

NEWS

University of Colorado at Boulder

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YOU ARE WHAT YOU EAT, ACCORDING TO PAPER BY CU-BOULDER RESEARCH TEAM

The old adage that *"you are what you eat"* is now more telling from a biochemical standpoint than most people have thought, according to new research reported by two University of Colorado at Boulder biologists.

An article appearing in the Dec. 13 issue of Science magazine by CU-Boulder Professors Barbara Demmig-Adams and William W. Adams indicates there are a number of profound effects from human diet on both physical and mental health. Food molecules entering human bodies act as hormone-like messengers that regulate pivotal body functions at the cellular level, said Demmig-Adams.

Demmig-Adams said such functions include the division of cells in the human body that have implications for cancer as well as heart disease inflammation processes. In addition, some mental imbalances can be aggravated by the consumption of particular foods that contribute to mood and learning disorders.

For example, attention-deficit hyperactivity disorder, schizophrenia and dyslexia all can be influenced by food, she said. Improvements are seen in diets rich in Omega-3 fatty acids. It is likely that fatty acid imbalance is aggravated by the consumption of foods high in Omega-6 fatty acids, such as those found in deep-fried foods.

One irony, said Adams, is that people who are diagnosed with severe mental disorders are often institutionalized in places where they are fed fatty foods and a generally nutritionally poor diet.

Most of the hormone-like food molecules are synthesized by plants and cannot be manufactured by the human body, Demmig-Adams said. She and Adams believe age-related diseases like heart failure, diabetes and many types of cancer have increased significantly in the Western world due to a dramatic decrease in the consumption of plant-based food such

as vegetables, fruits, herbs and spices.

"Food molecules enter our bodies and modulate our genes," said Demmig-Adams. "One's diet can be more powerful than drugs."

One important class of food molecules is antioxidants. The husband-and-wife research team who work in CU-Boulder's environmental, population and organismic biology department focus on antioxidants that protect photosynthesis that harnesses solar energy in plants from oxidative damage.

The same antioxidants, zeaxanthin and lutein, mitigate damage by intense light to the eyes when consumed by people, they said. Lutein and zeaxanthin also may enhance immune system response and protect against heart disease and cancer, the authors said. "Many of the compounds that protect plant cells also protect human cells. Improving plant resistance to stress may thus have the beneficial side effect of also improving the nutritional quality of plants in the human diet," they wrote in Science.

A number of antioxidants found in plants fight free-radical oxygen molecules, which can damage human cells and ultimately organs. "In addition, antioxidants are gene modulators that turn on and off the appropriate genes," said Demmig-Adams.

"Food gives our bodies information," said Adams. "But the hormone-like compounds in food have declined in their effects as humans have moved away from plant-based foods."

"If we had diets more enriched with the right plant foods, we would likely live longer, and, more importantly maintain a higher quality of life as we age,"

Demmig-Adams and Adams also have found that wild vegetation like evergreen plants living in harsh conditions have evolved "a bag of tricks" to deal with environmental conditions by developing antioxidant strategies not found in domesticated crop plants. They now are working on identifying specific traits and genes found in these highly stress-tolerant plants that might be transferred to crop plants by genetic engineering to improve their tolerance of harsh environments as well as their nutritional quality.

"If we had diets more enriched with the right plant foods, we would likely live longer, and, more importantly maintain a higher quality of life as we age," said Demmig-Adams.

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