The Metabolic Approach to Cancer
Integrating Deep Nutrition, the Ketogenic Diet, and Nontoxic Bio-Individualized Therapies

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The Cancer Crisis

As to diseases, make a habit of two things—to help, or at least, to do no harm.

—Hippocrates

What we discovered, counter-intuitively, is that when you start killing a cancer cell, one of the things it does in order to survive is to spread even further.

—Dr. Patrick Soon-Shiong, well-known doctor, surgeon, and scientist

Cancer is the most elusive, cunning, adaptable, intelligent, and innovative disease in history, and it has been outsmarting us for a long time. Since the earliest cases of cancer were identified around 1.6 million years ago, humans have been invested in discovering its cause and ultimate treatment. The first written record of cancer dates back to 3000 BC, where it was declared, depressingly: “There is no cure.”¹ And there still is no cure even now, thousands of years later. In fact, medical thinking has really progressed only a few paces from the antiquated idea that cancer is caused when one of the body’s four humors—blood, phlegm, yellow bile, or black bile—is out of balance. The prevailing (and failing) dogma in Western medicine today is that cancer is caused and driven by genetic mutations, or just bad luck.

The somatic mutation theory (SMT) asserts that when a cell endures extensive damage to its genetic material—deoxyribonucleic acid, or DNA—it eventually reaches a point where it goes rogue from its intended function and becomes cancerous. Cancer research and treatment development have
been locked within the tiny confines of this tenet since the SMT theory was cast in carbonite over seventy-five years ago. The problem is that this out-dated mutation focus is not getting us any closer to preventing or curing this scary, heartbreaking, expensive, and painful disease. We simply must take a new approach because right now we’re not winning the war on cancer—not even close. Today there’s a better chance of surviving Russian roulette than cancer and its associated Western treatments. Something is terribly wrong with the current cancer model.

As of this writing, cancer directly affects almost half of the US population. Half. The numbers are horrifying: By today’s end, approximately sixteen hundred cancer patients will have died. The same number will die tomorrow and the next day. In 2015 more than 1.5 million new cancer cases were diagnosed (an estimated 1,665,540), resulting in over half a million deaths (585,720, to be precise). New cancer cases have steadily increased for the last 150 years. At the beginning of the nineteenth century, only one person in twenty was diagnosed with cancer. In the 1940s that increased to one out of every sixteen people. By the 1970s it had become one in ten. In 1960, breast cancer affected one in twenty women, and by 2016, the number rose to one in eight. Today half of all men and over a third of all women in the United States will develop cancer in their lifetime. For carriers of a \textit{BRCA} mutation (a genetic mutation that can increase the risk of certain cancers including breast) who were born before 1940, the risk of developing breast cancer by age fifty was 24 percent, but among those born after 1940, when pesticides were introduced (more on this relationship later), it has almost tripled to 67 percent. From 1973 to 1991 prostate cancer rates increased 126 percent. In several European countries cancer is now the leading cause of death, and in America it is expected to surpass cardiovascular disease as the number one cause of death by 2020. While cancer is not contagious, it is unquestionably the bubonic plague of our day.

It is important to know that what cancer is \textit{not} is a disease of the aging population. From the early 1980s to the early 1990s, the incidence of cancer in American children under age ten rose by 37 percent. After accidents, cancer is the next most frequent cause of death in children, and a 2016 study found that malignant brain tumors are the number one cause of cancer-related deaths in American adolescents between the ages of fifteen and nineteen.
Not only is cancer affecting children at an increased rate of almost 40 percent in the past sixteen years, rates of secondary cancers, which are new cancers unrelated to a person’s original cancer, are also surging like a tsunami. Nearly one in five new cancer cases in the United States involves someone who has had the disease before, a rate increase of almost 300 percent since the 1970s.

As if this is not overwhelming enough, the comorbidities resulting from cancer treatments are also increasingly alarming. A March 2016 article in the journal *Oncology* found that survivors of young adult cancers have more than twice the risk of developing cardiovascular disease than people without a cancer history. A 2006 University of California, Los Angeles (UCLA), study found that chemotherapy causes changes to the brain’s metabolism and blood flow that can linger at least ten years after treatment (a phenomenon many refer to as “chemo brain”). If cancer patients can survive conventional oncology’s antiquated and largely ineffective treatments, they are far more likely to die earlier and with a lower quality of life.

Leading cancer treatments such as chemotherapy and radiation are, in fact, carcinogenic, meaning they actually *cause* cancer. Indeed, several cancer drugs including tamoxifen, used to treat breast cancer, are classified by the International Agency for Research on Cancer (IARC) as Group 1 carcinogens—meaning carcinogenic in humans. So is radiation. Yet when you or the person next to you is diagnosed with cancer, then surgery, radiation, or chemotherapy, or a combination of these, will be your primary treatment options. These modalities will, in words used by those in the oncology field, “slash, burn, and poison” cancer cells in hopes of killing them. (Early chemotherapies were actually derived from mustard gas, a chemical agent of war.) The trouble is that these conventional treatments also slash, burn, and poison a body’s healthy cells. Not only that, but they further deplete the immune system, damage DNA, eradicate critical microbes in the gut, cause inflammation and oxidative stress—all of which are cancer-*promoting* factors (each of which we will discuss further in this book). But the sad reality at this point in time is that there are few to no other treatment options available. Until now. With this book we intend to shine a beacon of light on integrative, nontoxic diet and lifestyle approaches to cancer that *work*, without the side effects.

A new approach to cancer is sorely needed since the current model of conventional oncology is based solely on treating the tumor and cancer
cells through aggressive strategies that can—and do—diminish the tumor but often with significant cost to the patient. If someone does not already have an autoimmune condition before cancer, they will usually get one after conventional treatment, as these therapies strongly override, suppress, or overstimulate the immune system (more on this in chapter 7, in “Causes of Immune System Impairment”). And while some patients bounce back after treatment, many do not. The long-term implications of these therapies can include increased gut permeability, impaired cardiovascular health, depressed cognitive health and neurological function, debilitating neuropathy, destruction of the immune system, and even death. But there is a stunningly effective cancer treatment available right at the grocery store: food.

While certainly no magic bullet or single intervention exists for treating cancer in either practice model, conventional or nonconventional, study after study shows that only 5–10 percent of cancer is caused by damaged DNA. What’s more, is these inherited mutations cause cancer only if said mutations also alter mitochondrial function. The remaining 90–95 percent of cancer cases are caused by poor diet and unhealthy lifestyles that also damage mitochondrial function. This is where we absolutely have to start focusing. Cancer is a mitochondrial disease related to a person’s physiology, psychology, and ecology. Examining a damaged gene by itself is like putting on your seat belt after your car has crashed. Cancer is not a genetic disease but instead a metabolic disorder that occurs in response to how we are feeding and treating our bodies and therefore our genomes. Humanity’s modern diets and lifestyles are in complete discordance with our evolution. Through epigenetics (which you will learn about in chapter 3) we have the ability to influence gene expression and mitochondrial function through diet, lifestyle, and thoughts. That’s powerful medicine.

If a line were drawn across the bottom of every page of this whole book to represent the entire time line of human existence, the very last page would represent the era when our basic diet of wild animals and plants was changed to incorporate grains, legumes, and dairy products. On the very last inch of the very last page would be listed the following changes to humans’ diet and environment that have occurred in only the last 250 years: air-conditioning, airplanes, antibiotics, artificial food color, artificial sweeteners, cars, cell phones, chronic stress, computers, electric lighting, emulsifiers, high-fructose corn
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syrup, genetically modified food, internet, pesticides, prescription medications, artificial preservatives, refined foods, sunscreen, synthetic chemicals, synthetic fats, television, toilets, vaccines, and much more. That’s quite a list for our ancient genome to adapt to, and it’s clearly not adapting very well. While we cannot go back in time and live in caves again (nor need we aspire to), we can begin to focus on resurrecting dietary and lifestyle approaches that are more in keeping with our genetics and our ancient metabolic systems, unchanged for millions of years and now disturbed by modern life. In this book you will learn how these disruptions are causing cancer and how to rectify it.

What is metabolism? Metabolism is the combination of physical and chemical processes that occur in the body to create the energy required to maintain life. Simply speaking, metabolism is how the body utilizes the food we eat to obtain energy. Thus, our metabolic approach to cancer is nutrition-centered. Food, air, water, and sex are what have sustained the human race for the past 2.6 million years, so clearly they are pretty important. If food is the body’s gasoline, the mitochondria inside cells are the tiny engines responsible for converting that food into energy for the body to run on. It is therefore inside the mitochondria where metabolism takes place. What has been known—but largely ignored—for over a hundred years is that the root cause of cancer is actually damaged mitochondria. Think of it this way: When you pour sugar into the engine of a car, it stops running. The same concept can be applied to the human race. What we explain in this book is that while most modern diets and lifestyles are largely responsible for cancer-causing mitochondrial damage, deep nutrition, therapeutic diets (low-glycemic, fasting, and ketogenic), and nontoxic lifestyle approaches can provide the repairs.

Now more than ever it is critical to understand that cancer is about the way our bodies and our minds interact with the environment. The majority of cancers seen today are modern, man-made diseases, and a metabolic approach can prevent and halt the cancer process. Doesn’t this sound simple? You may wonder why this hasn’t been prescribed for the last hundred years. Indeed, it is unfathomable why a treatment so utterly obvious is not already in practice. One explanation: There is no money in food research, and the results of whatever research is done cannot be patented. Thankfully, isolated cancer-fighting phytonutrients can be patented (meaning there is money
to be made), and there are scores of available studies proving the ability of food-derived compounds to counteract cancer’s many tricks. (We cover many of these “superfoods” in this book.) In general, however, the power of nutrition as a cancer therapy—either on its own or alongside Western treatments—has been largely underestimated and ignored. Until now. But before we go into the details of the metabolic approach, let’s begin at the beginning.

**What Exactly Is Cancer?**

While the American Cancer Society asserts that cancer is a collection of over a hundred different diseases and imbalances, more recent research is demonstrating that cancer is not many diseases rather a singular disease of energy metabolism. All cancers, regardless of tissue or cellular origin, use fermentation (the Warburg effect) to generate energy, which is different than how healthy cells produce energy. This energy production dysfunction is the common defect seen in all cancers, which is why targeting metabolism will target all cancers to some degree—and is the basis of this book.

More broadly, cancer is defined as the uncontrolled division of abnormal cells and the spread of those cells throughout the body. A tumor is a mass of these abnormal, or mutated, cells, each exhibiting riotous and prolific growth. Cancer cells are like teenagers hopped up on Red Bull in a mosh pit—out of control and urging others near them to join the frenzy. As cell masses grow and expand they can affect surrounding normal tissues or organs such as the liver or bowel.

It is important to know that most common cancers take months, sometimes years, to develop into a detectable mass. In fact, even healthy adults produce five hundred to a thousand new cancerous cells a day, and only one in a thousand people is truly cancer free. It’s scary to think about, but all of us have cancer cells in our body, no matter how healthy we are. All it takes is a hearty push from one of the ten factors we detail in this book to toss healthy cells into the mosh pit of uncontrolled growth. Then, without specific nutrition designed to repair mitochondrial dysfunction, invigorate the immune system, reduce inflammation, repopulate the microbiome, and balance hormones and blood sugar, healthy cells disappear into the chaotic realm of cancer.
The Ten Hallmarks of Cancer

1. **Sustained proliferation**: Cancer cells multiply out of control by creating proteins that encourage their explosive growth.

2. **Insensitivity to antigrowth signals**: Cancer cells disarm the processes the body uses to put the brakes on unwanted cell division.

3. **Evasion of apoptosis (also known as cell suicide)**: Normal cells self-destruct when they detect an error (mutation) that cannot be repaired, but cancer cells thrive despite these errors.

4. **Limitless replicative potential**: Normal cells die after a certain number of divisions. Conversely, cancer cells are immortal.

5. **Sustained angiogenesis (development of blood supply)**: Cancer cells are able to orchestrate the creation of new blood vessels to supply them with the oxygen and nutrients they need to grow.

6. **Ability to metastasize**: Cancer cells can spread to other sites in the body where space, oxygen, and nutrients are more plentiful.

7. **Reprogramming of energy metabolism (known as the Warburg effect)**: Cancer cells alter their method of energy production and increase their metabolic rate in order to sustain rapid growth.

8. **Avoidance of immune destruction**: Cancer cells suppress the function of key immune cells, including natural killer (NK) cells, while also evading immune surveillance systems.

9. **Tumor-promoting inflammation**: Tumors activate an inflammatory response that can increase their access to growth factors and blood supply.

10. **Genome instability and mutation**: Almost all cancer cells have defects in their ability to repair DNA, allowing the reproduction of mutated cells.

While there exist over two hundred known types of cancers, ten specific traits have been identified that are inherent to each one. These so-called hallmarks of cancer are the anticancer defense mechanisms hardwired into all
cells that must be breached in order for a cell to become cancerous. In other words, healthy cells have ten different security systems in place to keep cancer from breaking in and taking over, which is why we all don’t have full-blown diagnosable cancer despite the aforementioned presence of cancer cells in our bodies. In 2000 Douglas Hanahan and Robert Weinberg published a groundbreaking review article in the journal *Cell* in which they identified the original six hallmarks, and in 2011 they updated their list by proposing four more.9 While of course there are some critics of their assertions, in general these ten hallmarks of cancer are largely accepted by Western medicine. In this book we review several of them from a metabolic perspective. But where our approach differs is this: Western medicine identifies the genetic mutations or the pinpoint mechanisms that cause these system breaches in order to design drugs to treat them. Our approach prevents the breaches from happening in the first place. And if a breach does occur, we prescribe a nutritional, or metabolic, counteragent. Do be aware that each one of these biological security systems, or hallmarks, is incredibly complex; the sidebar provides only extremely basic synopses of their mechanisms. The main idea is to give you an idea of how truly complex cancer is.

**How Conventional Medicine Uses This Information**

Certainly, having an understanding of the many ways cancer works is a brilliant example of the progress made by modern science. But when it comes to the effectiveness of developing new treatments based on these hallmarks (not to mention the millions of dollars spent on research) there has, unfortunately, not been much success. Instead, we’ve seen or experienced the devastating physical side effects from conventional, chemical-based, and targeted treatments. Many of us have incurred significant emotional and financial costs, without success. For the last seventy-five years, the “War on Cancer” has been laser-focused on developing targeted therapies and mapping the human genome for genetic clues to cancer. But the magic bullet scientists have been searching for has remained elusive, leaving a trail of failed and highly toxic therapies. Still, 95 percent of cancer spending is allocated to genetic research
while prevention accounts for only about 5 percent of spending.\textsuperscript{10} Five percent! Truly the Western way: Treat the disease, not the cause. Even worse, our prevention model is centered on drugs (think aspirin), vaccinations, and radiation-based screening methods including mammograms, which are also a risk factor for cancer. Sadly, false-positive mammograms and overdiagnosis of breast cancer among women ages forty to fifty-nine cost $4 billion in health care spending annually, according to an April 2015 study in the journal \textit{Health Affairs}.\textsuperscript{11}

It probably comes as no surprise that areas of cancer research and drug development have become a big business. In 2014 alone, the global market for cancer drugs hit $100 billion.\textsuperscript{12} Some drugs, bevacizumab (Avastin) for example, can cost the patient $8,000 per month. The average cost of a new cancer drug is over $100,000 a year, and medical costs associated with cancer cripple many families. In 2010 an estimated 40 percent of patients reported depleting their savings, almost 30 percent reported dealing with bill collectors, and 54 percent of those handling the catastrophic financial burden of cancer said it had become more difficult to afford treatment.\textsuperscript{13} So while cancer might be spectacular for the economy, it has proven both costly and deadly for the patient.

Let’s look more closely at the biological drug bevacizumab, which was developed to inhibit angiogenesis, one of the hallmarks of cancer. Bevacizumab works by blocking a protein called vascular endothelial growth factor (VEGF) that is encoded by the \textit{VEGF} gene and promotes the formation of new blood vessels that help to feed tumor cells. Based on this mechanism, bevacizumab was approved for use with metastatic (stage IV) breast cancer in February 2008 under the “accelerated approval program” offered by the US Food and Drug Administration (FDA). This program allows a drug to be used before traditional full approval is granted, giving patients earlier access to promising new drugs that may treat serious or life-threatening conditions while the final confirmatory clinical trials are still being conducted.\textsuperscript{14} The initial phase 3 randomized study of bevacizumab known as E2100 found that patients administered bevacizumab in combination with another drug, paclitaxel, survived a mere six months longer without their tumors progressing than those given paclitaxel alone. Six months. This is considered a huge success in the cancer world. Not only that, but VEGF is only one of
twenty-six angiogenesis pathways; it just happens to be the one most studied. This example illuminates the fact we have found a single drug to act on a single protein but ignore the other twenty-five pathways—something food can address simultaneously.

But in February 2011 the *Journal of the American Medical Association* published the pooled results of sixteen confirmatory studies of 5,608 patients taking bevacizumab and found that these patients in fact had a 50 percent increased risk of dying from treatment-related adverse events compared with the use of chemotherapy alone. The risk of fatal problems such as bleeding, blood clots, and bowel perforations more than tripled when bevacizumab was used with certain kinds of chemotherapy drugs, particularly platinum- and taxane-based medications.15 With that, the FDA revoked approval for bevacizumab’s use in treating breast cancer, but it remains in use for other cancers. The worst part about this story is that bevacizumab was the only hope offered to millions of women who were already dying of their cancer.

Can this really be all conventional oncology has to offer? In effect, surgery, chemotherapy, and radiation rip only the top of the weed out of the garden and leave the roots behind in the soil, only to grow back a stronger and more resilient plant. Of course, we do not discount that there may be a time and place for these treatments depending on the cancer case, but it is negligent of oncologists not to take a broader approach and look at the whole person when designing comprehensive cancer care plans. It is important to note, however, that while we are critical of the current model in conventional care, with this book we do not mean simply to bash Western medicine, but rather to embrace all existing models, while using food as the foundation for healing. Cancer treatment does not have to be “either-or”; using a metabolic approach can be effective on its own while also improving the outcome of conventional treatments when they are used in tandem.

You will learn that there is a lot more happening in and to the body that provokes cancer than we are currently told, and that you have a treatment (and prevention) option sitting right in your refrigerator or waiting to be harvested from your garden. But please remember we are up against a lot of misinformation out there, and an utter lack of support in the conventional oncology world with regard to nutrition. In fact, typically when a newly diagnosed cancer patient asks their conventional oncologist what they should
eat to help support their health, the response is: “It doesn’t matter, eat what you want; just don’t lose weight.” Know this: Less than 25 percent of all medical schools offer a course in nutrition, and most of these are elective. Your medical doctor likely has little understanding of basic nutrition, never mind deep or integrative nutrition, and is therefore simply not qualified to offer advice on the topic. And it’s not just medical doctors, either; there is a contingent of naturopathic physicians who are not up to speed in nutritional biochemistry. Throughout this book we scientifically myth-bust several diet dogmas currently prominent in the world of natural medicine. On a brighter note, more and more oncologists and other medical professionals are recognizing the role of metabolic nutrition in the health of their patients—but not nearly enough.

The nutrition recommendations of the American Cancer Society (ACS) are formulated by registered dietitians trained in the food pyramid (read: Big Agriculture) model. Their corporate sponsors are the American Dairy Association, Abbott Nutrition (maker of seasonal vaccines and ibuprofen), and PepsiCo. The “quick and easy” snacks they recommend to people undergoing cancer treatment include angel food cake, cookies, doughnuts, ice cream, and microwavable snacks.16 (We are not kidding; visit their website and see for yourself.) These recommendations turn a blind eye to the many important studies (not to mention the suppressed work of Otto Warburg, PhD, MD, and Thomas Seyfried, PhD, in the field of the metabolic theory of cancer, which we detail in chapter 4; see “How Cancer Cells Gobble Glucose: The Warburg Effect”) that have proven that sugar causes—or, at the very least, can stimulate—cancer. Even a mainstream 2016 study from the University of Texas MD Anderson Cancer Center concluded that diets high in sugar are “a major risk factor” for certain types of cancers, especially breast cancer. We simply must reverse the dismissive attitude toward the role that diet and lifestyle play in cancer prevention or progression. Because it may very well be our only hope.

A metabolic, deep nutrition, and nontoxic approach is the answer to cancer prevention and management. This book is our call to arms—we must focus on the 90–95 percent of cancers that are caused by the standard American diet and exposure to environmental toxins. We simply cannot keep shrugging our shoulders when we, or our loved ones, are diagnosed.
If a new virus began to kill one of every four people in the United States, you can bet your pink ribbon a cure would be found, and fast. While Western medicine continues to drive along the dusty, dead-end road seeking the genetic and targeted answer to cancer, it is time for us to start taking control of our own health and health care choices. We’ll say it again: Cancer is a metabolic, environmental, and emotional disease. It’s not just a tumor; it signifies correctable imbalances that occur inside and outside our body. Now is the time for lifelong remission. It is time for some real hope and to disarm the most deadly disease of modern times. How? With the metabolic approach to cancer.
Introduction: The Cancer Crisis


Assessing Your Terrain

Ten Questions to Ask Your Oncologist

Do not be afraid to ask questions. Remember, you are paying your doctor, so they work for you. Consider yourself the CEO of your cancer care process and your caregivers are your board of directors. Here are ten sample questions to ask when interviewing a doctor for the position of caring for your life:

1. What will you be doing to treat my cancer stem cells, since chemotherapy, radiation, and surgery do not target these and can, in fact, stimulate their proliferation?
2. How do you plan to prevent further DNA or mitochondrial damage to my healthy cells?
3. What are your expectations of and rationale for this particular treatment?
4. What is your overall expectation for this course of treatment? A cure? Palliation (meaning improving quality of life)?
5. What are the possible risks and how will the medical team address possible adverse consequences?
6. Are there treatments you cannot provide? What would you consider doing if you had my disease?
7. What would my course of disease progression be if I choose to do nothing you recommend? (What would my survival time be, for example?)
8. Are you open to integrative therapies and willing to work with my integrative oncology experts?
9. What experience and training do you have with integrative oncology, nutrition, or integrative medicine in general?
10. Are you available and willing to communicate with my entire team and be supportive of my personal choices?
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