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### The Effect of Sugar on Gut Biome, Immunity, and Inflammation Which Causes Cancer

From the *National Cancer Institute's* article, "Cancer Statistics," it is stated that cancer impacts the lives of 1,806,590 individuals per year of which 606,520 people die. Traditional healthcare in America suggests the FDA's Standard of Care which dismisses alternative conjunctive treatment and includes chemotherapy and radiotherapy. In recent years, there has been a trend for alternative treatments in lieu of, or in conjunction with, the FDA's Standard of Care in the treatment of cancer. One of those alternative treatments is restriction of sugar. In the article, "Nutrition and Cancer: A Review of the Evidence for an Anti-Cancer Diet," Donaldson proposes that Americans eat too many refined flours and sugars, which changes their glucose metabolism and leads to inflammation in the body, an environment in which cancer thrives (2). Unfortunately, the Western diet actually deactivates immune cells, which are essential for preventive and therapeutic ways to handle diseases like cancer (Christ et al. 801). Therefore, will eliminating sugar from the Western diet decrease metastasis and death cancer statistics in America, and will the FDA's Standard of Care include alternative treatments which limit sugar for cancer prevention or treatment?

Researchers from Duke-NUS Medical School find, "...sugar has a novel signaling function in cancer cells whereby its deprivation triggers voltage differences across cancer cell membranes, leading to...cell death" (1). That is why, "cancer cells continue to divide uncontrollably," because they're trying to kill cells (Fadaka et al. 47). To further illustrate the

correlation between glucose and tumor growth, Gapstur et al. provide, "...evidence for a positive...relationship between postload glycemia and pancreatic cancer mortality among individuals who did not report diabetes at baseline (2557)". According to Baylock, cancerous "stem cells can exist for a lifetime" in people's bodies and eating a poor diet allows the cancer stem cells to reproduce (4).

A novel treatment for cancer is the use of a repurposed drug called metformin used to control Type 2 Diabetes by blocking glucose. According to Salani, "In 2005 a 23% reduction in the incidence of any cancer in type 2 diabetics patients treated with metformin was reported. Salani says, "Metformin as a key regulator of cellular metabolism... that inhibits proliferation and induces apoptosis in cancer cells" (R461). Amazingly, "In diabetic patients, it inhibits hepatic glucose production, by reducing cellular concentrations of ATP and then mimicking a fasting condition" (Baylock, 11).

Research on the role diet plays on gut biome and immunity is emerging (Gi 3). Shively et al. find, "diet is a main determinant of gut microbial diversity" (47). In the article, "Fructose-induced inflammation and increased cortisol: a new mechanism for how sugar induces visceral adiposity", DiNicolantonio et al. believe sugar should be avoided because it, "...[plays] an etiological role in obesity and metabolic syndrome" which is influenced by gut biome (3). Ge et al. propose, "...sugar may increase metabolic disorders and the abundance of inflammation - including bacteria, which can be carcinogenesis, " because, "...gut microbiota regulate cancer at the level of genetic instability..." Poor gut biome and immunity leads to inflammation.

Inflammation is known to stimulate cell production. Baylock believes, "...inflammation is at the center of the cancer process" (10). To Baylock, "It is becoming evident that inflammation is playing a central role in tumor initiation, progression, invasion and metastasis"

(5). Coussens & Werb say, “Recent data has expanded the concept that inflammation is a critical component of tumor progression. Many cancers arise from sites of infection, chronic irritation and inflammation” (1). Also, O’Connor et al. performed a large study on 9678 individuals in East England and found a higher intake of sugar from non-alcoholic beverages and sugar added to tea, coffees, or cereal was associated with glycemia and inflammatory markers (1313). To O’Connor et al., “The current findings should stimulate the identification of biological mechanisms and also help to further inform dietary public health messages on sugar intake” (1321).

Current FDA Standard of Care for cancer is chemotherapeutic drugs and radiotherapy. According to Blaylock, “Most cancer stem cells are completely resistant to Conventional therapy, which explains dormancy and the poor curate with metastatic tumors” (1). So, shockingly, although people go through chemotherapy to kill their tumor cells they still have cancer stem cells which need to be eliminated to prevent reoccurrence. This is why the recurrence and metastasis rates for many cancers are high. Oncologists focus on killing cancer tumor cells through chemotherapy and radiotherapy. Oncologists are not working to prevent apoptosis of the cancer stem cells which are still circulating in the body after the chemotherapy and radiology. .

In an interview, Winters admits she is aware of the resistance by healthcare professionals to use alternative treatments like glucose (sugar) restriction for cancer care. The research linking sugar to cancer has not been accepted in the medical community. Pharmaceutical companies make profits from chemotherapy and radiation treatments. For alternative treatments and education Americans must, “...track down people out of network, and pay out of pocket, to get the proper treatment, for a good outcome” (Winters). But times are slowly changing, Winter says, “...a few years ago, I would not have even had an opportunity to sit down with a general

family practitioner and have this conversation” but now oncologists are beginning to accept the metabolic approach to cancer because it decreases their cancer mortality rates. (Winters).

To decrease the chance of contracting cancer or cancer metastasizing, people must limit processed sugar consumption. According to Ge et al., “intervention that regulates intestinal flora and improves immune function may be new regimens for future cancer treatment” (2). One way to change gut flora is to limit sugar and increase healthy fruits and vegetables. A growing number of studies find that several different types of foods have phytochemicals which kill cancer and enhance the effectiveness and safety of Standard of Care therapies. “Natural compounds are powerful anti-cancer agents when used alone, and significantly improve conventional chemotherapy and radiation treatments,..., is reason enough to begin to use these valuable agents now, both as cancer preventatives and in the treatment of the established cancers” (Blaylock 11). In the book, *In Defense of Food: An Eater's Manifesto*, Michael Pollan discusses how inflammation associates with cancer (163-164). Pollan explains that when Aborigines returned to their native habitat their health improved because they no longer ate a Western diet (164). The Western diet is high in sugar intake which causes glycolysis, disrupted gut biome, immunity problems and inflammation which causes cancer. Oncologists are beginning to accept sugar restriction lowers cancer metastasis and death statistics. And in the end, Fuhman says, “The goal for all physicians and other healthcare professionals is to work to transform America’s cities into nutrition zones of excellence”(379).

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