

Foods, Phytonutrients, and Health

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Discoveries in the nutrition and health arenas during this century have widened our view of what foods do for us—from supplying raw energy to providing the vitamins and minerals that the body needs to function. More recently, these sciences have come to recognize that plant foods contain a virtual cornucopia of compounds—over and above vitamins and minerals—that potentially enhance human health.

Examples include cruciferous vegetables such as broccoli and cauliflower that can blunt tumor growth in animal models, phytoestrogens in soybeans that appear to reduce risk of breast cancer, and plant anthocyanins—or color pigments—that appear to reduce the rate of oxidative damage within the human body.

These plant, or phyto-, nutrients are not essential for the body's day-to-day operation. But they appear to be in foods for good reason. They may protect DNA and other cell parts from oxidation, detoxify environmental pollutants, deactivate carcinogens, boost the immune system, or act in as yet unknown ways to prevent or delay onset of cancer, heart disease, cataracts, and other diseases related to the foods we eat or don't eat. Together, diet-related diseases in the United States cost more than \$200 billion for care and medical treatment each year.

The discovery of phytonutrients has stimulated much excitement among nutrition and health scientists. Now it challenges us to translate new findings into a food supply that enhances health with aging. Traditionally, agricultural and nutrition sciences have gone along separate paths—one to produce and deliver whole foods, the other to identify individual nutrients and learn how they work in the body. Now these two sciences will have to work together to bring the phytonutrient promise to fruition.

For its part, nutrition research will need to shift its focus toward whole foods and diets for reaching optimum health, rather than simply toward preventing deficiencies of individual nutrients.

Before we can identify the most beneficial phytonutrients, researchers need to develop better methods of monitoring how these compounds affect human health. For example, there's plenty of epidemiological evidence linking a high fruit and vegetable intake with reduced risk of chronic diseases. But we need early predictors—or biomarkers—of these diseases to test the ability of foods and their components to prevent them. The other partner, agricultural research, will need to broaden its thinking to make human health a key target. It will take the coordinated ef-

forts of plant physiologists, breeders, genetic engineers, soil scientists, agricultural engineers, and food marketing and distribution experts to ensure that our crops reach the family table with the high-

est nutritional values—and with essential nutrients and phytonutrients in forms the body can easily assimilate.

This will require more than just plant breeding or genetic engineering. For instance, it's becoming more evident that the quality of soil affects nutritional value. Intensive cropping, while it has given us efficient production, may not yield the most nutritious plants.

Similarly, harvesting, storage, and distribution practices affect the nutritional value of fruits and vegetables. For example, harvesting fruit well before it is ripe has enabled Americans to purchase unspoiled produce year round. But it appears that plants synthesize many of their phytonutrients during the latter stages of ripening, along with sugar production. If so, that means the produce picked the latest would be the most healthful—as well as being the tastiest.

According to recent surveys, U.S. consumers are increasingly concerned about the nutrient value of their foods. The question is: Are we willing to pay higher prices for top quality and flavor, or would we forego our favorite fruits out of season? As we have better evidence of health effects, some consumers will seek out these products—especially if the taste is improved.

But we have to be careful to not run ahead of science. A food supply that targets health as a top priority requires long-range planning, coordination, and, perhaps most importantly, a change in mindset. To facilitate this transition, the Agricultural Research Service is sponsoring a forum and workshop this month—National Nutrition Month.

Keynote speakers at the Food, Phytonutrients, and Health conference will address health, plant science, and industrial perspectives on phytonutrients and health. In the workshops, invited guests from government, academia, and industry will discuss how to fill current gaps in knowledge, identify research priorities, and look for opportunities to develop partnerships among nutrition sciences, agricultural sciences, and the food industry. We hope the gathering will also give federal validation to the efforts of individual scientists within ARS and university programs who have pioneered the discovery of phytonutrients.

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