

## EDUCATOR'S GUIDE

# Space Food

## Preparation

### Overview and Objectives

This lesson is geared toward students in grades 3–8.

This program discusses the history of food in space and the adjustments astronauts have to make when eating in a microgravity environment. The food must provide the necessary nutrients for the survival of the astronauts and be enjoyable to help maintain morale, but it also must be transportable and long lasting to survive the rigors of space travel. Many factors are taken into account when preparing food supplies for a space mission.

This lesson includes a [slideshow](#) in which an instructor can lead participants through ways that food is prepared for space travel and culminates with participants planning their very own space meal.

### Instructional Modalities

This activity was designed for both synchronous or asynchronous instruction.

For **synchronous instruction**, we recommend a platform that allows both for whole class discussion and for students to interact in small groups.

For **asynchronous adaptations**, we provide suggestions for teachers to provide additional support for the activities and for students to share their work with each other.

### Materials

- [Space Food Slideshow](#)
- **Space Food Worksheets** (p. 6 & 7)
- **Pen or Pencil**

### Standards

NEXT GENERATION  
LEARNING STANDARDS

4-LS1-1

5-PS3-1

3-5-ETS1-2

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## Lesson

### 1. Introductory Activity

- Participants will watch eleven minute [video](#) (10:44-22:03) on space food and answer these questions:
  - **Why does food need to be prepared a certain way for space travel?**
  - **How had space food changed over time?**
- Discuss the responses with the group.

### 2. Core Activity

- Explain to participants that food being sent to space is treated in various ways. As you go over each preparation method, have participants write down foods they enjoy that could be prepared that way using their worksheet.
- Ask participants to look over their responses.
  - **Which of your favorite foods could easily be adapted for space travel?**
  - **What are some foods you enjoy that you don't think could be eaten in space?**
- As students respond, encourage them to discuss possible ways their favorite foods could be enjoyed in space.
- Ask participants if their favorite foods are also the healthiest option for them
  - **Would it be healthy for someone to eat that meal every day?**
  - **Why should astronauts be concerned about the types of food they eat?**
- Show the MyPlate diagram on slide 15 in the [slideshow](#) and have participants share what they notice. Let them know that MyPlate is the current nutrition guide published by the USDA that tells us what balanced meals should look like. MyPlate is divided into four sections of approximately 30 percent grains, 40 percent vegetables, 10 percent fruits and 20 percent protein, accompanied by a smaller circle representing dairy, such as a glass of milk or a yogurt cup. NASA uses similar guidelines when planning meals for its astronauts.

- Using Activity 2 on their worksheet, have participants create a balanced meal for astronauts that would be considered healthy but also tasty. Participants can write in their ideas on the MyPlate diagram and identify how each item in their meal would have to be prepared if it were to be eaten in space. As participants work on their menus, ask:
  - **What are some issues that could occur in space if you brought them up in their natural form?**
  - **What would you have to do to your meal to make it suitable for consumption in space?**
- Ask participants to share their planned meals with the group. Participants can vote for the most delicious meal, the healthiest meal, and the most delicious healthy meal.

## Asynchronous Adaptation

Have participants go through the [slideshow](#) on their own. Using their worksheet, participants can jot down foods that would work with each preparation method and plan a meal in space. Have students share their ideas on a Padlet or Google Doc

## Extension Activities

To deepen student engagement with this content, you may choose to add the following activities :

### **Food Data Central**

Have participants visit [Food Data Central](#), a data system by the U.S. Department of Agriculture to learn about the nutritional information of their space meals. They can then create an infographic using the FoodData Central statistics with a tool like [Canva](#), [Spark Post](#), or [Genially](#).

## Additional Resources/ References

### **Space Food**

Food in space is an imperative aspect in an astronaut's journey. Besides taking a trip to space in a shuttle orbiter, the astronauts need to take many precautions in order to maintain good health and continue to be a positive influence. In addition to their successes exploring space, the astronauts have to take care of many different

pre-flight procedures. One of these procedures is choosing their flight menu that they will use throughout their space mission. Astronauts choose from a menu to pick which types of foods they want to have on their individual menu in space which is repeated every seven days.

Originally, bite sized food items, freeze dried powders, and semi-liquid pastes in tubes were items that the Mercury astronauts ate when in space. Now, food items have been improved to be rehydrated in order to improve the taste. Items such as shrimp cocktail, chicken and vegetables and fruits are just a few of the choices the astronauts have now.

NASA has to take many factors into account when providing meals for its astronauts, in addition to nutrition and taste. For example, when eating in space, various foods will be more problematic than others. Foods such as breads are poor to eat in space because when crumbs break apart from the bread, they do not fall to the ground but rather float round the space shuttle.

Some foods are therefore covered in edible gelatin to prevent crumbs. Others are packaged in a dehydrated form and water is added to them when needed. Water, a precious commodity for life, is conserved and recycled aboard the Space Shuttle and International Space Station.

The food must be packed, transported, and prepared in an efficient manner. Weight is always an important factor in space travel. The Space Shuttle needs 76lbs of fuel to lift just 1lb of payload into orbit. The weight of supplies on a mission, especially a long-duration mission, must be carefully measured. A total of 3.8lb per day per astronaut is allocated to food and packaging. The packaging must be taken into account because it too takes up space and has mass.

The fresh food locker is packed at the Kennedy Space Center and is installed on the Shuttle 18-24 hours prior to launch. The fresh food lockers contain food items such as tortillas, fresh bread, breakfast rolls, and fresh fruits and vegetables including apples, bananas, oranges and carrot/celery sticks. The rest of the food is packaged and stowed in locker trays in Houston about a month before each launch.

These lockers are installed in the Shuttle 2-3 days before launch. Frozen food includes entrees, vegetable and dessert items while refrigerated food includes fresh and fresh-treated fruits and vegetables, extended shelf-life refrigerated foods, and dairy products. Astronauts select their menu approximately five months before flight and these menus are analyzed for nutritional content by the Shuttle Dietitian.

**My Plate:**

The FDA recommends fruits and vegetables make up at least half of the foods you eat daily. Sugary and fried foods, foods with high sodium content and processed foods are not encouraged as they can lead to obesity and other health problems. They also stress large amounts of protein rich nuts and beans.

NASA uses similar guidelines when planning meals for its astronauts. Fruits and vegetables have historically been a challenge to keep fresh for long periods of time. New technological developments have allowed these vital foods to be packaged for long term use, while maintaining not just their nutritional value, but their taste as well.

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## ACTIVITY 1: SPACE-READY FOOD

Directions:

As you see each way food can be prepared, write down some foods you enjoy that could be eaten this way (keeping in mind the concerns of space travel).

| <b>Preparation Method</b>                   | <b>Foods I like that can be prepared this way</b> |
|---|---|
| <b>Intermediate Moisture Foods</b>          |   |
| <b>Rehydratable (Or Freeze-dried) Foods</b> |   |
| <b>Natural Form Foods</b>                   |   |
| <b>Thermostabilized Foods</b>               |   |

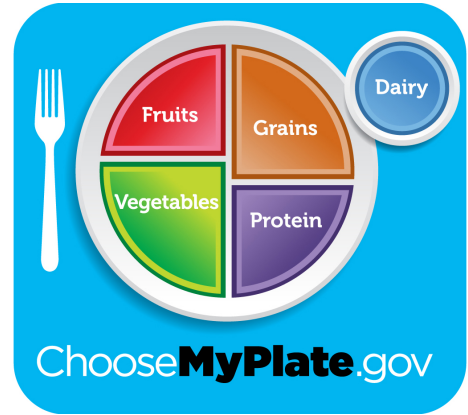
Are there any foods you enjoy that you don't think could be eaten in space? Why?

## ACTIVITY 2: PLAN A BALANCED SPACE MEAL

Directions: Using the My Plate diagram as a guide, plan a balanced meal you would want to eat in space in the spaces provided below.

**Preservation methods:**

- T = Thermostabilized
- R= Rehydratable
- IM = Intermediate Moisture
- FD = Freeze-Dried
- NF = Natural Form
- B = Beverage (Rehydratable)



1. Look at the MyPlate diagram and think about a meal you would enjoy. What are some issues that could occur in space if you brought them up in their natural form?

2. What would you have to do to your meal to make it suitable for consumption in space?

| Food Item | Preservation Method (Select from Preservation methods above) |
|-----------|--|
|           |  |
|           |  |
|           |  |
|           |  |
|           |  |