

Probing Question: What do astronauts eat in space?

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Freeze-dried cubes and unpleasant powders? Try shrimp cocktail and butterscotch pudding. These are only a couple of the items now on the galactic menu thanks to NASA's Food Technology Commercial Space Center (FTCSC), located at Iowa State University. Here, food scientists, nutritionists, engineers, and plant breeders are collaborating to develop nutritious, convenient, safe, and tasty foods for outer space consumption. Koushik Seetharaman, assistant professor in the department of food science at Penn State, is part of the team.

Seetharaman said the Food Center originally was tasked with developing appetizing space foods that could remain edible for three to five years -- the time required to reach Mars. "Aside from being healthy and tasty, space food must also have an extended shelf life, meet specific safety criteria and use ingredients that may be grown or produced in a place like Mars or the moon," he said.

FTCSC researchers have developed several methods to meet these requirements. Thermostabilization and rehydration techniques keep food products safe from microorganisms and enzymes that would be harmful in the space environment. Fish, ham, pudding and some fruits are heat-processed to destroy harmful bacteria, while water is removed from soups (chicken noodle and cream of mushroom) and casseroles (macaroni and cheese) to prevent microbial growth. These techniques improve both safety and shelf life.

Even condiments must meet nutritional and functional criteria,

Seetharaman said. Ketchup, mustard, mayonnaise and taco sauce are provided to astronauts in their natural forms, while salt and pepper are liquidized and stored in bottle droppers.

Seetharaman said packaging is another tricky issue. Oxygen must be removed during packaging to inhibit mold growth. Food trays and containers must be equipped with Velcro strips to prevent items from floating in the microgravity of space.

The FTSCS is always looking for new ideas, which is why each year it holds a product-development competition for undergraduate and graduate students in food science or food engineering. Student teams are challenged to design a space food product that meets the requirements of long-term space travel.

Seetharaman advises Penn State participants in the competition. In 2004, the vegetable spread developed by his students -- Renee Britton, Supratim Ghosh, Rajesh Potineni and Vandana Totlani -- came away with first prize. Veg@eez, as the team named their creation, was made from minimally processed spinach, tomatoes, carrots, potatoes and radishes -- all of which potentially can be grown on Mars or the moon, said Seetharaman. A blend of oregano, salt, vinegar and olive oil was added to the three-layer spread to make a tasty snack. Its high nutrition content and attractive tricolor appearance topped the competition.

"The nuances of developing a product with specific dietary, shelf-life and safety criteria for space travel allow students to be creative in applying the knowledge they have learned as food scientists," said Seetharaman. "After all, food science is more than just cooking."

Source: Penn State (By Emily Rowlands)

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