

Studies on nutrients, gene expression could lead to tailored diets for disease prevention

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Personal health recommendations and diets tailored to better prevent diseases may be in our future, just by focusing on genetics.

Researchers at Kansas State University recently published an academic journal article discussing the potential for nutrigenomics, a field that studies the effects of food on [gene expression](#). The researchers discussed the possibility of using food to prevent an individual's genes from expressing disease. The researchers said nutrigenomics could completely change the future of public health and the food and culinary industries.

"Nutrigenomics involves tailoring diets to someone's [genetic makeup](#)," said Koushik Adhikari, K-State assistant professor of sensory analysis. "I speculate that in five to 10 years, you would go to a genetic counselor or a physician who could help you understand your genetic makeup, and then a nutritional professional could customize your diet accordingly."

Adhikari collaborated with Denis Medeiros, professor and department head of human [nutrition](#), and Jean Getz, former K-State graduate student in human nutrition, for an article on nutrigenomics that was published in the January issue of *Food Technology*. Getz, now a student at the School of Osteopathic Medicine at Michigan State University, wrote the article while at K-State.

Nutrigenomics is a fast-moving field of research that combines molecular biology, genetics and nutrition to regulate gene expression through specific nutrients. Nutrients have been shown to affect gene

expression through [transcription factors](#), which are biochemical entities that bind to DNA and either promote or inhibit transcription of genes. By understanding the roles of specific nutrients and how they might cause diseases, scientists could recommend specific foods for an individual based on his or her genetics.

"Scientists are looking at the molecular mechanisms in the body," Adhikari said. "At the molecular level, you can look at what specific nutrients can do to your body that would trigger genes to act properly, in a healthy way."

Medeiros said K-State researchers in human nutrition are doing these kinds of studies. Some are studying the impact plant chemicals have on different types of cancers in terms of their potential prevention effects. Other researchers are looking at how wolfberry, a Chinese fruit, could be used to improve vision.

"These studies not only answer whether the concerned nutrients prevent a disease, but also how they exert their health benefits," Medeiros said.

Current health recommendations for people in the United States are general for the overall population. However, with nutrigenomics research, health recommendations could be better modified to individuals.

"That is where I think the main focus of nutrigenomics is going to be in the future," Adhikari said. "It could tell you that you have the propensity for certain chronic diseases so that you could modify your diet accordingly. With a better understanding of how nutrients alter gene expression, there is a potential that food could be used instead of medication to combat problems like high cholesterol."

Adhikari said this kind of personalized health care is in the near future

since the human genome has been mapped. Now scientists are focusing on identifying single-nucleotide polymorphisms, which are a small change in a person's DNA sequence like sensitivity to bitterness. Polymorphisms could determine if a person has a propensity for different chronic diseases. At K-State, Adhikari and Mark Haub, associate professor of human nutrition, are leading a study of the genotypes of diabetic and non-diabetic individuals to determine if there is a link between the risk for type-2 diabetes and bitter-taste sensitivity.

Nutrigenomics would require a collaborative effort from people in genetics and the industries of public health, food science and culinary. Adhikari said more options should be available so that consumers can make the healthiest choice. He said the food industry should collaborate with the culinary industry to create more healthful and appealing foods.

"This is one of the major issues with the food industry," he said. "It's very easy to make good-tasting food. Put some lard or butter in it, and it's going to taste good. The challenge is how to take the fat out and create healthful but also good-tasting food."

Consumer education also will be an important factor for the future of nutrigenomics and public health. Adhikari said consumers are often skeptical of genetically modified foods, where scientists modify a food's DNA by splicing and adding genes. However, this practice is different from nutrigenomics, which focuses on using foods' natural components to promote better health.

The researchers said a shift in public health is greatly needed, and with an increasing incidence of obesity and chronic diseases such as types 2 diabetes, nutrigenomics might prove to be the panacea in the future.

Provided by Kansas State University

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