



Space Foods: The Food for Zero Gravity

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Introduction

Space Foods, which are processed to prepare for consumption by astronauts in outer space or in zero gravity during a space mission. Space foods poses specific features which provide balanced nutrition, easy to store (long shelf life), safe to consume in weightless environment. This makes a challenge for food scientists/ developers to prepare food which have to be eaten in zero gravity. Food product in form of crumbs are not allowed, as they can float around the cabin and can cause accident by hitting someone's eye or nose or clog air ventilation. Waste is another main challenge for the food scientists/ developers. Astronauts consume meal thrice a day: breakfast, lunch and dinner. The food astronauts consume, should provide them a balanced supply of vitamins and minerals. Calorie requirements differ for astronauts. For example, a small woman would require only about 1,900 calories a day, while a large man would require about 3,200 calories. In recent years, space food has been used by various nations engaging on space programs represents their cultural identity and facilitate intercultural communication. Although astronauts consume a wide variety of foods and beverages in space. Astronaut can choose from many types of foods such as fruits, nuts, peanut butter, chicken, beef, seafood, candy, brownies, etc. Available drinks include coffee, tea, orange juice, fruit punches and lemonade. Eating in Space, provided cooking a new peak on earth as well as in outer space. With enthusiasm of space technology, astronauts today are able to take in a variety of tastes and textures that please their palates and satisfy their stomachs while orbiting hundreds of miles from earth.

History

Explorers and travellers throughout history needed, to develop methods for preserving food and carrying enough food for their journeys. More recently, refrigeration and canning methods have been developed to solve the problem of food preservation. However, space travel required new methods to be devised for keeping foods edible. Space foods must be light-weight, compact, tasty and nutritious. They must also keep for long periods without refrigeration. Early space foods were basically composed of bite-sized cubes, freeze-dried powders, and thick liquids stuffed in aluminium tubes. Eventually, the tubes were discontinued, the powders made easier to re-freeze, and the cubes were coated in Gelatine to prevent crumbling on the equipment. John Glenn was the first American to eat in space aboard Friendship 7 in 1962. At that time, it was not known if ingestion and absorption of nutrients were possible in a state of zero gravity. Glenn's consumption of applesauce, packed in a tube, and xylose sugar tablets with water, demonstrated that people could eat, swallow, and digest food in a weightless environment. There were many space mission's like Gemini, Apollo, Apollo 11, Skylab, Inter- kosmos etc organised by NASA, in which development of processed food took place. They used foods such as: shrimp cocktail, chicken and vegetables, toast squares, butterscotch pudding, and apple juice in Mission Gemini and Apollo; Menu in Skylab mission included 72 items; for the first time about 15% was frozen. Shrimp cocktail and butter cookies were consistent favourites; Lobster Newberg, fresh bread, processed meat products. The food provided in Soyuz-19 were canned beef tongue, packaged Riga bread,

and tubes of borscht (beet soup) and caviar. And in Interkosmos mission food provided were tarator, sarma, musaka, lyutenitza, kiselo mlyako, dried vegetables and fruits, etc.

Classification

Space foods are classified on the basis of processing, the food undergoes. It is classified as follows:

Sr.No.	Type of Food	Example
1	Beverages(B)	Freeze dried drink mixes, flavoured drinks
2	Fresh Foods (FF)	Fresh fruits, vegetables, and <u>tortillas</u>
3	Irradiated (I) Meat	Beef steak
4	Intermediate Moisture (IM)	Foods that have some moisture but not enough to cause immediate spoilage
5	Natural Form (NF)	<u>nuts</u> , <u>cookies</u> , and <u>granola bars</u> that are ready to eat.
6	Rehydratable (R) Foods	Foods which have been dried and can be rehydrate later
7	Thermostabilized (T)	Foods which Stabilized by thermal process
8	Extended shelf-life bread products	<u>Scones</u> , <u>waffles</u> , and <u>rolls</u>
9	Shelf Stable Tortillas	Tortillas that have been heat treated and specially packaged in an <u>oxygen-free nitrogen</u> atmosphere to prevent the growth of mould.
10	Condiments	<u>Liquid salt solution</u> , <u>oily pepper paste</u> , <u>mayonnaise</u> , <u>ketchup</u> , and <u>mustard</u> .

Packaging

Many of the foods used for the Shuttle and ISS are freeze dried and packaged into rehydratable containers. Beverages are packed by inserting septum with nitrogen flushing. Modified atmospheric packaging are used for packaging of bit size foods. Commercial pouches are used for thermostabilized and irradiated food. As with all freeze-dried foods, eggs are stored in metal cans or foil packages and egg's stored in metal cans under nitrogen at 40 ° F with shelf life of two years old.



Apollo Space Food- Beef Hash



Apollopace Food -Spiced Fruit Cereal

Space Foods at Present

At present, Astronauts have a wide range of foods to be eaten in outer space at zero gravity atmosphere. Chinese have yuxiang pork, Pao chicken, Eight Treasures rice, Chinese herbal tea. Italian commercial firms Lavazza and Argotec developed an espresso machine, called ISSpresso, for the International Space Station, which can brew hot coffee, tea and broth. Japanese have ramen, sushi, soups, and rice with ume. Korean have their national dish Kimchi. Russian have a range of 300 dishes like for breakfast: curds and nuts, mashed potatoes with nuts, apple-quince chip sticks, sugarless coffee, and vitamins. For lunch: jellied pike perch, borscht with meat, goulash with buckwheat, bread, black currant juice, sugarless tea. For supper: rice and meat, broccoli and cheese, nuts, tea with sugar. For second supper: dried beef, cashew nuts, peaches, grape juice.



Apollo Space Food Pineapple Fruitcake



Apollo Space Food Chocolate Pudding

Conclusion

As space food is very important for astronauts. There are many upcoming space projects which will require greater energy, provides a great future scope for food scientists or developers. NASA plans to grow fruits and vegetables on space farms by creating green house and are temperature controlled. Despite of having a lot of limitations in development of space food, it provides a golden opportunity to enhance career in food science.

Reference

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