is associated with triple the rate of telomere loss,[60] so the first step is simple: Stop smoking. But the food you eat every day may also have an impact on how fast you lose your telomeres. The consumption of fruits,[61] vegetables,[62] and other antioxidant-rich foods[63] has been

associated with longer protective telomeres. In contrast, the consumption of refined grains,[64] soda,[65] meat (including fish),[66] and dairy[67] has been linked to shortened telomeres. What if you ate a diet composed of whole plant foods and stayed away from processed foods and animal foods? Could cellular aging be slowed?

The answer lies in an enzyme found in Methuselah. That's the name given to a bristlecone pine tree growing in the White Mountains of California, which, at the time, happened to be the oldest recorded living being and is now nearing its 4,800th birthday. It was already hundreds of years old before construction of the pyramids in Egypt began. There's an enzyme in the roots of bristlecone pines that appears to peak a few thousand years into their life span, and it actually rebuilds telomeres.[68] Scientists named it telomerase. Once they knew what to look for, researchers discovered the enzyme was present in human cells too. The question then became, how can we boost the activity of this age-defying enzyme?

Seeking answers, the pioneering researcher Dr. Dean Ornish teamed up with Dr. Elizabeth Blackburn, who was awarded the 2009 Nobel Prize in Medicine for her discovery of telomerase. In a study funded in part by the U.S. Department of Defense, they found that three months of whole-food, plant-based nutrition and other healthy changes could significantly boost telomerase activity, the only intervention ever shown to do so.[69] The study was published in one of the most prestigious medical journals in the world. The accompanying editorial concluded that this landmark study "should encourage people to adopt a healthy lifestyle in order to avoid or combat cancer and age-related diseases."[70]

So were Dr. Ornish and Dr. Blackburn able to successfully slow down aging with a healthy diet and lifestyle? A five-year follow-up study was recently published in which the lengths of the study subjects' telomeres were measured. In the control group (the group of participants who did not change their lifestyles), their telomeres predictably shrank with age. But for the healthy-living group, not only did their telomeres shrink less, they *grew*. Five years later, their telomeres were even longer on average than when they started, suggesting a healthy lifestyle can boost telomerase enzyme activity and *reverse* cellular aging.[71]

Subsequent research has shown that the telomere lengthening wasn't just because the healthy-living group was exercising more or losing weight. Weight loss through calorie restriction and an even more vigorous

exercise program failed to improve telomere length, so it appears that the active ingredient is the quality, not quantity, of the food eaten. As long as people were eating the same diet, it didn't appear to matter how small their portions were, how much weight they lost, or even how hard they exercised; after a year, they saw no benefit.[72] In contrast, individuals on the plant-based diet exercised only half as much, enjoyed the same amount of weight loss after just three months,[73] and achieved significant telomere protection.[74] In other words, it wasn't the weight loss and it wasn't the exercise that reversed cell aging—it was the food.

Some people have expressed concern that boosting telomerase activity could theoretically increase cancer risk, since tumors have been known to hijack the telomerase enzyme and use it to ensure their own immortality.[75] But as we'll see in chapter 13, Dr. Ornish and his colleagues have used the same diet and lifestyle changes to halt and apparently *reverse* the progression of cancer in certain circumstances. We will also see how the same diet can reverse heart disease too.

What about our other leading killers? It turns out a more plant-based diet may help prevent, treat, or reverse *every single one* of our fifteen leading causes of death. In this book, I'll go through this list, with a chapter on each:

MORTALITY IN THE UNITED STATES

	Annual Deaths
1. Coronary heart disease[76]	375,000
2. Lung diseases (lung cancer,[77] COPD, and asthma[78])	296,000
3. You'll be surprised! (see chapter 15)	225,000
4. Brain diseases (stroke[79] and Alzheimer's[80])	214,000
5. Digestive cancers (colorectal, pancreatic, and esophageal)[81]	106,000
6. Infections (respiratory and blood)[82]	95,000
7. Diabetes[83]	76,000

8. High blood pressure[84]	65,000
9. Liver disease (cirrhosis and cancer)[85]	60,000
10. Blood cancers (leukemia, lymphoma, and myeloma)[86]	56,000
11. Kidney disease[87]	47,000
12. Breast cancer[88]	41,000
13. Suicide[89]	41,000
14. Prostate cancer[90]	28,000
15. Parkinson's disease[91]	25,000

Certainly there are prescription medications that can help with some of these conditions. For example, you can take statin drugs for your cholesterol to lower risk of heart attacks, pop different pills and inject insulin for diabetes, and take a slew of diuretics and other blood pressure medications for hypertension. But there is only one unifying diet that may help prevent, arrest, or even reverse each of these killers. Unlike with medications, there isn't one kind of diet for optimal liver function and a different diet to improve our kidneys. A heart-healthy diet is a brain-healthy diet is a lung-healthy diet. The *same* diet that helps prevent cancer just so happens to be the same diet that may help prevent type 2 diabetes and every other cause of death on the top-fifteen list. Unlike drugs—which only target specific functions, can have dangerous side effects, and may only treat the symptoms of disease—a healthy diet can benefit all organ systems at once, has *good* side effects, and may treat the underlying cause of illness.

That one unifying diet found to best prevent and treat many of these chronic diseases is a whole-food, plant-based diet, defined as an eating pattern that encourages the consumption of unrefined plant foods and discourages meats, dairy products, eggs, and processed foods.[92] In this book, I don't advocate for a vegetarian diet or a vegan diet. I advocate for an evidence-based diet, and the best available balance of science suggests that the more whole plant foods we eat, the better—both to reap their nutritional benefits and to displace less healthful options.

Most doctor visits are for lifestyle-based diseases, which means they're preventable diseases.[93] As physicians, my colleagues and I were trained not to treat the root cause but rather the consequences by giving a

lifetime's worth of medications to treat risk factors like high blood pressure, blood sugar, and cholesterol. This approach has been compared to mopping up the floor around an overflowing sink instead of simply turning off the faucet.[94] Drug companies are more than happy to sell you a new roll of paper towels every day for the rest of your life while the water continues to gush. As Dr. Walter Willett, the chair of nutrition at Harvard University's School of Public Health, put it: "The inherent problem is that most pharmacologic strategies do not address the underlying causes of ill health in Western countries, which are not drug deficiencies."[95]

Treating the cause is not only safer and cheaper but it can work better. So why don't more of my medical colleagues do it? Not only were they not trained how, doctors don't get paid for it. No one profits from lifestyle medicine (other than the patient!), so it's not a major part of medical training or practice.[96] That's just how the current system works. The medical system is set up to financially reward prescribing pills and procedures, not produce. After Dr. Ornish proved that heart disease could be reversed without drugs or surgery, he thought that his studies would have a meaningful effect on the practice of mainstream medicine. After all, he effectively found a cure for our number-one killer! But he was mistaken—not about his critically important findings regarding diet and disease reversal but about how much influence the business of medicine has on the practice of medicine. In his words, Dr. Ornish "realized reimbursement is a much more powerful determinant of medical practice than research."[97]

Though there are vested interests, such as the processed food and pharmaceutical industries, which fight hard to maintain the status quo, there is one corporate sector that actually benefits from keeping people healthy—namely, the insurance industry. Kaiser Permanente, the largest managed-care organization in the country, published a nutritional update for physicians in their official medical journal, informing their nearly fifteen thousand physicians that healthy eating may be "best achieved with a plant-based diet, which we define as a regimen that encourages whole, plant-based foods and discourages meats, dairy products, and eggs as well as all refined and processed foods."[98]

"Too often, physicians ignore the potential benefits of good nutrition and quickly prescribe medications instead of giving patients a chance to correct their disease through healthy eating and active living.… Physicians should consider recommending a plant-based diet to all their patients, especially those with high blood pressure, diabetes, cardiovascular disease,

or obesity."[99] Physicians should give their patients a chance to first correct their disease themselves with plant-based nutrition.

The major downside Kaiser Permanente's nutritional update describes is that this diet may work a little too well. If people begin eating plant-based diets while still taking medications, their blood pressure or blood sugar could actually drop so low that physicians may need to adjust medications or eliminate them altogether. Ironically, the "side effect" of the diet may be not having to take drugs anymore. The article ends with a familiar refrain: Further research is needed. In this case, though, "Further research is needed to find ways to make plant-based diets the new normal. …"[100]

* * *

We're a long way off from Thomas Edison's 1903 prediction, but it is my hope that this book can help you understand that most of our leading causes of death and disability are more preventable than inevitable. The primary reason diseases tend to run in families may be that *diets* tend to run in families.

For most of our leading killers, nongenetic factors like diet can account for at least 80 or 90 percent of cases. As I noted before, this is based on the fact that the rates of cardiovascular disease and major cancers differ fivefold to a hundredfold around the world. Migration studies show this is not just genetics. When people move from low- to high-risk areas, their disease risk nearly always shoots up to match the new setting.[101] As well, dramatic changes in disease rates within a single generation highlight the primacy of external factors. Colon cancer mortality in Japan in the 1950s was less than one-fifth that of the United States (including Americans of Japanese ancestry).[102] But now colon cancer rates in Japan are as bad as they are in the United States, a rise that has been attributed in part to the fivefold increase in meat consumption.[103]

Research has shown us that identical twins separated at birth will get different diseases based on how they live their lives. A recent American Heart Association–funded study compared the lifestyles and arteries of nearly five hundred twins. It found that diet and lifestyle factors clearly trumped genes.[104] You share 50 percent of your genes with each of your parents, so if one parent dies of a heart attack, you know you've inherited some of that susceptibility. But even among identical twins who have the exact same genes, one could die early of a heart attack and the other could

live a long, healthy life with clean arteries depending on what she ate and how she lived. Even if *both* your parents died with heart disease, you should be able to eat your way to a healthy heart. Your family history does not have to become your personal destiny.

Just because you're born with bad genes doesn't mean you can't effectively turn them off. As you'll see in the breast cancer and Alzheimer's disease chapters, even if you're born with high-risk genes, you have tremendous control over your medical destiny. Epigenetics is the hot new field of study that deals with this control of gene activity. Skin cells look and function a lot differently from bone cells, brain cells, or heart cells, but each of our cells has the same complement of DNA. What makes them act differently is that they each have different genes turned on or off. That's the power of epigenetics. Same DNA, but different results.

Let me give you an example of how striking this effect can be. Consider the humble honeybee. Queen bees and worker bees are genetically identical, yet queen bees lay up to two thousand eggs a day, while worker bees are functionally sterile. Queens live up to three years; workers may live only three weeks.[105] The difference between the two is diet. When the hive's queen is dying, a larva is picked by nurse bees to be fed a secreted substance called royal jelly. When the larva eats this jelly, the enzyme that had been silencing the expression of royal genes is turned off, and a new queen is born.[106] The queen has the exact same genes as any of the workers, but because of what she ate, different genes are expressed, and her life and life span are dramatically altered as a result.

Cancer cells can use epigenetics against us by silencing tumor-suppressor genes that could otherwise stop the cancer in its tracks. So even if you're born with good genes, cancer can sometimes find a way to turn them off. A number of chemotherapy drugs have been developed to restore our bodies' natural defenses, but their use has been limited due to their high toxicity.[107] There are, however, a number of compounds distributed widely throughout the plant kingdom—including beans, greens, and berries—that appear to have the same effect naturally.[108] For example, dripping green tea on colon, esophageal, or prostate cancer cells has been shown to reactivate genes silenced by the cancer.[109] This hasn't just been demonstrated in a petri dish, though. Three hours after eating a cup of broccoli sprouts, the enzyme that cancers use to help silence our defenses is suppressed in your bloodstream[110] to an extent equal to or greater than the chemotherapy agent specifically designed for that purpose,[111] without

the toxic side effects.[112]

What if we ate a diet chock-full of plant foods? In the Gene Expression Modulation by Intervention with Nutrition and Lifestyle (GEMINAL) study, Dr. Ornish and colleagues took biopsies from men with prostate cancer before and after three months of intensive lifestyle changes that included a whole-food, plant-based diet. Without any chemotherapy or radiation, beneficial changes in gene expression for five hundred different genes were noted. Within just a few months, the expression of disease-preventing genes was boosted, and oncogenes that promote breast and prostate cancer were suppressed.[113] Whatever genes we may have inherited from our parents, what we eat can affect how those genes affect our health. The power is mainly in our hands and on our plates.

* * *

This book is divided into two parts: the "why" and the "how." In part 1—the "why" to eat healthfully section—I will explore the role diet can play in the prevention, treatment, and reversal of the fifteen leading causes of death in the United States. I'll then take a closer look at more practical aspects of healthy eating in the "how" to eat healthfully section presented in part 2. For example, we'll see in part 1 *why* beans and greens are among the healthiest foods on earth. Then, in part 2, we'll take a look at *how* best to eat them—we'll explore such issues as how many greens to eat every day and whether they're best cooked, canned, fresh, or frozen. We'll see in part 1 why it's important to eat at least nine servings of fruits and vegetables daily, and then part 2 will help you decide whether to buy organic or conventional produce. I'll try to answer all the common questions I receive daily and then offer real-world tips for grocery shopping and meal planning to make it as easy as possible to best feed yourself and your family.

* * *

Besides writing more books, I intend to keep lecturing at medical schools and speaking at hospitals and conferences for as long as I can. I'm going to keep trying to ignite the spark that led my colleagues into the healing profession in the first place: to help people get better. There are tools missing from too many doctors' medical toolboxes, powerful interventions that can make many of our patients well again instead of merely slowing their decline. I'll keep working on trying to change the system, but you,