

## **MSU Extension Publication Archive**

Archive copy of publication, do not use for current recommendations. Up-to-date information about many topics can be obtained from your local Extension office.

Food Mysteries – Case 1: Telltale Grains

Michigan State University Cooperative Extension Service

4-H Club Bulletin

Stella Cash, Foods Science and Human Nutrition; Patricia A. Hammerschmidt, 4H Food program; Ruth L. Eggert, Program Leader

Issued July, 1987

8 pages

The PDF file was provided courtesy of the Michigan State University Library

**Scroll down to view the publication.**

# Food Mysteries



## BE A DETECTIVE! Solve the Mystery Message

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

**D**id you have toast, a bagel or a favorite cereal for breakfast this morning? Or perhaps pizza, spaghetti or tacos for lunch or dinner? These foods all have something in common. They are made from plants called **grains**.

The most important grains that people use are wheat, corn (also called maize), rice, oats, rye and barley. When grain plants grow, they produce a stalk and seeds. When the plants are harvested, the seeds are saved for use by people. The stalks can be used for animal feed and bedding.

The seeds from grain plants are milled, which means they are processed so that people can use them. For example, most flour is made from milled wheat, and corn is ground into corn meal.

### Do You Want To Know More?

**The Secret of the Rising Bread** experiment (page 4) will help you discover the key to what makes bread rise.

Flour and other milled grains are used in foods like bread, spaghetti and breakfast cereals.

List some of your favorite foods made from grains:

---



---



---



---

Try to unscramble the letters to name these grains:

REY = \_\_\_\_\_      ROCN = \_\_\_\_\_  
 YBAELR = \_\_\_\_\_      CERI = \_\_\_\_\_  
 AOST = \_\_\_\_\_      THWEA = \_\_\_\_\_

Turn to page 8 for the answers.



## Discover Nutrition!

You need at least four servings of grain foods in your diet every day. Because it is important to have a variety of foods in your diet to keep you glowing and growing, you should eat different kinds of grain foods. There are many choices — oatmeal, grits, cereals, and all types of bread and pasta such as spaghetti and macaroni.

Grain foods, fruits, vegetables and legumes are foods that are high in carbohydrates. (Legumes are the seeds from plants such as peas, kidney beans, lima beans and lentils.) Carbohydrates are used to supply the body with **energy**. Sugars, starches and fiber are all forms of carbohydrates. Grain foods contain a lot of starch and are a good low-cost source of energy.

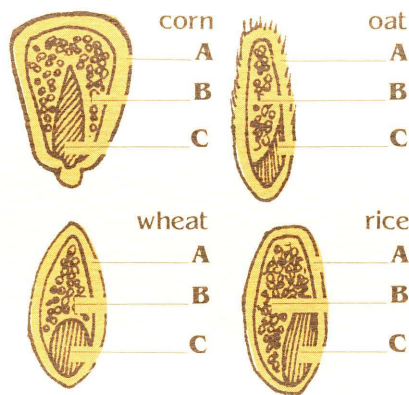
### Do You Want To Know More?

The **Searching for Starch** experiment (page 5) will help you discover which foods contain a lot of starch.

Whole grain foods are also a good source of fiber. Fiber is important for good health because it adds bulk to your diet. This bulk speeds up the passage of food through the digestive tract. The **Dietary Guidelines for Americans** is information written by nutrition and health experts and published by the

government. The guidelines suggest that people should eat foods that are good sources of starch and fiber, such as grains, fruits and vegetables.

Do you know what happens to the whole grains during milling? Look at the pictures below, and you will see that each corn, oat, wheat and rice grain has three parts. **Bran** is the outer protective layer. The bran contains fiber, B vitamins and minerals. The **endosperm**, which is the largest part of the grain, contains starch and protein. The **germ** is the smallest part of the grain. The germ contains fat, protein, B vitamins, vitamin E and minerals.



**Name the parts of these grains:**

A = \_\_\_\_\_

B = \_\_\_\_\_

C = \_\_\_\_\_

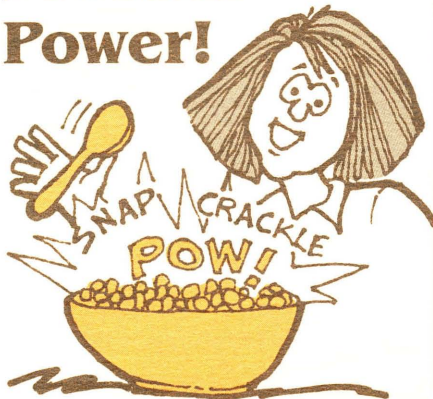
When milled grain products like white bread, macaroni and rice are made, the bran and germ are removed. This means that the nutrients contained in the bran and germ are also removed. Because of this, these grain products are often **enriched** with some of the nutrients lost during milling.

Federal law requires that breads and cereals labeled as enriched have iron and the B vitamins thiamin, niacin and riboflavin added back to at least the level of whole wheat. It is important to eat whole grain or enriched cereals and whole grain or enriched breads because of the nutrients they contain.

A **fortified** food is one that contains either nutrients not normally found in the food or nutrients in amounts much larger than are normally found in the food. The nutrients have been added to the food during processing. Many types of foods may be fortified. For example, ready-to-eat cereals sometimes have nutrients added. Milk is usually fortified with vitamin D.

The B vitamins thiamin, riboflavin and niacin help people use energy from food. They also help develop the brain and nerves and **give** people normal appetites, good digestion and healthy skin.

# Grain Has Protein Power!



Grain foods are also a source of protein. Protein helps bodies grow, repairs cells and helps form substances to fight infection. Protein is made of 22 different chemical compounds called amino acids. Eight of the 22 amino acids cannot be made in your body and must come from the foods you eat. These eight are known as **essential amino acids**.



## Be Calorie Wise

Many grain foods are filling and not too high in calories, but lots of toppings can pile up the calories! Toast is one example:

- Toast = 60 calories
- Toast + 1 teaspoon butter = 94 calories
- Toast + 1 teaspoon butter + 1 tablespoon jelly = 143 calories

As you grow, you need to think about your body height and size and how active you are to know how many "add-on" calories you can consume to stay healthy and physically fit. If you don't pile on added spreads and toppings, grain foods are a great value for the calories.

The protein in grain foods is missing or low in some of the eight essential amino acids. Because of this, grain protein is called **incomplete**. Other plant foods such as legumes, sunflower seeds and peanuts are also incomplete protein foods. If you eat certain incomplete protein foods together at the same meal (such as legumes and grains), you can end up with the combination of amino acids your

body needs. Meals like baked beans and corn bread, or refried beans in a taco shell are examples of the right combinations.

You can also eat an incomplete protein food with an animal source of protein (such as milk, cheese, meat or eggs) to get the right combination for your body. Cereal with milk or macaroni with cheese are possible combinations.

### Following is a simple formula for good eating:

Another incomplete protein food

Grain food + \_\_\_\_\_ or \_\_\_\_\_ = Good nutrition!

A complete protein

For example:

- Taco shell + Refried beans = Good nutrition!
- Macaroni + Cheese = Good nutrition!

Name other nutritious food combinations using different grain foods:

- \_\_\_\_\_ + \_\_\_\_\_ = Good nutrition!
- \_\_\_\_\_ + \_\_\_\_\_ = Good nutrition!
- \_\_\_\_\_ + \_\_\_\_\_ = Good nutrition!

## CAUTION — BE SCIENCE WISE!

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

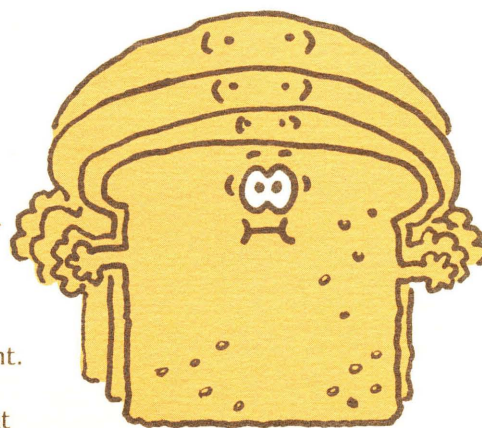
1. Be sure to read **all** directions before starting the experiments.
2. In many experiments, a "control" is used. The control is the standard against which you compare the experimental food.
3. When doing the experiments, keep everything the same as the control except for the one thing the directions 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

# The Secret of the Rising Bread

Flour made from wheat or rye is used to make bread. Did you ever wonder how a lump of bread dough made from flour and other ingredients ends up as a light and delicious loaf of bread? What makes bread rise?

Besides flour, some kinds of bread also have yeast as an ingredient. Yeast is a living plant! Under the right conditions, yeast may use sugars as food, and carbon dioxide gas is produced as a result. What does that have to do with bread rising? Try this experiment to solve a food science mystery!



### INGREDIENTS

- 3 packages active dry yeast (not the rapid rising type)
- 3/4 teaspoon sugar
- 1 cup ice water
- 1 cup warm water (110 to 115° F)
- 1 cup boiling water

### EQUIPMENT

- 3 empty soft drink bottles (16 oz. each), rinsed
- 3 deflated balloons, same size
- funnel
- masking tape
- marker
- measuring cup - liquid
- measuring spoons
- clock

### PROCEDURE

1. Using masking tape and a marker, label each bottle with the temperature of the water to be used (ice, warm, boiling).
2. Use the funnel to empty the contents of one package of dry yeast and 1/4 teaspoon sugar into each bottle.
3. Add the water to match the temperature on the label. Have the boiling water ready before starting to add water to any of the bottles. Be careful when adding the boiling water.
4. Immediately put a balloon over the top of each bottle. Swirl or shake each bottle **gently**. Be careful not to spill the boiling water since it could burn you.
5. Look at the clock and write down the time when step 4 was completed. \_\_\_\_\_
6. Let the bottles stand undisturbed at room temperature. Get ready to observe any differences in the sizes of the balloons. Record what you see by listing the changes in the sizes of the balloons at different times. Do they get large or stay small?

Time	5 min.	15 min.	30 min.	45 min.
Ice water and yeast				
Warm water and yeast				
Boiling water and yeast				

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

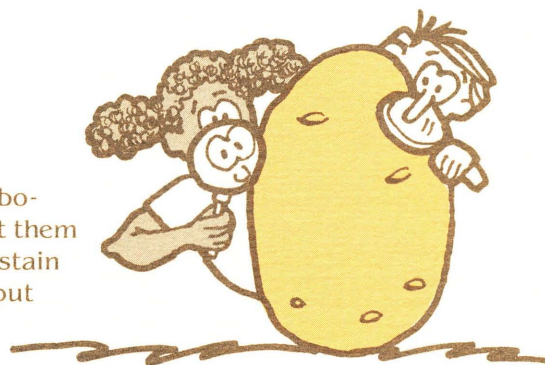
- What caused the balloon to inflate?
- Did the amount of gas produced vary with the different water temperatures? If yes, which water temperature produced the most gas? Why do you think this happened?
- Did the amount of gas produced vary with the amount of time? If yes, why do you think this happened?
- What did you discover from this experiment that will help you when making yeast breads?

Turn to page 8 for an explanation of **The Secret of the Rising Bread**.

## EXPERIMENT 2

# Searching for Starch

Many different foods (including **grain** foods) contain the carbohydrate called starch. To see if foods have starch, you can test them by using iodine. Be very careful in handling the iodine. It can stain clothing, equipment and skin, and **it is poisonous. Do not** put iodine in your mouth and **do not** eat any tested foods.



### INGREDIENTS

- 1 tablespoon milk
- 1 egg
- 1/2 slice bread
- 1 slice raw potato
- 1 tablespoon flour, cornstarch or dry tapioca
- 1 slice cucumber
- 1 teaspoon sugar
- 1 slice unripe (green) banana

### EQUIPMENT

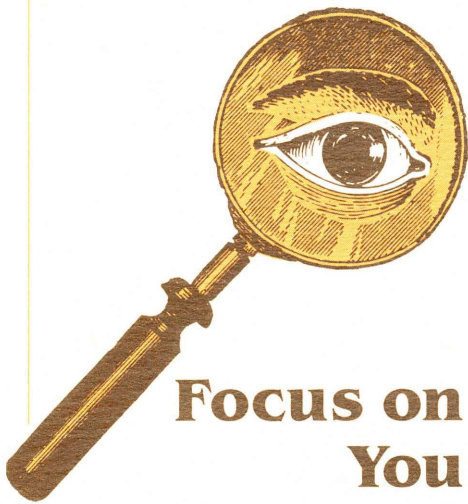
- newspapers
- cutting board
- knife
- measuring spoons
- iodine (*not decolorized iodine*)
- medicine dropper
- 3 paper plates
- 2 disposable plastic cups

### PROCEDURE

1. Place several layers of newspaper on a table. Be sure to do this experiment on the newspapers since iodine will stain a table.
2. Place the milk in one cup and the egg in the other cup. Put the other foods to be tested on paper plates. (You can put more than one food on a plate.) Remember to put the plates on the newspaper.
3. With the medicine dropper, put a few drops of iodine on each food to be tested. If starch is present, the iodine will change from reddish-brown to bluish-black. **Remember, don't taste any of the foods tested!**
4. Record what you find as you test each food.

Food	Color	Is starch present?	
		Yes	No
Milk			
Egg			
Bread			
Potato			
Flour, cornstarch or tapioca			
Cucumber			
Sugar			
Banana (green)			

5. Put the iodine away and wash your hands when you are finished.
  6. See if you can answer these questions based on what you observed:
    - What types of foods are high in starch?
    - The banana you tested was an unripe one. How do you think a ripe banana would react with iodine? Why?
- Turn to page 8 for an explanation of **Searching for Starch**.



## Focus on You

**Q.** I've heard that carbohydrate foods like potatoes and bread are more fattening than other foods. Is this true?

**A.** No. Carbohydrates are a good source of energy for the body. They are not more "fattening" than other foods. Carbohydrates supply calories for energy at the same rate as protein and less than half that of fat. Their fattening reputation probably

comes from the fact that many carbohydrate foods are served with toppings that are high in fat (such as butter on potatoes or bread).



## Mystery Message

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

Unscramble them to solve the mystery sentence:

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



## The Nutrition Challenge

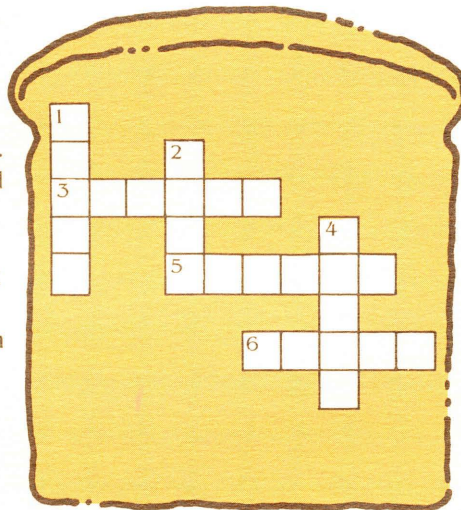
### Across

3. Carbohydrates supply your body with \_\_\_\_\_.
5. A B-vitamin added back to milled grains during enrichment.
6. Used to make sandwiches and toast.

### Down

1. The parts of a grain plant that are processed for use by people.
2. A mineral added back to grain foods during enrichment.
4. A type of carbohydrate in whole grains that adds bulk to the diet.

Turn to page 8 for the answer to the puzzle.



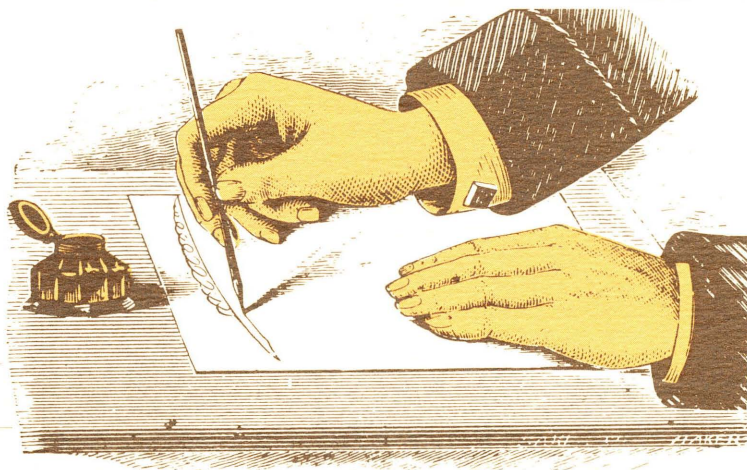
## Try This at Home

Look at the containers of grain products you have at home such as rice, flour, ready-to-eat cereals, macaroni or bread. Check the labels for the words "enriched" or "fortified." What products can you find with these words?

**Enriched** \_\_\_\_\_

**Fortified** \_\_\_\_\_

# 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 Grains

(page 1)

REY = RYE

YBAELR = BARLEY

AOST = OATS

ROCN = CORN

CERI = RICE

THWEA = WHEAT

## Explanation: The Secret of the Rising Bread

(page 4)

Since yeast is a living plant, it is sensitive to temperature. Cold temperatures slow down the production of carbon dioxide gas by the yeast. Warm temperatures

are best for yeast to grow and produce carbon dioxide gas, which makes the balloon get larger. Temperatures that are too hot will kill the yeast, so no carbon dioxide will be produced. When yeast grows and produces carbon dioxide in bread dough, the gas is trapped in the dough and the bread rises. This explains how you end up with a light loaf of bread!

## Explanation: Searching for Starch

(page 5)

Iodine reacts with the starch in foods to produce a bluish-black color. Foods that are high in starch include grain foods and some vegetables such as dried beans and peas (lima beans,

kidney beans, black-eyed peas, garbanzo beans), potatoes, yams and corn. Less ripe fruits, such as the unripe banana, may also contain a fair amount of starch. The amount of starch decreases as the fruit ripens, so a ripe banana will not produce a bluish-black color with iodine.

## Mystery Message

(page 6)

Grain foods give you carbohydrates for energy.

## The Nutrition Challenge

(page 6)

Across: (3) Energy, (5) Niacin,

(6) Bread

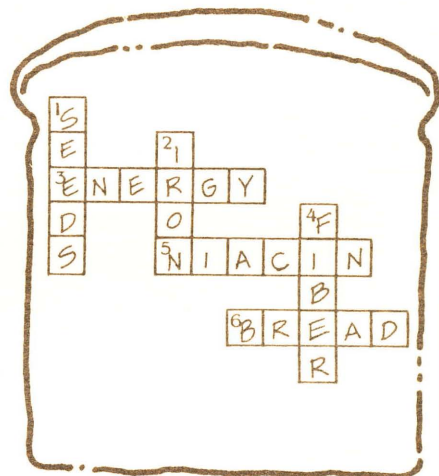
Down: (1) Seeds, (2) Iron,

(4) Fiber



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.

This 4-H educational material was developed and printed through a grant from the Allen Foundation to the Michigan 4-H Foundation. The Allen Foundation, based in Midland, Michigan, provides funding to nutrition education and training programs. The Michigan 4-H Foundation is a public foundation which accepts charitable gifts and grants in support of 4-H youth work.



MSU is an Affirmative Action/Equal Opportunity Institution. Michigan 4-H Youth educational programs and all other Cooperative Extension programs are available to all without regard to race, color, national origin, sex or handicap.

Issued in furtherance of Cooperative Extension work, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. W. J. Moline, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned. This bulletin becomes public property upon publication and may be reprinted verbatim as a separate or within another publication with credit to MSU. Reprinting cannot be used to endorse or advertise a commercial product or company.

IP-5M-7:87-HP-JRO Price 40 cents

