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Food Mysteries – Case 2: Fruitful Evidence

Michigan State University Cooperative Extension Service

4-H Club Bulletin

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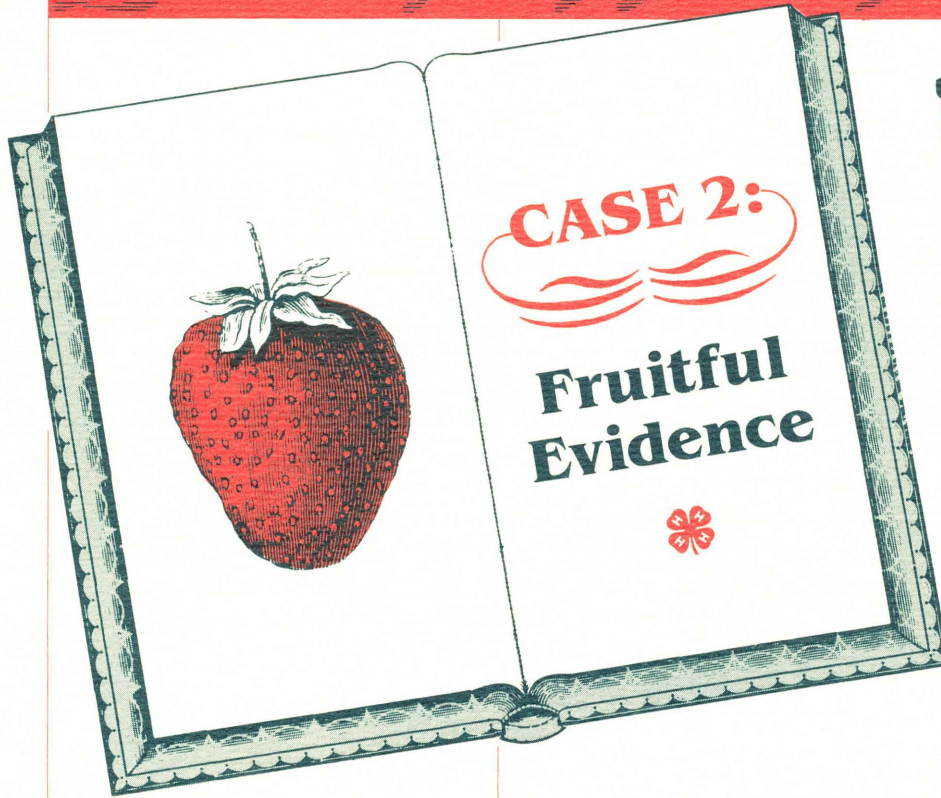
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# Food Mysteries



## BE A DETECTIVE! Solve the Mystery Message

Throughout this book, you will find several underlined words printed in red. Collect these words and place them in the space provided on page 6. Unscramble the words to solve the mystery message about fruits.

**F**ruits are great tasting, colorful and packed with vitamins. Because fruits can be transported to all parts of the United States, you can have a fresh supply of many kinds of fruit all year. The chart on this page shows states that are the largest commercial producers of some fruits. What fruits grow well in your state?

Fruits are an important part of our daily diet. They add color, flavor, texture and sweetness. They also provide many nutrients as well as fiber. Citrus fruits (such as oranges, lemons and

grapefruit), cantaloupes and strawberries are excellent sources of vitamin C. Kiwifruit and papaya, two tropical fruits

that are available at many supermarkets, are also good sources of vitamin C. Deep-  
(continued on next page)

### Fruit

- Apples
- Blueberries
- Cantaloupes
- Tart cherries
- Cranberries
- Grapefruit
- Grapes
- Oranges
- Peaches
- Pears
- Pineapples
- Strawberries

### States Where Fruit Is Grown

- Washington, New York, Michigan, Pennsylvania
- Michigan, New Jersey
- Texas, Arizona
- Michigan, New York, Wisconsin, Utah
- Massachusetts, Wisconsin, Washington, New Jersey
- Florida, California, Texas, Arizona
- California, New York, Washington, Michigan
- Florida, California, Texas, Arizona
- California, South Carolina, Georgia, Pennsylvania
- California, Washington, Oregon
- Hawaii
- California, Oregon, Washington, New York, Michigan



yellow fruits, such as apricots, cantaloupes and mangoes, are high in vitamin A. These and other fruits also provide nutrients such as folic acid, potassium and magnesium.

### Do You Want To Know More?

The **Fruit Juicy!** experiment (page 5) will help you discover how you can change the color of fruits.

#### Unscramble these fruits that are good sources of vitamin C.

EROGAN = \_\_\_\_\_

TGRPIUAEFR = \_\_\_\_\_

UANCTPEALO = \_\_\_\_\_

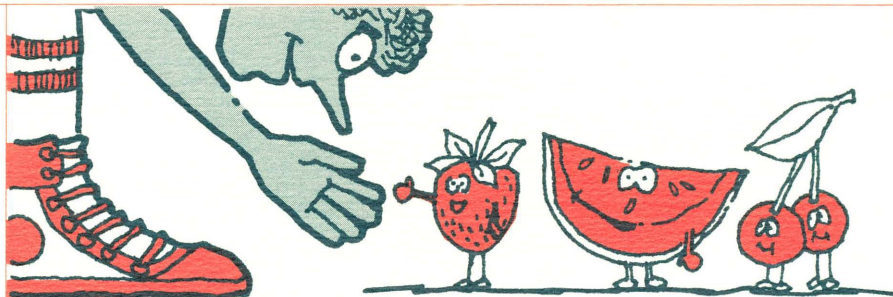
RRBESWTRYA = \_\_\_\_\_

Turn to page 8 for the answers.



### Did You Know?

Another name for vitamin C is ascorbic acid. Vitamin C is used by the body for healthy gums and to help you fight off infectious diseases. When you have a cut or wound, vitamin C is needed to help heal the body. Vitamin C, which is found in ingredients such as lemon juice, is also useful in food preparation. The **O<sub>2</sub> Secrets** experiment on page 4 will help show you how vitamin C can be useful when preparing foods.



## Getting to Know Sugars!

Fruits have almost no fat or protein, but they all contain sugar, which is a carbohydrate. Carbohydrates are needed to supply the body with energy.

There are six common sugars found in **food**: glucose, fructose, galactose, sucrose, lactose and maltose. The first three sugars — glucose, fructose and galactose — are called simple sugars or monosaccharides.

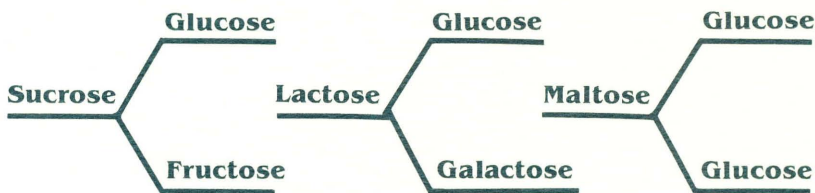
#### Monosaccharide = mono (one) + saccharide (sugar)

Glucose is found in fruits, honey and some vegetables. Fructose is also found in fruits and honey, and it appears in many vegetables. Galactose is seldom found in nature. Galactose is part of the disaccharide lactose. There is more information on that below.

In foods, the monosaccharides are often combined to form the disaccharides — sucrose, lactose and maltose. Sucrose is found in white and brown sugars as well as in some fruits. Lactose is found in milk, while maltose (malt sugar) appears in some plants.

#### Disaccharide = di (two) + saccharide (sugar)

Disaccharides break down in the body to form monosaccharides. This action allows the body to use the sugar for energy. The following breakdowns take place:



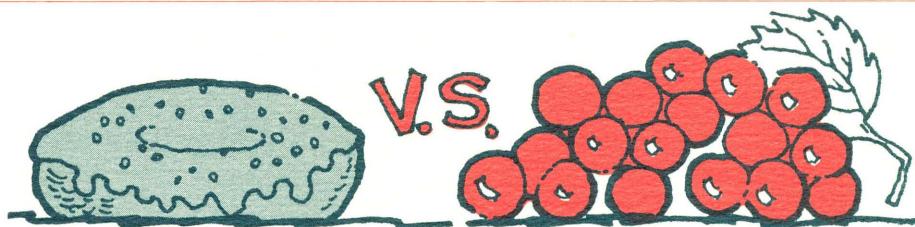
See if **you** can fill in the blanks:

- Maltose is made of \_\_\_\_\_ and \_\_\_\_\_.
- Sucrose is made of \_\_\_\_\_ and \_\_\_\_\_.
- If you combine glucose and galactose, you have the sugar \_\_\_\_\_.
- The monosaccharide \_\_\_\_\_ is found in all disaccharides.

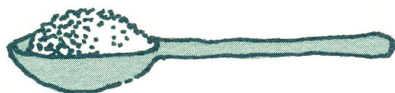
Turn to page 8 for the answers.



# Eat Right – The Choice Is Yours!



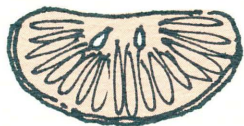
The **Dietary Guidelines for Americans** is information written by nutrition and health experts and published by the government. The guidelines suggest that people should avoid too much sugar. Choose your sources of sugar carefully. Some of the same monosaccharides and disaccharides are found in table sugar, honey and fruit, but fruit is better for you to **eat**. Look at the following pictures. Can you see why fruit is a better source of sugar for you than table sugar or honey?



**1 teaspoon of sugar = 15 calories**



**1 teaspoon of honey = 22 calories**



**1 slice of fruit (section of orange) = 7 calories + fiber + vitamins + minerals + water**

The **Dietary Guidelines for Americans** also suggests that people eat a variety of foods. No one food can give your body all the nutrients it needs in the right amounts. It's important to choose foods every **day** from each of the major food types:

- Fruits
- Vegetables

- Grains
- Dairy products
- Meats, fish, poultry, eggs, and dried beans and peas

It is also important to vary your food choices **within** each food type. For example, you could select a variety of fruits and juices. Make a list in the next column of the fruits and fruit juices that you have eaten or drank in the past three days.

Remember that fruits can be purchased in many different forms. Put "F" next to the fruits or juices on your list that were

eaten fresh, "C" next to the canned fruits or juices, "FF" next to the frozen fruits or juices and "DF" next to the dried fruits.

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## CAUTION – BE SCIENCE WISE!

Before you begin any science experiment, you should always follow these basic rules:

1. Be sure to read **all** directions before starting the experiments.
2. In many experiments, a "control" is used. The control is the standard against which you compare the experimental food.
3. When doing the experiments, keep everything the same as the control except for the one thing the directions say to change. Use the same size pans, the same type of bowls and the same mixing speeds. Be sure that just **one** thing changes each time.
4. Be sure to label each food when conducting these experiments. Use a piece of masking tape, a marking pencil, a crayon or anything that will help you remember which food is which. In some experiments, you'll have no trouble telling the foods apart. In others, the foods may look the same.
5. The experimental food is not meant to be perfect. Since you are purposely doing something wrong, you can't expect it to be perfect! So it's all right when something turns out "bad." That's what is **supposed** to happen.
6. Not all experiments in food science yield products that can be eaten. **Never sample products in an experiment unless your leader says they are safe to eat.**
7. Records are an important part of any scientific project. You should write down what happens in each experiment. Experiments may not turn out exactly the same every time. Recording your results will help you and others who may try to repeat your experiment.



## EXPERIMENT 1

# O<sub>2</sub> Secrets

Have you ever noticed how apples turn brown after they have been cut and left on the counter awhile? Light-colored fresh fruits and vegetables darken when exposed to air. This browning is called **oxidation**. It is caused by a reaction between the oxygen (O<sub>2</sub>) in the air and certain substances in the raw fruit or vegetable. This experiment will help you discover the secret to stopping the browning reaction.



### INGREDIENTS

- 1 banana
- 1 apple (not the Jonathan variety)
- 1 potato
- 1 tablespoon sugar
- 2 tablespoons lemon juice
- 2 tablespoons water

### EQUIPMENT

- 4 paper plates
- marker
- paring knife
- cutting board

### PROCEDURE

1. Use the marker to label one paper plate "sugar," one "lemon juice," one "water" and one "plain."
2. Slice the banana, apple and potato so that you have eight evenly sliced pieces of each.
3. Place two slices of banana, apple and potato on each of the four paper plates.
4. Sprinkle the slices on the corresponding plate with the sugar, lemon juice and water. Leave one plate of slices plain. Let the foods stand uncovered at room temperature.
5. Observe the color of the fruit and vegetable slices after 15 minutes, 30 minutes and 1 hour. Record the differences in color on the following table.
6. The banana, apple and potato slices left plain were your controls. The addition of sugar, lemon juice and water were the treatments you experimented with to see their effect on browning. See if you can answer these questions based on what you observed.

	15 min.	30 min.	1 hour
Banana with sugar			
Apple with sugar			
Potato with sugar			
Banana with lemon juice			
Apple with lemon juice			
Potato with lemon juice			
Banana with water			
Apple with water			
Potato with water			
Banana - plain			
Apple - plain			
Potato - plain			

- What happened to the controls after 1 hour?
- Which treatment had the greatest effect in stopping browning after 1 hour?
- Lemon juice contains vitamin C (ascorbic acid) which you probably observed is very effective in stopping browning. Other juices high in vitamin C would have the same effect. If you are going to make a fruit salad with apples, peaches and bananas, what could you add to the fruit salad besides lemon juice to prevent browning?
- Since you may not want to add lemon juice to peeled potatoes, how can you keep them from browning?

Turn to page 8 for an explanation of **O<sub>2</sub> Secrets**.



## EXPERIMENT 2

# Fruit Juicy!

Fruits and vegetables contain pigments that give us the rainbow of possible colors in these foods. Because of these colors, fruits and vegetables add a lot of interest to our meals. Can you imagine what meals would be like if we ate only white foods at every meal?

The pigments called anthocyanins (an-tho-SY-a-nins) give several foods their red, blue or purple color. The anthocyanins change color depending on whether they are in contact with an acid or a base. Try this experiment to see how you can change the color of fruits!



### INGREDIENTS

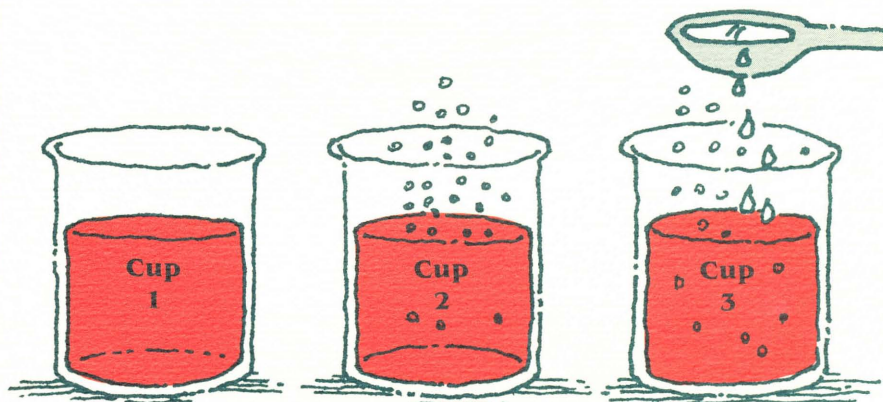
- 3/4 cup cranberry juice
- 1/2 teaspoon baking soda
- 1 tablespoon lemon juice

### EQUIPMENT

- 3 custard cups or clear glasses
- measuring cup - liquid
- measuring spoons
- sheet of white paper
- masking tape
- marker
- spoon for stirring

### PROCEDURE

1. Place the custard cups or clear glasses on the white paper. Label each cup or the paper with the masking tape and marker like this:



Cranberry juice

Cranberry juice  
+  
baking soda

Cranberry juice  
+  
baking soda  
+  
lemon juice

## About Acids and Bases...

Many foods we eat contain acid which gives them a sour taste. Lemon juice and vinegar are examples of acids we eat. We also eat certain bases, although they are not as common as acids. Baking soda, for example, is a base when it is dissolved in water.

When you add a base, such as baking soda, to an acid food, the food will become less acid and more of a base. In some foods, this will cause the color of the food to change.

2. Add 1/4 cup cranberry juice to each cup.

3. Add 1/4 teaspoon baking soda to cups 2 and 3. Stir.

4. Record what you see:

Cranberry juice = \_\_\_\_\_ color

Cranberry juice + baking soda = \_\_\_\_\_ color

5. Now add 1 tablespoon lemon juice to cup 3. Record what you see:

Cranberry juice + baking soda + lemon juice = \_\_\_\_\_ color

6. See if you can answer these questions based on what you observed:

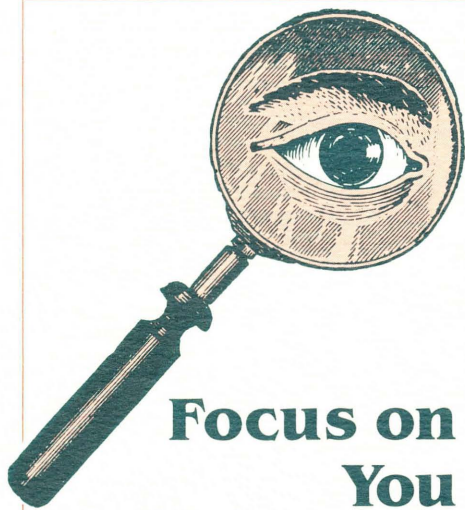
- Which cup represents your "control"? (Remember, a control is the standard against which you compare the experiment.)

- Cranberry juice is an acid solution that contains anthocyanin pigments. What does the solution become when baking soda is added to the juice? What color change did you see when the baking soda was added?

- What did the baking soda/juice solution change to when the lemon juice was added? What color change did you observe when the lemon juice was added?

Turn to page 8 for an explanation of **Fruit Juicy!**





## Focus on You

**Q.** Is it bad for me to have snacks in addition to my meals?

**A.** Yes and no. If you choose your snacks wisely, snacking can be good for you! Fruits, cheeses and raw vegetables are examples of nutritious snacks. Try a glass of fruit juice instead of a soda pop. Or reach for a crisp apple instead of a candy bar. Your age and the amount of exercise you do each day will help determine the amount of calories you should get from snacks.

If you eat foods for your snack that are loaded with sugar, salt or fat, and low in protein, vitamins and minerals, then snacking can be bad for you. Plan your snack foods. If you are hungry, you may be tempted to grab the first munchies in sight. The trick is to have a variety of the right snack foods handy. Fresh fruits and fruit juices are always a good choice! Other foods **high** in nutrients (such as vegetables, breads and cereals, milk, yogurt, peanut butter, meats, beans and cheese) make great snacks.

## The Honey Myth

Honey is often mistakenly thought to be a nutritious food that is much better for you than white sugar. What are the facts?

**FACT:** Honey is made by bees, while table sugars are made from sugar cane or sugar beets. Honey contains the same two sugars found in table sugar: fructose and glucose.

**FACT:** Honey does contain a few minerals, but you would need to eat a lot of honey each day to get very much of the minerals. For example, in order to meet your **need** for calcium, you would have to eat over 50 pounds of honey every day! To meet your need for iron, you would need to eat 8 pounds of honey daily. While honey does add a unique flavor to foods, it doesn't add many nutrients.



List the underlined words you found throughout this book printed in red:

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Unscramble them to solve the mystery sentence:

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Turn to page 8 to see if you correctly solved the Mystery Message.



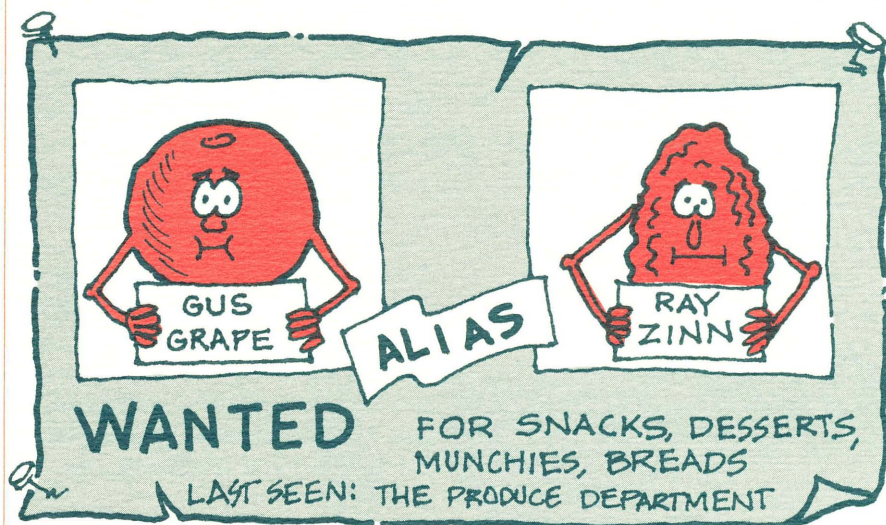


## Name Change Puzzle

Some fruits change their name once they are dried. A dried grape is called a \_\_\_\_\_.

A dried plum is called a \_\_\_\_\_.

Dried apricots, apples, pineapples and bananas are also available at many grocery stores.

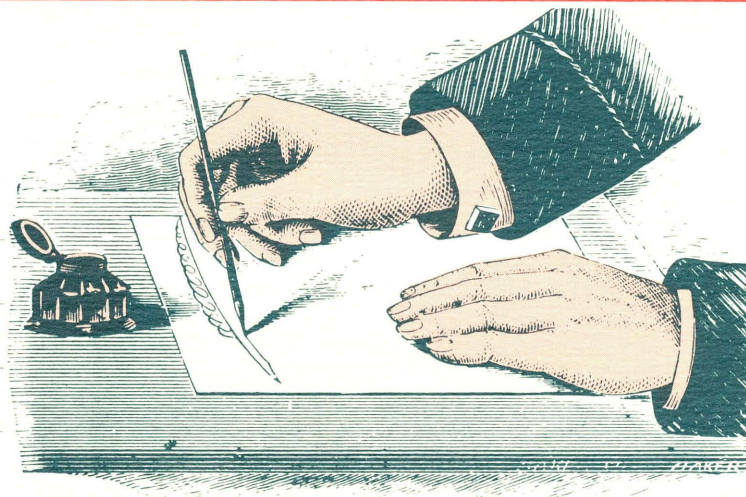


## Record What You Learned:

Name \_\_\_\_\_

Age \_\_\_\_\_

Address \_\_\_\_\_



Experiments I tried:

Ideas I learned from the experiments:

Things I learned about nutrition:

Other food and nutrition activities I'd like to try:



# How Did You Do?

The following are answers to the puzzles and explanations for the experiments found in this book:

## Unscramble the Fruits (page 2)

EROGAN = ORANGE

TGRPIUAEFR = GRAPEFRUIT

UANCTPEALO = CANTALOUPE

RRBESWTRYA = STRAWBERRY

## Sugar Questions (page 2)

1. Maltose is made of **glucose** and **glucose**.
2. Sucrose is made of **glucose** and **fructose**.
3. If you combine glucose and galactose, you have the sugar **lactose**.
4. The monosaccharide **glucose** is found in all disaccharides.

## Explanation: O<sub>2</sub> Secrets (page 4)

There are several ways to keep light-colored fruits and vegetables from turning brown. Ascorbic acid (vitamin C) works very well to prevent browning by interfering with the chemical reaction. Lemon juice is high in vitamin C. Sugar and water can also stop the browning reaction, but they are not as effective as ascorbic acid.

## Explanation: Fruit Juicy! (page 5)

Why did the juice change colors? Cranberry juice is an acid that contains the anthocyanin pigment. In acid, this pigment is red. When baking soda was

added to the cranberry juice, the juice became less acid and more like a base. Anthocyanin pigments turn blue in a base. When the color is blue, you can reverse it by adding an acid such as lemon juice. This action makes the cranberry juice acid again and the color changes back toward red.

You probably also observed fizzing when the baking soda was added to the cranberry juice. The fizz is from bubbles of carbon dioxide gas. The gas is formed when an acid (cranberry juice) is mixed with a base (baking soda).

## Name Change Puzzle (page 7)

- A dried grape is called a **raisin**.
- A dried plum is called a **prune**.

## Mystery Message (page 6)

You need to eat a food high in vitamin C every day.



This publication was written by Stella H. Cash, R.D., Specialist, Department of Food Science and Human Nutrition, Michigan State University, and Patricia A. Hammerschmidt, Extension Associate, Food and Nutrition, 4-H Youth Programs, Michigan State University. Assistance was provided by Ruth L. Eggert, Program Leader, 4-H Youth Programs, Michigan State University. This publication was designed by Marian Reiter, 4-H Graphic Artist, and edited by Janet R. Olsen, 4-H Publications Editor.

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