

Could adjusting your diet lower your cancer odds?

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Cholesterol, triglycerides, and nutrition: How your diet may increase your cancer odds

Metabolic diseases such as hypertension or diabetes can elicit an inflammatory response that damages a person's DNA, which over time may cause normal cells to become cancerous.



Metabolic syndrome—a cluster of symptoms including high blood pressure, high cholesterol, diabetes, and excess abdominal fat—is now linked with an increased prevalence and progression of cancers. Above, a patient has her blood pressure checked at a clinic.

Photograph by Whitten Sabbatini, The New York Times/Redux

By Amy Paturel

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When Urvi Shah was a hematology-oncology fellow she was diagnosed with Hodgkin lymphoma, a cancer affecting the lymph system that is vital for a healthy immune response. Shah received four months of intense chemotherapy that cured the disease, but she wondered what role, if any, diet played in eradicating her cancer.

“I heard plenty of recommendations from friends and family about what I should and shouldn’t eat, and I realized that we don’t learn anything about the role of nutrition in healing in medical school,” says Shah. “As a patient, I wanted to feel empowered to do something to support my health.”

Intrigued by the evidence that high fiber plant foods reduce cancer incidence and risk of recurrence, Shah refocused her research on modifiable risk factors for cancer, including nutrition, obesity, diabetes, and the microbiome. Now a myeloma specialist and assistant professor at Memorial Sloan Kettering Cancer Center, Shah is spearheading four dietary intervention studies (NUTRIVENTION trials) to provide nutrition guidance for cancer patients.

Shah’s work is part of a growing body of research suggesting that a constellation of metabolic diseases including obesity, diabetes, hypertension, high cholesterol, and high triglycerides—which affect more than 40 percent of Americans—could be a key driver in the onset and progression of many cancers. There’s even a medical term—metabolic syndrome—to describe people who have three or more of these conditions. The incidence of this syndrome has been trending upward for decades and the western diet combined with an inactive lifestyle are largely to blame.

Over-indulging in alcohol, refined carbohydrates, and fat-laden foods, and spending most of your time on the couch or seated at a desk, produces an inflammatory response that leads to DNA damage over time. Unfortunately, the more damaged your DNA, the more likely normal cells are to become cancerous.

Our view of cancer as a genetic disease drove the development of therapies that target specific genetic mutations, says Stephen Freedland, director of the Center for Integrated Research in Cancer and Lifestyle at Cedars-Sinai. “But we now know that cancer is a metabolic disease with unique metabolic needs—and many of the gene changes that happen in cancer regulate metabolism.”

(Colon cancer is rising among young adults. Here are signs to watch for.)

According to estimates from the International Agency for Research on Cancer (IARC), there were nearly 20 million new cancer cases in 2022 and 9.7 million cancer deaths. In many high-income countries, cancer has surpassed heart disease as the leading cause of death. And while genetic sequencing has advanced knowledge of the genomic changes that occur in cancer, it has not resulted in many effective therapeutic targets.

With cancer cells exhibiting millions of genetic alterations, developing tumor-specific drugs is a daunting task. What scientists know is that faulty metabolism—the process by which cells generate and use energy—is a hallmark of cancer. That suggests that metabolically reprogramming cancerous cells could be a viable treatment strategy.

Metabolic players in cancer

Only 5 to 10 percent of cancers are linked to a specific genetic mutation, and no single mutation is associated with all cancers. Metabolic changes, on the other hand, occur in nearly all cancers. So, it makes sense that the rates of cancer are rising alongside the growing epidemic of metabolic diseases.

A 2024 study of more than 44,000 people in China, published in *Cancer*, reported that people who had at least three of the five components of metabolic syndrome had a 30 percent higher risk of developing cancers of all types during the nine-year study period compared with those who had fewer than three of these risk factors. Researchers found that the risk of breast, endometrial, kidney, colorectal, and liver cancers among those in the group with the highest metabolic syndrome scores were between two and four times higher than those with the lowest scores.

Obesity, a component of metabolic syndrome, is associated with high levels of inflammation that damage healthy tissue and contribute to the onset of at least 13 cancers. For example, studies show that obese women have a three times greater risk of endometrial cancer and a 2.5 times greater risk of kidney cancer compared to their metabolically healthy and normal-weight counterparts.

“Excessive body fat, especially around the mid-section, drives rising inflammation, blood sugar, and production of insulin-like growth factor (IGF-1), all of which are linked to certain cancers,” Freedland says. “The mechanisms may be different for different types of cancer, but metabolic dysfunction is the common denominator.”

But what we eat and how much we weigh aren't the only factors at play. Research shows even normal weight individuals with metabolic syndrome have a higher risk of developing cancer. Lifestyle, for instance, can change your body's response to insulin and how well you convert energy from food into usable fuel.

Study after study links stress, disrupted sleep, inactivity, and loneliness, with cancers of all types, regardless of weight or body mass index.

Cancer cells gobble up glucose

The theory that cancer is a metabolic disease dates to the 1920s when German scientist Otto Warburg reported that cancer cells have a metabolic quirk. Unlike normal cells, cancer cells use glucose almost exclusively for energy, even when there's sufficient oxygen to break

down alternate fuel sources like fatty acids and proteins.

This characteristic enables early stage cancer detection with a fludeoxyglucose-18 (FDG) positron emission tomography (PET) scan, a non-invasive imaging test that tracks the glucose consumption of cells and enables identification of cancerous ones (those gobbling more glucose).

The question then becomes, can you starve cancer cells by nixing sugar?

Most scientists aren't ready to make that leap, but several studies link excessive glucose consumption through sugar-sweetened beverages and refined carbohydrates (a.k.a., sugar) with increased cancer risk. The research suggests that diabetes patients who take the blood-sugar-stabilizing drug metformin are less likely to get cancer than those who don't take the drug.

Poorly controlled blood sugar is like catnip for cancer. Unlike normal cells, which stop growing in response to hormonal signals, cancer cells' faulty metabolism interferes with these messaging systems. In fact, two critical hormones made by fat tissue—leptin and adiponectin—may play a role in converting normal cells into cancerous ones when their balance is altered.

Low adiponectin and high leptin are associated with obesity and metabolic syndrome, explains Shah. This altered ratio “is associated with increased cancer risk through insulin resistance and inflammation, two key drivers of cancer.”

What remains murky, however, is whether genetic alterations lead to dysregulated metabolism in cancer or, whether a dysregulated metabolism gives rise to the genetic changes seen in cancer.

(There's new guidance on lung cancer screening. Here's who is affected.)

“Metabolic syndrome leads to genetic changes, which predispose you to get cancer,” says Suresh T. Chari, a gastroenterologist at The University of Texas MD Anderson Cancer Center in Houston, who is investigating whether certain metabolic biomarkers might help detect cancer earlier. “But the cancer itself also causes a lot of metabolic disturbances in the years before it's diagnosed, probably for its own survival.”

This link, according to Chari, suggests an opportunity: Metabolic conditions like diabetes, and factors like lipid levels and C-reactive protein (a measure of inflammation) might help detect evasive cancers sooner. And because the two processes are so intertwined, tools that combat metabolic disorders might also tame cancer of all types.

Toward early intervention

Scientists' understanding of the metabolic underpinnings of cancer continues to evolve. According to Shah, monitoring things like blood sugar, blood pressure, and cholesterol, and taking steps to reprogram metabolic dysfunction may help doctors find cancer sooner, or even prevent it altogether.

“There’s skepticism that these modifiable risk factors confer only a modest risk so we shouldn’t burden patients with this information,” says Shah. “But in my experience, patients are hungry for information about how they can prevent or curtail the disease process, and strong data suggests that monitoring and managing metabolic syndrome is an important prevention and treatment strategy.”

In one of Shah’s trials, sweetened beverages were associated with 40 to 60 percent increased risk of abnormal proteins in the blood linked to multiple myeloma risk. Conversely, whole grains, fruits, and vegetables, were associated with a 30 to 50 percent reduced risk of this precancerous state. Research also suggests that becoming metabolically healthy through lifestyle strategies may improve survival odds if you already have cancer.

With myriad ways to improve metabolic risk factors, patients can take charge of their health—at least to some degree. They should know that how much, when, and what they eat makes a difference. That hitting the gym instead of binging on Netflix could reduce their risk of developing cancer and improve outcomes if they’re already diagnosed; and that swapping soda for water with a squeeze of lime is the low-hanging fruit among cancer prevention strategies.

“Patients have tremendous power,” Freedland says. “The decisions they make every day can make a dramatic difference in their risk of developing cancer and other diseases.”