

Ancient wisdom, modern technology team up to fight disease

April 29 2015, by Matt Swayne



Jairam Vanamala studies how compounds in food can either promote health or foster disease. His research interests were inspired by the ancient Ayurvedic approach to diet and disease he learned as a child. Credit: Patrick Mansell

The high tech facilities where Jairam Vanamala probes the links between food and health are a long way from the rural village in southern India where he grew up, but to him the two are closely connected.

Vanamala, an associate professor of [food science](#) at Penn State, got his first training in the lush fruit and vegetable fields that surrounded his hometown. There, "eating healthy" was more than a catchy slogan for the villagers; with the nearest health facility almost 40 miles away, it could mean the difference between life and death.

For generations, Vanamala's family was active in helping residents of the community maintain [good health](#) through diet, exercise, and lifestyle modifications that are integral aspects of Ayurvedic medicine, the traditional Hindu system of [health care](#) that stretches back thousands of years. His childhood experience helping his mother tend gardens and grow medicinal herbs influenced Vanamala's philosophy about the connection between health and diet—and continues to shape his journey as a researcher today.

"It is something that has been passed down from generation to generation," says Vanamala, who is also a faculty member at the Penn State Hershey Cancer Institute. "Helping people become strong and robust and maintain a healthy lifestyle through diet are some of the best strategies for preventing disease."

His formal career began with the study of food production and [food processing](#) as he pursued his bachelor's and master's degrees in India. He then moved to the United States, completing his doctoral work at Texas A&M University and eventually coming to Penn State.

Vanamala now combines modern analytical technologies with his early lessons on the importance of food and food production. He hopes the results will someday help people choose better foods, or find ways to

make foods healthier.

"What we're doing is going back to Jean Anthelme Brillat-Savarin's philosophy: Tell me what you eat and I will tell you what you are," says Vanamala, quoting an 18th-century French lawyer and pioneer in the Western study of food's effect on health.

Cancer is the primary target of his investigation. Over the past few decades, researchers have uncovered evidence linking some foods typical of the Western diet with chronic inflammatory diseases such as cancer and type 2 diabetes, and suggesting that other diets, particularly those composed mainly of fresh fruits and vegetables, ease inflammation and lower the risk of suffering these diseases.

Colon cancer, for example, has been linked to a Western-style diet high in saturated fat and refined sugars and low in vitamins and minerals. According to Vanamala, the incidence of colon cancer in the United States is decreasing, but the disease is still expected to cause almost 50,000 deaths in the U.S. this year alone. Not only do Western nations have higher rates of colon cancer, but people from countries with mainly plant-based diets who emigrate to Western countries tend to increase their risk of colon cancer—and the change can occur within a single generation.

Vanamala's group is delving deeper into this finding by examining how compounds in food—both beneficial ones, such as polyphenols and carotenoids, and harmful ones, such as acrylamide and BPA (bisphenol A)—interact with mammalian physiology to prevent or cause cancer. The answer, his initial research suggests, may be in effects the compounds have on certain kinds of cancerous cells. Cancer stem cells, as they are called, seem to be resistant to conventional treatments such as chemotherapy and radiation. Although they occur in very small numbers within a tumor, they retain the ability to divide and produce more cancer

cells some time after the rest of the tumor has been destroyed. Vanamala hopes that finding ways to use foods to target the cancer stem cells will reduce the number of patients who suffer a recurrence of their cancer.

One way to do that is by developing new varieties of crops with higher amounts or different kinds of beneficial compounds. Vanamala is also interested in the effects of production and processing—what he calls farm-to-fork operations—on anti-inflammatory and anti-cancer components in foods. His research group uses analytical techniques such as gas/liquid chromatography and mass spectroscopy to separate and analyze thousands of compounds in raw and processed foods, as well as in the animals and humans who consume them.

For example, Vanamala's lab has shown that blue-fleshed potatoes contain far more anti-inflammatory compounds than white potatoes, but many of these beneficial compounds are lost during processing. Frying is especially destructive. It also results in the production of acrylamide, which is a suspected carcinogen. Since most potatoes consumed in the U.S. are fried white potatoes in the form of chips or French fries, Vanamala's group is trying to develop frying techniques that retain anti-inflammatory compounds while reducing the production of acrylamide and other toxicants.

Though his research is still in the preliminary stages, Vanamala is encouraged that the two wisdoms—ancient and modern—are allies in a battle for better health.

"This is a great opportunity to promote health and prevent disease in the 21st century," says Vanamala. "We are taking those first steps to bring clarity to how food production and food processing can prevent or promote disease. We're very hopeful in where this research will lead."

Provided by Pennsylvania State University

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