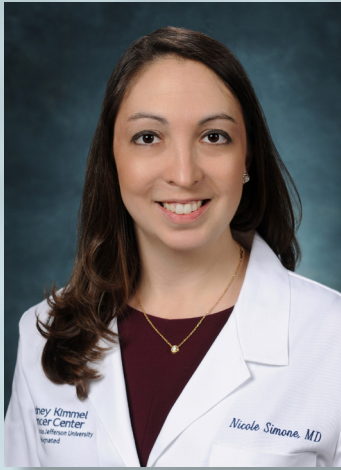


Fighting Cancer with Precision Nutrition

How targeted and reduced-calorie diets during
cancer treatment could yield better outcomes

PRESENTED BY
NICOLE L. SIMONE, MD



NICOLE L. SIMONE, MD

CO-LEADER, SKCC, BREAST
CANCER RESEARCH PROGRAM
MARGARET Q. LANDENBERGER
PROFESSOR
RADIATION DIRECTOR,
JEFFERSON BREAST CARE
CENTER

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 her work has appeared in prestigious scientific publications, including *The Oncologist*, *Cell Cycle* and *Future Oncology*.

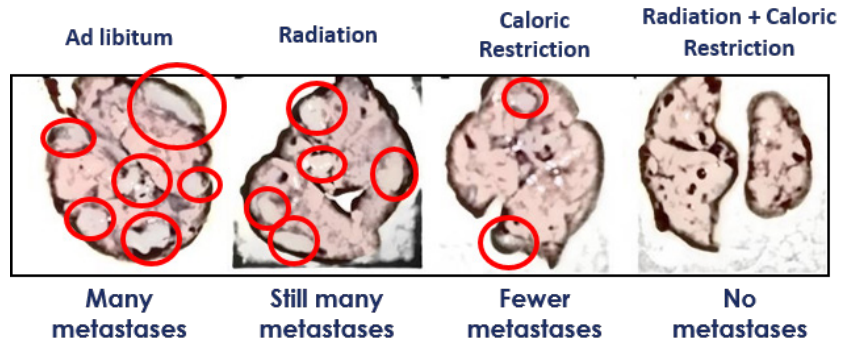
CUTTING CALORIES TO TREAT CANCER

HOW A REDUCED CALORIE DIET CAN ACTUALLY SHRINK A TUMOR

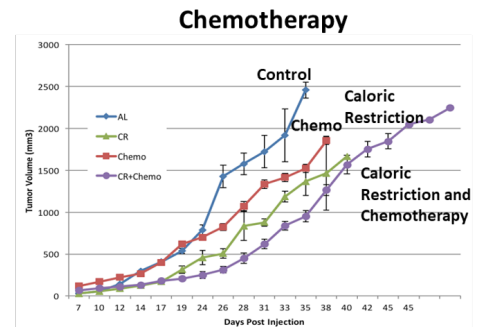
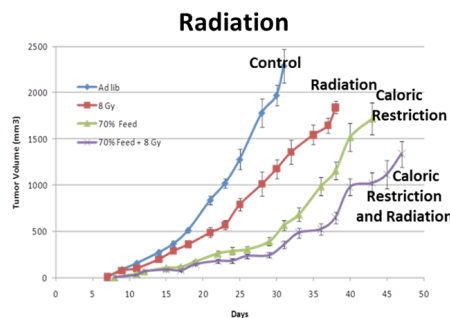
Doctors have been trained to treat cancer with surgery, chemotherapy, radiation and novel inhibitors. They've even recommended not losing too much weight during treatment, but what if you could enhance treatment through diet and precision nutrition?

Dr. Nicole Simone and her team have discovered that cutting calories during standard cancer therapy can help decrease the size of cancerous tumors, prevent metastasis and help improve outcomes and 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.



Above: Metastases volume decreased with caloric restriction,
Below: Tumor size decreased with both chemotherapy and radiation



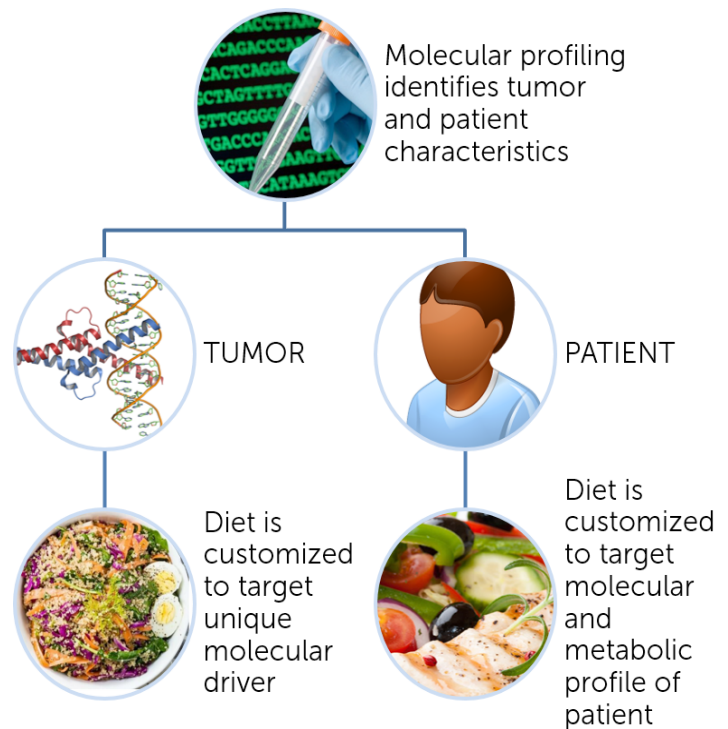
HOW IT WORKS

The mechanism lies in cancer cells' reliance on glucose for energy. When calories and glucose are reduced, the cancer cells decrease their production of two microRNAs (17 and 20) which have been shown to be involved in tumor growth and proliferation. Thus, the diet activates an epigenetic program that protects the patient from metastatic disease.

PRECISION MEDICINE GUIDING PRECISION NUTRITION MAKING PERSONALIZED CHANGES TO QUALITY OF FOOD, NOT JUST QUANTITY

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.

For example, in patients whose tumors are induced by an 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). Dr. Simone and her lab are currently teaming up with scientists at Johns Hopkins University and Harvard to identify diet recommendations for additional gene mutations.



CLINICAL TRIAL FOR PROSTATE CANCER

In a proposed neoadjuvant prostate cancer trial, Dr. Simone will use a patient's tumor's molecular profile as well as the patient's body mass index (BMI) to prescribe a dietary intervention between their prostate biopsy and prostatectomy procedure. Before and after the intervention, the GenomeDX score, which identifies the level of risk that prostate cancer will metastasize to other areas of the body, will be measured. As a result of the dietary intervention, Dr. Simone hopes to see a reduction in BMI, lower levels of certain biomarkers and a lower risk of metastasis.

"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

THE ROLE OF MICRO-RNA-21

LOWERING MIR-21 CAN LOWER INFLAMMATION AND RECURRENCE

Micro-RNA-21(miR-21) has been implicated in the pathogenesis of many solid tumors, including those originating in the breast, ovaries, prostate, brain, lung, liver, pancreas, thyroid and many others. Recent research has shown that miR-21 may predispose individuals to various types of cancer by inducing chronic inflammation in the body. By some estimates, miR-21 could be linked to 15% to 20% of all cancer deaths worldwide.

Unfortunately, the stress of cancer treatment itself has been shown to increase miR-21 and therefore inflammation, which is counterproductive to the fight against cancer in the body. When miR-21 is reduced, cancer recurrence and treatment resistance also decreases, so many researchers have searched for ways to limit its impact. The answer may lie in diet.

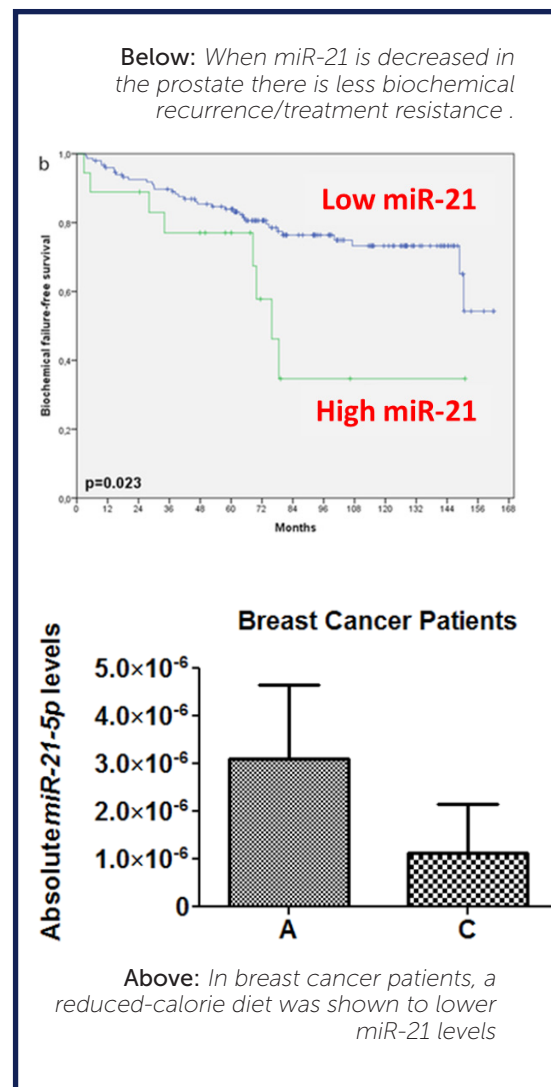
NEW FINDINGS: DIET CAN LOWER MIR21

In exciting new findings, Dr. Simone has shown that, through an anti-inflammatory diet, breast cancer patients were able to lower 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. In turn, Dr. Simone hopes to see reduced inflammation that would allow treatments to be more effective. Dr. Simone will also measure the patient's biome 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.

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. 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, 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.



 **Sidney Kimmel
Cancer Center**
at Jefferson
NCI – designated



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

Jonathan Agree
Associate Vice President
Office of Institutional Advancement
Thomas Jefferson University and Jefferson Health
215-503-6058 (o)
610-533-3014 (c)
Jonathan.Agree@jefferson.edu
giving.jefferson.edu