Nutrient Bioavailability

Many foods, especially fruits, vegetables, and whole grains, have naturally occurring bioactive components (like vitamins and minerals) that promote good health and can prevent, manage, and treat some chronic diseases. But to make nutritional recommendations for bioactive components, we need to understand more about them.

Researchers at land-grant universities across the country are collaborating to advance our understanding of bioactive food components and translate findings to public health practice.

More specifically researchers are:

- Determining the mechanisms of bioactive components towards improved health.
- Determining factors that influence the bioavailability of bioactive food components.
- Training scientists and students, developing a highly skilled workforce for research on bioactive food components.
- Sharing findings with food and agriculture professionals, health professionals, and consumers.

This research has provided evidence for general health recommendations as well as personalized, targeted dietary strategies to help consumers prevent, manage, and treat diseases. Findings have also helped breeders and farmers produce plants and animals that are higher in target nutrients and guided the food industry's development of novel products, which offer new ways for farmers, manufacturers, and retailers to be successful.

The scope of this project would not be possible without the collaboration of scientists from multiple states and disciplines. Coordinating efforts and sharing resources facilitates progress and innovation in a cost-efficient manner, while limiting scientific duplication. With members in multiple states, findings can be quickly and easily disseminated to the scientific community and relevant stakeholders for maximum impact.

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Multistate Research Fund IMPACTS

agInnovation science that feeds the world

Project Highlights (2017-2023)*

Obesity

Identified plant-derived fibers that can improve metabolic health even in those fed high-fat diets, meaning they could be used in effective obesity treatments. *University of Arizona*

Provided new information about the role of **carotenoids** in inhibiting obesity. *Oklahoma State University; University of Illinois*

Found that higher intakes of **green tea** can lower risks of obesity-related cardiometabolic disorders. *The Ohio State University*

Studied how **sleep** affects nutrient bioavailability and demonstrated that poor sleep worsens weight gain. *University of Arizona*

Provided the first evidence that **red raspberries** could help normalize inflammation and endothelial dysfunction (a type of coronary artery disease that narrows arteries) in obese rats. *University of Maine*

Diabetes

Provided educational materials about dietary supplementation with tropical plants like **papaya leaf** and **seaweeds** to help manage Type 2 diabetes. *University of Hawaii*

Brain Tumors

Showed that **milk** exosomes can be used to deliver any therapeutic to any disease tissue with minimal non-target effects, which has resulted in a $1 billion licensing agreement to use the technology to deliver drugs to brain tumors. *University of Nebraska-Lincoln*

Cancer

Provided evidence for establishing dietary **zinc** intake recommendations for cancer prevention. *Oregon State University*

Aging

Made discoveries that could provide new dietary approaches for preventing and managing age-related macular degeneration, which affects sight. *University of Arizona*

Bone Health

Found that isoliquiritigenin extracted from **licorice** roots reduces bone resorption via a different mechanism than hormones like estrogen and warrants further study as a promising dietary supplement for preventing bone loss in postmenopausal women or those with hormone deficiency. *Oregon State University*

Infant & Child Development

Made discoveries about the role of **milk** proteins and peptides in infant health (such as antimicrobial and immunomodulatory functions). These findings will guide dietary strategies that promote postnatal growth and development. *Oregon State University*

Identified new ways to process donor **milk** to better preserve bioactive components that are essential for infant health. *Oregon State University*

Informed infant **formula** manufacturers about the benefits of fortifying it with milk exosomes. *University of Nebraska-Lincoln*

Identified micronutrients pregnant women can use to reduce circulating concentrations of **lead**, which poses risks to fetuses. *University of Rhode Island*

Suggested that, while **iron** is crucial for early brain development, excess can lead to negative health effects. These results could help improve guidelines for iron supplementation, which is commonly practiced among infants and young children without prescreening their iron status. *University of California-Davis*

Showed that essential oils from **thyme** can inhibit the growth and infectivity of microbes that cause diarrhea, which affects the growth and health of children worldwide. *University of Florida*

Vitamin & Mineral Deficiencies

Identified a new **zinc** biomarker that will allow more reliable, accurate estimation of zinc status and created an index that will help assess the efficacy of dietary interventions to alleviate zinc deficiency, which affects 17% of the global population and can lead to depressed immune function, adverse pregnancy outcomes, neurobehavioral abnormalities, and more. *Cornell University*

Provided evidence to establish age-specific recommended intake amounts and limits for **zinc**. *Oregon State University*

Made discoveries that could help develop products that help enhance the bioavailability of **vitamin D**. *University of Illinois*

Shed new light on the use of certain biomarkers to indicate **folate** status and disease risk. *University of California, Berkeley*

Liver Disorders

Showed that **green tea** polyphenols fight inflammation and could be used to alleviate gut dysfunction related to liver disorders that affect over 80 million Americans. *The Ohio State University*

Identified bioactive compounds and foods, such as **blackcurrant**, that could be used to treat alcoholic and non-alcoholic liver disease, which has a high mortality rate in the U.S. *University of Connecticut*

Wound Healing

Provided the first documentation that bioactive compounds in **wild blueberries** can speed up wound healing and improve tissue remodeling by 20% (a patent is pending). *University of Maine*

Fortified Foods & Novel Food Products

Developed a **sorghum-soy blend** that is a cheaper alternative to whey protein concentrate for use in **fortified food aid**. *Kansas State University*

Identified types of iron that make **fortified rice** cheaper to produce. *Kansas State University*

Tested the best way to add **chickpeas** to **pastas** to increase protein and dietary fiber content. *Montana State University*

Developed **wheat** with high lysine, an essential amino acid with many health functions. *Montana State University*

Bred **potatoes** that could be useful in managing diseases like obesity and diabetes because they have high amylose (which improves gut health) and low amylopectin (which at high levels can spike blood sugar). *Montana State University*

Developed gluten-free, high-protein **oats** that have little effect on blood sugar. *Montana State University*

Discovered dietary nanoparticles in **ginger**, **honey**, and **shiitake mushrooms** and a bioactive fatty acid in **macadamia nuts** that inhibit inflammation and could be used in food products or supplements. *University of Nebraska-Lincoln*

Investigated how **milk** lipids affect cholesterol and gut bacteria, which could help the dairy industry by adding value to dairy products with high milk lipid content. *University of Connecticut*

Showed that the frozen dessert industry that **frozen yogurt** with up to 10% Greek yogurt (to increase protein content) is acceptable to consumers. *University of Missouri*

Showed that optimized cacao roasting can minimize bitterness and reduce the amount of sugar added to **chocolate** products. In addition, studies showed the health benefits of certain compounds in chocolate made from roasted cacao. *University of Missouri*

Received a patent for research showing **grape** stilbenes promote healthier intestinal function and microbiome. *Cornell University*

Showed that foods containing a type of **blue-green algae** can help prevent inflammatory diseases. *University of Connecticut*

Identified kinds of **fiber** that are better tolerated, which could help increase fiber consumption even among consumers who are intolerant. *Purdue University*

Provided new insights about **carotenoids** (naturally occurring pigments present in many fruits and vegetables and some animal products) and their effects on immune response, which could lead to dietary interventions that help mitigate a range of human diseases, including cancer, heart disease, inflammatory bowel disease, and autoimmune diseases. *University of Connecticut*

Athletic Performance Enhancement

Animal studies are helping determine whether **dietary nitrate** improves the availability of metabolic fuels for exercise. This information would help guide the International Olympic Committee, which currently considers dietary nitrate a performance-enhancing substance. *Oregon State University*

* *This project renewed in 2023. See their ongoing work: bit.ly/W5002*