Fighting Cancer with Precision Nutrition
How targeted and reduced-calorie diets can yield better outcomes

PRESENTED BY
NICOLE L. SIMONE, MD
CUTTING CALORIES TO TREAT CANCER
HOW A REDUCED CALORIE DIET CAN ACTUALLY SHRINK A TUMOR

Doctors have been trained to treat cancer with surgery, chemotherapy, radiation and novel inhibitors. Dr. Simone’s goal is to change that paradigm. Dr. Simone uses precision nutrition to kill tumors more effectively and reprogram the patient’s microbiome, metabolism and immune system to treat the patient as a whole.

Dr. Nicole Simone and her team have discovered that cutting calories during standard cancer therapy can help prevent cancer, decrease the size of cancer, prevent metastases and improve survival rates for cancer. They determined that diet helps cancer therapies hit the tumor harder, while protecting the normal tissue.

For example, in one of her team’s clinical trials, breast cancer patients who cut calories by 25% reported an average weight-loss of nine pounds in ten weeks (despite the fact that cancer patients typically gain weight during radiation treatment), experienced less toxicity from their radiation and reported feeling better overall. Dr. Simone was also able to demonstrate that caloric restriction alone can actually increase cancer cell death, decrease the tumor size of both hormone-sensitive and hormone-insensitive tumors as well as delay the development of metastases. These results are further enhanced when caloric restriction is added to standard chemotherapy or radiation.

HOW IT WORKS

A cancer cell relies on food as its fuel. Decreasing calories induces a positive stress on the body and activates mechanisms to help kill cancer cells. When calories and glucose are reduced, the cancer cells have increased apoptosis, and decrease inflammation. In addition, there is a decrease in the microRNA network involving miR-21, which has been shown to promote tumor growth and proliferation. Thus, the diet activates positive molecular mechanisms that protects the patient from cancer spread.

A pioneer in cancer research, Dr. Nicole Simone has devoted her professional career to improving cancer outcomes using precision nutrition.

Her laboratory was the first to show that decreasing caloric intake cannot only improve the effectiveness of radiation and chemotherapy for early-stage breast cancer patients but also decrease metastatic disease. They have since expanded the scope of their research to additional cancers, including an open clinical trial on prostate cancer.

Dr. Simone is a trailblazer in the discipline, conducting the first-in-field clinical trial focused on precision nutrition and cancer. She has received many accolades for her research and in 2016, she was selected by the leadership of the Sidney Kimmel Cancer Center to hold the prestigious Margaret Q. Landenberger Professorship for cancer research.
Dr. Simone believes that marrying the worlds of precision medicine with precision nutrition can improve cancer care, and is now personalizing diets both for the patient and for the tumor. In general, cancer patients should reduce fats and processed sugar, which have been shown to promote cancer growth, but additional nutritional changes can be made based on a patient’s molecular and metabolic profile and the molecular driver of his/her particular tumor identified through genetic sequencing.

This is a two-pronged approach. For example, a global dietary recommendation is made based on the patients’ metabolic state. This recommendation is coupled with a precise diet designed to target specific molecular drivers of the patient’s cancer that are identified via genomic sequencing. For a patient whose tumor is induced by over-expression of the oncogene c-MYC, Dr. Simone’s research would suggest a diet rich in pectin (which can be found in oranges and carrots), choline (found in egg yolks, yogurt and almonds) and turmeric (found in spices and mustard).

In a proposed prostate cancer trial, Dr. Simone will use the molecular profile of a patient’s tumor as well as the patient’s body mass index (BMI) to prescribe a dietary intervention between their prostate biopsy and prostatectomy procedure that will change the molecular profile of their cancer.

**THE ROLE OF MICRO-RNA-21**

**LOWERING MIR-21 CAN LOWER INFLAMMATION AND RECURRENCE**

MicroRNA-21 (miR-21) is responsible for 18 cancers including those originating in the breast, ovaries, prostate, brain, lung, liver, pancreas, thyroid and many others. Recent research has shown that elevated miR-21 not only predisposes individuals to cancer, but also causes treatment resistance and cancer progression which leads to worse cancer outcomes. This is due, in part, to the chronic inflammation that is caused. When miR-21 is reduced, cancer incidence, recurrence and treatment resistance also decreases, so many researchers have searched for ways to limit its impact. The answer may lie in diet.

**NEW FINDINGS: DIET CAN LOWER MIR-21**

In exciting new findings, Dr. Simone has shown that, through an anti-inflammatory diet, patients with and without cancer can decrease their miR-21 levels. Dr. Simone is now enrolling prostate, breast and endometrial cancer patients in a preoperative clinical trial where patients will reduce their caloric intake by 25% in an effort to lower miR-21 levels. To date, Dr. Simone has shown that decreasing miR-21 with diet decreases the patient’s overall inflammation and improves the patient’s immune function to help fight cancer. Dr. Simone is also measuring the patient’s microbiome as she looks ahead to a collaboration with a Prostate Cancer Foundation investigator at Johns Hopkins focused on the relationship between a high-fat diet and the patient’s biome, inflammation and prostate cancer growth.
"We can actually use diet to make cancer treatment work better. Instead of adding drugs that have side effects, we can be cost-effective, we can decrease toxicity and we may get improved survival—just by changing the foods that we eat."

-Dr. Nicole Simone

**FUTURE DIRECTIONS**
**THE WORLD’S FIRST PRECISION NUTRITION CENTER**

Dr. Simone is steadfast in her vision to change the landscape of cancer care by empowering patients to use dietary interventions to help fight disease. At Jefferson, we believe that her work has the ability to fundamentally transform the standard of care for cancer patients with her use of precision nutrition to kill tumors more effectively and reprogram the patient’s microbiome, metabolism, and immune system to treat the patient as a whole.

It is our ultimate vision to establish the Precision Nutrition Center at Jefferson's Sidney Kimmel Cancer Center—the first of its kind in the world. By bringing together SKCC’s world-class cancer experts with research dietitians, patient behavioral specialists, immunologists and genomic and microbiome sequencing capabilities, this multidisciplinary center will lead the charge in this new frontier of cancer care, unlocking the mysteries surrounding diet and the molecular drivers of cancer.

To learn more about Dr. Simone’s work, please contact:

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