Activity 1: Food Preparation for Space

Objective

The students will measure the proper amounts and mix ingredients of rehydratable foods and drinks.

Science Standards

- **Science as Inquiry:** Abilities necessary to do scientific inquiry
- **Life Science:** Matter, energy, and organization in living systems
- **Science in Personal and Social Perspectives:** Personal health

Mathematics Standard

- **Computation**
- **Measurement**

Helpful Hints

Have students work in groups of four. For younger elementary students, the ingredients can be premeasured or the amounts can already be determined.

Nonfat dry milk does not have the thickness of whole milk, which is usually used for instant pudding. Suggest to students that they add water in increments, mix, and repeat this process until the desired consistency is achieved. (This may mean that as little as half of the suggested amount of water is needed.)

Materials Needed Per Group

1 package instant pudding mix
1 package instant drink crystals
Sugar
Artificial sweetener
Nonfat dry milk
Water
Straws
Plastic spoons
Plastic zip-locking sandwich bags

Background

Travelers have known for a long time that condensing food will make their journey easier. It is no different in the space program. Hikers use rehydratable foods so they do not have to carry very much weight with them. This makes it easier to travel. All weight going into space raises the fuel consumption at liftoff. It is important to eliminate as much weight as possible. Because the fuel cells on the Space Shuttle produce water as a byproduct, water is easily attainable. Therefore, taking foods along that can be rehydrated with this water make sense because this reduces the amount of weight on liftoff. The rehydrated foods also take up much less space, and space is a valuable commodity onboard the Space Shuttle.

Procedure for Rehydratable Food

Read the recipe label on the instant pudding. Calculate the amount of dry mix ingredients necessary for a single serving (weight ÷ number in group). The recipe for instant pudding calls for lowfat milk. Record the amount necessary for a single serving. Read the recipe label on the nonfat dry milk package, and calculate the amount necessary for a single serving of instant pudding (amount ÷ number in group). Measure the dry instant pudding ingredient and the proper amount of nonfat dry milk, and place both into a zip-locking bag. Shake and stir the dry ingredients until thoroughly mixed. Pour the correct amount of water necessary to dissolve the mixture. Close the zip-locking bag, and knead the package in your hands until thoroughly mixed.

Procedure for Rehydratable Beverage

Read the recipe label on the instant drink package. Calculate the amount of dry mix ingredients necessary for a single serving (amount ÷ number of single servings). Measure the dry ingredient, and place into a zip-locking sandwich bag. Calculate the amount of water necessary for a single serving (amount ÷ number of single servings). Measure the amount of water, and pour into the zip-locking bag. Close the zip-locking bag, and knead the package with your hands until thoroughly mixed. Calculate the amount of sugar or artificial sweetener for an individual serving and add.

Dliscussion

1. What changes did you observe?
2. Would the temperature of the water make a difference?
3. Why did you use a zip-locking bag as opposed to a bowl?
4. How would being in space affect the way you eat and prepare food?

Extensions

1. Have the students work together in groups to calculate the amount of dry and liquid ingredients to make equal servings for the group.
2. Are the steps listed on the package the only possible way for proper preparation? Have the students develop an alternative way of mixing dry and liquid amounts. Compare the results with the method given on the box label.
3. The recipe suggests chilling before serving. How can you eliminate refrigeration and still be able to serve it cold?
4. Use discussion questions for journal-writing topics.
5. Design a space food packaging label. Prepare a package label to include the following information: item name, manufactured date, instructions for preparing the item in space (if needed), a bar code for computerized inventory or conducting nutritional studies, and an expiration date. Labels include colored dots for crew member identification purposes:

Color Dot Standards Table

Red	Commander
Yellow	Pilot
Blue	Mission Specialist 1
Green	Mission Specialist 2
Orange	Mission Specialist 3
Purple	Mission Specialist 4 or Payload Specialist 1
Brown	Mission Specialist 5 or Payload Specialist 1

Labels also include the amount of water to rehydrate foods and the time and temperature needed to make it the best possible meal.

Lastly, place a Velcro dot on the package for attachment in microgravity. The Velcro "hooks" should be on the opposite side of the food package label.

Assessment

Have the students write procedures to make a rehydratable food and drink.

Food for Thought!

Pure orange juice or whole milk cannot be dehydrated. Orange drink crystals, when rehydrated, just make orange "rocks" in water. There is a freeze-dried orange juice, but it is difficult to rehydrate. Still, some astronauts request it. Whole milk does not dissolve properly. It floats around in lumps and has a disagreeable taste. Nonfat dry milk must be used in space packaging. During the 1960's, General Foods developed a synthetic orange-flavored juice called Tang, which can be used in place of orange juice. Today, this product is available in several different flavors.