# Extracts

## Research Shows How Nutrients Affect Genes

While diet has long been recognized as a key factor affecting chronic diseases, new University of Florida research demonstrates how one nutrient can influence the health of genes at the molecular level.

"The research is part of an emerging new field called nutrigenomics, which is the next frontier in nutrition science," said Robert Cousins, a food science and human nutrition professor with UF's Institute of Food and Agricultural Sciences. "Nutrigenomics examines the effects of nutrients on the expression of genes and how genetic makeup affects a person's response to individual nutrients and combinations of nutrients."

A UF research team, led by Cousins, presented its findings in two articles on the nutrigenomics of zinc in the *Proceedings of the National Academy of Sciences* last spring.

"The journal articles establish UF as a national leader in nutrigenomics research," he said.

Cousins, who has studied the biological effects of the micronutrient for more than 25 years, said completion of the human genome project and a similar genome project for mice has made it possible to identify which genes are turned on or off by consuming different amounts of zinc. The research is supported by grants from the National Institutes of Health.

He conducted the research with longtime associate Raymond Blanchard, an assistant instructor in nutritional biochemistry; Bernadette Moore, a former doctoral student in the department; and Cal Green, a senior research associate.

Their research focused on cells of the immune system, Cousins said. Improved immunity is one of the benefits of diet with adequate levels of zinc, which is abundant in red meats and some seafoods.

*Researcher Raymond Blanchard, left, former doctoral student Bernadette Moore and food science and human nutrition Eminent Scholar Robert Cousins are studying nutrigenomics, which examines the effects of nutrients on the expression of genes and how genetic makeup affects a person's response to nutrients.*

"We found that some genes were turned off by zinc, while others were turned on," Cousins said. "Those that were turned off by less zinc were associated with the activation of white blood cells that protect against a variety of infections. When zinc was provided, those genes were turned on."

Working with Michael Popp and Li Liu, scientists in the DNA Microarray Core at UF's Health Science Center, Cousins and Blanchard screened more than 22,000 human genes to identify those that respond to different amounts of zinc.

Cousins said international public health investigators are interested in defining the value of zinc in treating many health problems, such as diarrhea and malaria, in the developing world. He said their studies also may be useful in developing targets for new drugs to treat these and other immune-related disorders.

Cousins, an eminent scholar and member of the National Academy of Sciences, said the UF research indicates all humans respond to nutrients in characteristic, genetically programmed ways.

"In the future, dietary requirements may be more individualized based upon a person's genetic profile," he said. "Recommendations health professionals give for diets may depend on how your genes respond to what you are eating."

Robert Cousins, rjcousins@mail.ifas.ufl.edu

*Chuck Woods*