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Great Grains

Greg Tammen,
Kansas State University

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Great grains

A cross-disciplinary team is developing a nutritious, sorghum-based porridge for impoverished children in Tanzania

Malnutrition affects an estimated 195 million children worldwide and is the underlying cause of death in nearly 3 million children under 5 years of age

“We’re trying to make nutritious products that will be useful in preventing malnutrition,” Lindshield said. “Young children are especially vulnerable, and many problems they experience early in life are irreversible, meaning meeting their nutrition needs is critical.”

A collaboration between five academic departments will be one for the recipe books.

Researchers in the Kansas State University colleges of Agriculture and Human Ecology are developing a series of novel, sorghum-based blended foods that use two cups of hot water to form a high-protein porridge. These food products can be used globally for supplemental feeding and nutrition programs for infants 6 months of age through children up to 5 years old.

Malnutrition affects an estimated 195 million children worldwide and is the underlying cause of death in nearly 3 million children under 5 years of age, said Sajid Alavi, professor of grain science and industry in the College of Agriculture. Alavi, who serves as the project's principal investigator, is an expert in extrusion processing and value-added uses of biological materials.

The university project is receiving \$5 million in funding from the U.S. Department of Agriculture's Micronutrient Fortified Food Aid Products Pilot initiative, and is part of a joint initiative of the USDA and the U.S. Agency for International Development to improve effectiveness of their nutrition and food assistance programs around the world. The sorghum-based porridge mixes also could be used by other global agencies that have fortified blended foods in their emergency and supplementary feeding programs.

"Every year the U.S. ships about 200,000 metric tons of these fortified blended foods and spends about \$700 million in food aid," Alavi said. "Currently, these commodities are corn-based and corn is not very sustainable. Sorghum, though, is sustainable and offers a lot of benefits over corn."

For example, sorghum is drought tolerant, largely resistant to fungal diseases, not genetically modified and takes less water to grow than corn, Alavi said. Sorghum also is one the major crops grown in Africa, and Kansas is the largest sorghum producer in the U.S.

Additionally, these sorghum-based porridge mixes developed by the university researchers are processed using extrusion — a technology

commonly used for manufacturing common food products such as breakfast cereals and expanded snacks. Extrusion leads to efficient and complete cooking, ensuring the mixes use less energy and fuel to make into porridge in the homes than current fortified blended foods.

The Goldilocks principle

To find porridge mixes that are just right, researchers are studying various blends of sorghum with soybeans, cowpeas and corn-soy.

Since the project began in January 2013, 33 prototypes have been developed through these different blends and extrusion processing methods. Physical, nutritional and sensory analysis tests have helped the team narrow the prototypes to 17. The final five prototypes will be field-tested in Tanzania by 2,000 youth for 20 weeks.

For the field-testing portion, the team is collaborating with Project Concern International — a nonprofit, humanitarian organization — to reach out to families and children in Tanzania.

Edgar Chambers IV, university distinguished professor and director of the Sensory Analysis Center and an expert in food quality, is testing the physical and sensory aspects of the blends — such as consistency, texture and shelf life.

Brian Lindshield, an assistant professor of human nutrition in the College of Human Ecology who specializes in micronutrient fortification, is testing to ensure that blends contain absorbable iron and vitamin A.

Researchers also are evaluating the blends from a practicality standpoint.

For example, Tanzanians cook food aid products in the morning and store them in thermos-like vessels for the remainder of the day. This means that rather than requiring users to change their lifestyle, the sorghum-based porridges cannot break down over a day and must remain food safe for a long time period, said Sandy Procter, assistant professor of human nutrition whose research focuses on infant and childhood nutrition.

"We want to make sure these are food products that people would choose to eat if presented with other options because they not only taste good, but also fit into their lifestyle," Procter said.

Nina Lilja, an associate professor of agricultural economics and director of International Agricultural Programs, specializes in project monitoring and evaluation on a global scale. She is working on analysis of the whole farm-to-processing delivery chain in the U.S. and in Africa to understand the economic feasibility of these new food aid products.

"It's a very comprehensive project in that we're doing all the things a company would normally do," Chambers said. "We're looking at the research and developments components, the manufacturing and economic aspects as well as marketing the final products."

"We're trying to make nutritious products that will hopefully be useful in preventing malnutrition," Lindshield said. "Young children are especially vulnerable, and many problems they experience in early in life are irreversible meaning meeting their nutrition needs is critical." Researchers say they designed the project to be comprehensive for good reason.

The project will conclude in 2016.

— By Greg Tammen, Division of Communications and Marketing

