Specialized ARS Facilities Conducting Functional Foods Research Available for Partnering Opportunities

ARS Regional Research Centers With Food Technology and Engineering Expertise

- **ARS Western Regional Research Center, Albany, CA.**
  Relevant research focuses on identifying and characterizing beneficial phytochemicals and developing novel technologies for healthful food products from fruits and vegetables, legumes, and cereals.
- **ARS Eastern Regional Research Center, Wyndmoor, PA.**
  Relevant research focuses on developing technologies for healthful dairy-based foods and characterizing health-promoting components from food-processing wastes and fuel ethanol co-products.
- **ARS Southern Regional Research Center, New Orleans, LA.**
  Relevant research focuses on developing technologies for enhancing the quality and nutritional value of rice, peanuts, and other food products, including a major effort on mitigating peanut and other food allergens.
- **ARS National Center for Agricultural Utilization Research, Peoria, IL.**
  Relevant research focuses on characterizing health-promoting components in cereals and oilseeds and non-traditional or non-food crops and their processing co-products, and developing new processing technologies that provide a human-health benefit beyond basic nutrition.

ARS Human Nutrition Research Centers

- **ARS Beltsville Human Nutrition Research Center, Beltsville, MD.**
  Current research investigates the role of phytochemicals in cinnamon in alleviating glucose intolerance and the role of phytochemicals in preventing cancer.
- **ARS Jean Mayer Human Nutrition Research Center on Aging, Boston, MA.**
  Current research focuses on identifying the role of nutrition in aging-associated diseases, the role of nutrients in gene expression, and the role of genetic inheritance in defining nutrient requirements and the variability of dietary responses.
- **ARS Western Human Nutrition Center, Davis, CA.**
  Current research focuses on the role of micronutrients and fatty acids on immune function, with the Center having increasingly encompassed into its research metabolomics, an emerging field that investigates how diet affects health differently based on the genotype of the person.
- **ARS Arkansas Children's Nutrition Center, Little Rock, AR.**
  Researchers are currently studying the health consequences of phytochemicals in children.
- **ARS Children's Nutrition Research Center, Houston, TX.**
  Current research focuses on the biochemistry, physiology, and transport of phytonutrients.
- **ARS Grand Forks Human Nutrition Research Center, Grand Forks, ND**.
  Researchers are currently studying the various roles of food components in human health.

A calcium- and vitamin C-based coating to prevent browning increases fresh-sliced apples' shelf-life.

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United States Department of Agriculture

Agricultural Research Service

Functional Foods Research in ARS

What Are Functional Foods?

Functional foods are designed to have physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions, and may be similar in appearance to conventional food and consumed as part of a regular diet.

Phytochemicals are naturally occurring bioactive components of plants. Some phytochemicals are thought to promote human health but have no known requirement and thus can be an important component of functional foods.

Agricultural Research Service

The Agricultural Research Service (ARS) is the U.S. Department of Agriculture's principal in-house research agency. ARS employs nearly 8,000 people, including more than 2,000 research scientists, at over 100 locations in the United States. Learn more about ARS at **http://www.ars.usda.gov**

ARS Mission

ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provides information access and dissemination to ensure high-quality, safe food and other agricultural products; to assess the nutritional needs of Americans; to sustain a competitive agricultural economy; to enhance the natural resource base and the environment; and to provide economic opportunities for rural citizens, communities, and society as a whole.

ARS Research Related to Functional Foods

With a national scope, field-to-table focus, history of accomplishment, and partnering opportunities—as well as national laboratories and capabilities in functional genomics and breeding, agronomics, food science, and human nutrition—ARS is a powerful force in functional foods research. Pertinent research is conducted under the following ARS National Programs:

Quality and Utilization of Agricultural Products

Four Regional Research Centers with state-of-the-art chemistry and microbiology labs and research pilot plants, and other locations in this program, focus on characterizing, separating, and purifying phytochemicals in agricultural commodities and byproducts and developing new technologies to create health-promoting foods. Learn more about this program at **http://www.ars.usda.gov/qualityandutilization**

Current projects include…

- Developing lactic probiotics.
- Developing prebiotics from crop polysaccharides.
- Developing new and improved technologies that yield health-promoting foods from cereals, fruits and vegetables, oilseeds, legumes, and dairy products.
- Developing methods to reduce food allergens.
- Characterizing and evaluating beneficial phytochemicals in blueberries, watermelon, soybeans, crop residues, and food-processing wastes.

Cholesterol-reducing compounds have been found in citrus.

Human Nutrition

ARS's network of six Human Nutrition Research Centers, and several other locations, contribute significantly to the identification of phytochemicals and other health-promoting properties of foods. As scientists elucidate the various roles of these chemicals in human health, results will pave the way for the development of new food crops and products with enhanced nutritional properties. Learn more about this program at **http://www.ars.usda.gov/humannutrition**

This program has numerous projects that generate information relevant to functional foods and health. Current projects include…

- Plant polyphenol effects on glucose and insulin metabolism.
- Blueberry influence on aging and cognition.
- Absorption and metabolism of plant pigments by humans.
- Modulation of immune function by phytochemicals and nutrients.
- Influence of various dietary factors on bone health.
- Prevention of heart disease and cancer in animal and cell models.

Carrots have been modified to contain more calcium.

Plant Genetic Resources, Genomics and Genetic Improvement *and* Plant Biological and Molecular Processes

These two programs are improving the nutritional quality and health-promoting properties of food crops. This includes providing genetic, genomic, and bioinformatic tools, information, and genetic resources for developing new food crops, as well as identifying specific genes that mediate functional traits, and identifying and characterizing functional compounds in crop plants and new sources of valuable bioactive compounds. Learn more about these programs at **http://www.ars.usda.gov/research/NP301** and **http://www.ars.usda.gov/research/NP302**

Sunbutter is a sunflower-based alternative to peanut butter that can be consumed by persons with peanut allergies.

Projects at more than 50 locations generate new plant varieties and information relevant to functional foods and health.
Current projects include…

- Increasing carotenoid and vitamin A levels in corn and tomato.
- Developing new vegetable varieties (carrots and garlic) with increased carotenoid levels and bioavailability.
- Determining the bioavailability of the antioxidant compound avenanthramide, found in oat grain, and investigating whether avenanthramide can exert bioprotection against age- and exercise-related oxidative stress.
- Developing high-folate potatoes.
- Identifying and improving broccoli varieties for anti-cancer properties and carotenoids.
- Determining natural antioxidants and antioxidant capacity of dark-colored bran rice.

ARS-developed potatoes with orange, red or purple flesh. These potatoes are not just more colorful: they are more nutritious because they are high in antioxidants.

ARS Accomplishments Related to Functional Foods

ARS research has yielded new and improved technologies leading to new food products with added value and benefits for consumers and producers alike. The four Regional Research Centers, mandated by an act of Congress in 1938 to develop new uses for agricultural commodities and byproducts, developed many of these new technologies. The American Chemical Society has formally recognized all four Centers as National Historic Chemical Landmarks for their roles in developing technologies leading to the commercialization of high-impact products.

Pertinent ARS technologies adopted and commercialized by cooperative research partners include…

- Lactose-reduced dairy products (Lactaid).
- Low-fat mozzarella cheese used in the National School Lunch Program.
- Whey-based texturized foods.
- Quality and shelf-life extension of fresh-cut fruits and vegetables.
- 100-percent-fruit bars.
- Fruit and vegetable wraps for various foods.
- Vitamin D-enhanced mushrooms.
- Sunbutter, a sunflower-based alternative to peanut butter for persons with peanut allergies.
- Low-oil-uptake, rice-based batters.
- A series of grain-based technologies (Oatrim, Nutrim, Z-trim, and Calorie Trim) yielding food ingredients that can replace fats in food and/or deliver dietary fiber.
- A low-glycemic sweetener (sucromalt).

New 100-percent-fruit bars developed by ARS are nutritious snacks.

Partnering With ARS

Partnerships have become an increasingly important resource for ARS research, providing meaningful opportunities to combine expertise and leverage resources in a way that can significantly advance research results. ARS partners with other Federal agencies, universities, industries, small businesses, and non-profit organizations in the United States and abroad. In the past decade alone, ARS has entered into thousands of new partnership agreements.

ARS conducts basic and applied research and transfers those research results, leaving commercialization and marketing of new products to its many partners. Many ARS research advancements are realized largely through these mutually beneficial partnerships with industry and other organizations. ARS is continually looking for new opportunities to work with outside organizations on a variety of research issues.

Guidance for these partnerships is provided by ARS's Office of Technology Transfer, which oversees the process by which research results are adopted and put into practice to advance a field of science, to solve a problem or as a commercial product, including…

- **Intellectual Property Management (IPM),** which includes the patenting and licensing of innovative ARS technologies;
- **Cooperative Research and Development Agreements (CRADAs),** which provide access to ARS research capacity through joint efforts to solve an agricultural need or problem that involves a non-Federal partner;
- **Material Transfer Agreements (MTAs),** which are used to exchange research materials to explore possible cooperative research; and
- **Confidentiality Agreements (CAs),** which protect information/material from public disclosure.

Learn more about partnering with ARS at **http://www.ars.usda.gov/partnering**

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