



FOOD FOR SPACEFLIGHT

Student Section _____

Student Name _____

Lesson Objective

This lesson will help you select and compare foods for spaceflight suitability, and package them for spaceflight.

During this lesson, you will

- select foods to test for spaceflight suitability.
- subject foods to spaceflight suitability testing based upon criteria.
- gather data by sorting foods based upon the results of the suitability for spaceflight testing.
- develop packaging for the suitable foods for spaceflight.
- develop a conclusion based upon the results of this activity.

Problem

What foods are best suited for spaceflight and what makes foods suitable for spaceflight?

Observation

As astronauts travel into space, they need energy and proper nutrition to keep them going. Astronauts have to take their food with them when they go into space. Preparation varies with the food type. Some foods can be eaten in their natural form, such as fruit. Other foods require adding water to rehydrate them, such as macaroni and cheese or spaghetti. There are no refrigerators in space, so space food must be specially prepared and preserved to avoid spoilage, especially on longer missions.

One of the favorite foods of the astronauts is the tortilla. Tortillas are popular in space for several reasons. First, they are nutritious. Tortillas contain large amounts of carbohydrates that the body needs to function. Second, tortillas are easily stored since they lay flat and they don't take up too much room. Third, tortillas are one of the perfect space foods because they do not produce crumbs.

Crumbly or loose foods can float and contaminate the inside of the International Space Station or space shuttle and become an annoyance or even a hazard to crews and equipment. Tortillas are easier to handle in reduced gravity and they also stay fresh longer than sliced bread. Making a wrap type sandwich with a tortilla requires less handling than when using two slices of bread.

Unlike tortillas found in restaurants, NASA's are mold resistant. The specially formulated tortillas are produced with less water than normal and are packaged in plastic bags filled with nitrogen. The tortillas taken on the ISS have a shelf life of about eighteen months.

In this activity you will select, compare, test and package foods for spaceflight suitability.

Use the first column of this KWL chart to organize your observations about foods for spaceflight.

Brainstorm with your group what you want to know about foods for spaceflight, then list in the second column of this KWL chart.

KNOW	WANT TO KNOW	LEARNED

Hypothesis

Based on your observations, answer the “problem question” with your best guess. (What foods are best suited for spaceflight and what makes foods suitable for spaceflight?) Your hypothesis should be written as a statement.

My hypothesis: _____

Materials

Per student

- a portion size of a variety of foods for testing (brought from home)
- 1 pair of safety glasses

Per group

- assorted packaging materials such as
 - zipper seal bags of all sizes
 - paper bags
 - aluminum foil
 - plastic wrap
 - recyclable storage bags
 - tape
- mailing labels or masking tape
- markers

Safety

Review your classroom and lab safety rules. Put on safety glasses when instructed. Use wafting when observing odor. Tasting is not appropriate in the science lab.

Test Procedure

1. Brainstorm with your teacher and class about the kinds of foods the astronauts take into space. Discuss why foods must be freeze-dried, thermostabilized, or dehydrated.
2. Place the portioned foods that your group brought from home in one location for discussion. Observe these foods with your group. Discuss with your group why you brought the foods you did.

3. As a group, set up a list of properties that would make your food suitable for spaceflight. You will look for these properties during testing. Record these properties on the Food for Spaceflight Data Sheet.
4. What types of tests would qualify the foods for spaceflight? As a group, create tests for the foods you brought from home. These tests will discover if the food shows properties that would make them suitable for spaceflight.
5. Record your tests on the Food for Spaceflight data sheet in the student section.
6. Put on your safety glasses. Remember smelling rules in the science lab and do not taste.
7. Test each food using the suitability tests you formulated.
8. Collect and record data on the Food for Spaceflight Data Sheet.
9. Based on your test and the posted criteria, decide if each food is suitable for spaceflight and check “yes” or “no” on the Food for Spaceflight Data Sheet.
10. Gather all food items that are suitable for spaceflight together. Set all other food items aside.
11. Discuss the packaging materials you have to use and determine which packaging material would be best for each food.
12. Package the foods with the food packaging material. Label each food item with mailing labels or tape and a marker.
13. Record the materials used for packaging each food on the Food for Spaceflight Data Sheet.
14. After conducting all tests, packaging and labeling, study the data and draw conclusions by answering the questions following the Food for Spaceflight Data Sheet.

Record Data

Food for Spaceflight Data Sheet

Type of food	Property to test	Test applied to food	Results of test	Suited for spaceflight?	Food packaging material used
				<input type="checkbox"/> Yes <input type="checkbox"/> No	
				<input type="checkbox"/> Yes <input type="checkbox"/> No	
				<input type="checkbox"/> Yes <input type="checkbox"/> No	
				<input type="checkbox"/> Yes <input type="checkbox"/> No	
				<input type="checkbox"/> Yes <input type="checkbox"/> No	
				<input type="checkbox"/> Yes <input type="checkbox"/> No	

Study Data

1. What did your testing prove?
2. What are common properties for the foods that you decided could be eaten in space?
3. What packaging material was used the most often? Why?
4. Does this data support your hypothesis? Why or why not?
5. How do your results compare to class results?

Conclusion

- Update the LEARNED column in your KWL chart.
- Restate your hypothesis and explain what happened during testing.