Food Mysteries – Case 4: Protein Puzzlers
Michigan State University Cooperative Extension Service
4-H Club Bulletin
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Food Mysteries

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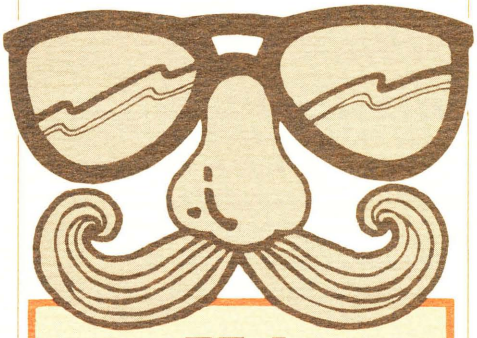


BE A DETECTIVE!

Solve the Mystery Message

Throughout this book, you will find several underlined words printed in orange. Collect these words and place them in the space provided on page 7. Unscramble the words to solve the mystery message about protein foods.

If you were given the job of planning a meal, what food would you consider first? Many people in the United States center their meals around meat, fish or poultry. But there are other nutritious and delicious choices. For example, you could make scrambled eggs or use legumes in a taco. What's that? You say you don't know what legumes are?

Legumes are all kinds of beans and peas such as Great Northern beans, black-eyed peas, chick-peas or garbanzo beans, kidney beans, split peas, lentils, peanuts and soybeans. Some of these are used in baked beans or soup.

Legumes are just one type of the many body-building foods that add variety to your diet. Look at the list below. Check the foods you have eaten. Is there variety in your diet?

MEAT

- ☐ Beef
- ☐ Pork
- ☐ Veal
- ☐ Lamb
- ☐ Rabbit
- ☐ Wild game

POULTRY

- ☐ Chicken
- ☐ Turkey
- ☐ Duck
- ☐ Goose
- ☐ Eggs

FISH

Fish:

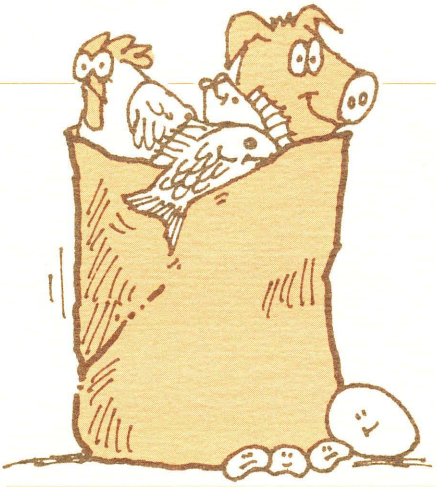
- ☐ Cod
- ☐ Lake trout
- ☐ Catfish
- ☐ Halibut
- ☐ Haddock
- ☐ Salmon
- ☐ Orange roughy

Shellfish:

- ☐ Oysters
- ☐ Scallops
- ☐ Lobster
- ☐ Shrimp
- ☐ Clams
- ☐ Mussels
- ☐ Crab
- ☐ Crayfish

LEGUMES

- ☐ Black-eyed peas
- ☐ Baked beans
- ☐ Garbanzo beans
- ☐ Kidney beans
- ☐ Peanuts
- ☐ Soybeans
- ☐ Split peas
- ☐ Lentils



Shopping Hints

Here are some hints to remember when buying meat, poultry and fish:

1. Look for fresh quality and pleasant food aroma.
2. Watch out for the amount of fat.
3. Consider other protein sources besides meat like beans, eggs, peanut butter and cheese.
4. Don't always buy the same foods when shopping. Variety is important!
5. Look for weekly specials.

What Makes These Foods Good for You?

Meat, fish, poultry, eggs and legumes all contain **protein**. Milk, cheese, yogurt and grains also supply this important nutrient. Protein is needed by all parts of the body for growth and for maintenance of all body cells. Everybody needs protein throughout life to continuously replace cells on the inside and the outside of the body.

When the body is growing, cells must be made constantly. If you are a girl around 15 years old or younger, or a boy around 19 years old or younger, you are growing rapidly. At the end of each day you have more muscle, skin and blood cells in your body than when you began the day. Protein is needed to make these new cells and to maintain or replace old cells.

In addition to protein, meat, poultry, fish, eggs and legumes contain fat, B vitamins and minerals such as iron. All of us need these nutrients to be healthy.

Do You Want To Know More?

The **Baffling Beaters** experiment (page 4) will help you discover another interesting protein fact.

Iron is important because your body uses it to help make substances in your blood which carry oxygen to all cells. Remember, when you are growing, your body is making more cells. When there are more cells, there must be blood to carry more oxygen! This makes iron a very important nutrient during times of rapid growth, such as the teen years. These are some of the foods that give you the iron your body needs:

Meat	Spinach
Poultry	Dried apricots
Eggs	Prunes
Fish	Raisins
	Whole grains
	Molasses

Meats, poultry, fish, eggs, peanuts and soybeans all contain some **fat** which is important in the diet. Fat gives you energy and helps to maintain the health of your skin and hair. It protects your body from extreme temperatures and is essential for the vitamins A, D, E and K. Fat also adds flavor to your foods and gives you a satisfied feeling of fullness.

Then why is there so much concern about eating foods that contain fat?

The problem is that many people eat **too much** fat. Fat is a more concentrated energy source than protein and carbohydrate foods because it contains more calories as shown below:

1 gram fat = 9 calories
1 gram protein = 4 calories
1 gram carbohydrate = 4 calories

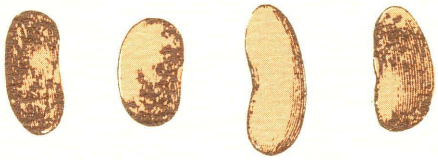
Too much fat can cause the body to become overweight.

Do You Want To Know More?

The **Where's the Fat?** experiment (page 5) will help you learn how to detect the presence of fat in foods.

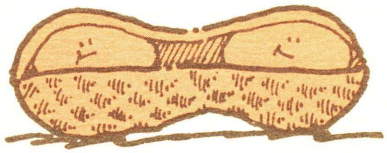
Many serious health problems, such as heart disease and some forms of diabetes and cancer, have been linked to being overweight and eating too much fat. The **Dietary Guidelines for Americans** is information written by nutrition and health experts and published by the government. The guidelines suggest that people should avoid too much fat.

The key to good nutrition is **variety** in the diet. You should have at least two servings of meat, fish, poultry, eggs or legumes each day.



You Can Make Peanut Butter!

Peanuts contain fat. In this activity, you can release the fat in peanuts to make peanut butter. Since you cannot separate the fat easily, the mixture of fat and nuts will produce a nut butter that is good to eat. Peanut butter is a good source of protein, although high in fat.



INGREDIENTS

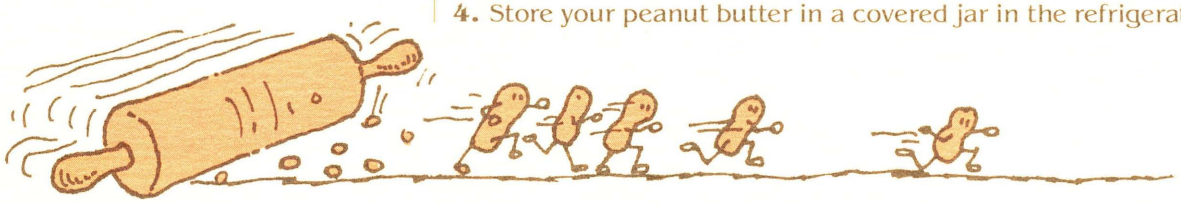
☐ **1/2 to 1 cup shelled peanuts (unsalted)**

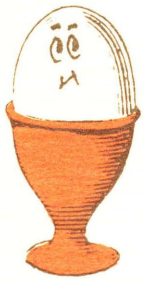
EQUIPMENT

☐ **rolling pin**
☐ **2 plastic bags**
☐ **knife or spoon**
☐ **jar or bowl with cover for storage**

PROCEDURE

1. Put one plastic bag inside the other. Then put the peanuts in the doubled plastic bag and pound with a rolling pin.
2. Roll the rolling pin on the peanuts with as much pressure as possible. (Hydraulic presses are used commercially to extract oil from peanuts.) Shake the bag occasionally so all the peanuts are crushed. The nut particles will begin to cling together as the oil is pressed from the nut meat. The finer the nut meat, the better the butter will be.
3. Turn the bag inside out and remove the peanut butter by scraping it out with a knife or spoon.
4. Store your peanut butter in a covered jar in the refrigerator. Enjoy!





An "Eggsasperating" Situation

Help! Your little brother (or sister) has mixed up the uncooked eggs with the hard-cooked eggs you had prepared for egg salad. What should you do?

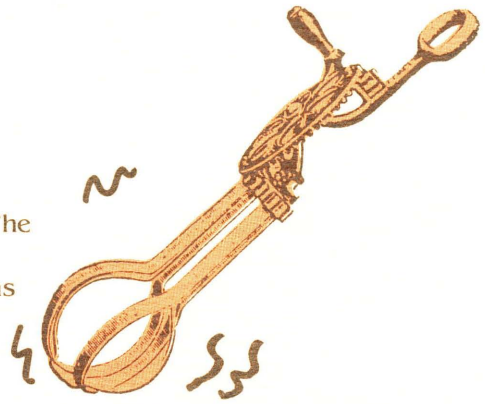
Spin the eggs on their pointed end. A hard-cooked egg will spin like a top. An uncooked egg will fall over. Try it and see!

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

Baffling Beaters



Egg whites are made up of water, protein, and small amounts of minerals and sugars. When egg whites are beaten, air gets added. The air bubbles are then surrounded by the egg white protein, causing the egg white foam to become stiff and stable. When an acid such as cream of tartar is added to an egg white foam, the foam becomes even more stable.

This experiment will help you understand this baffling mystery!

INGREDIENTS

- ☐ **2 egg whites from equal-size eggs at room temperature**
- ☐ **1/8 teaspoon cream of tartar**

EQUIPMENT

- ☐ **2 mixing bowls, same size**
- ☐ **electric mixer or rotary beater**
- ☐ **2 clear glasses (10 ounces or larger), same size**
- ☐ **measuring cup - liquid**
- ☐ **measuring spoons**
- ☐ **container for egg yolk**
- ☐ **spatula**
- ☐ **watch with a second hand**
- ☐ **masking tape**
- ☐ **marker**

DEFINITIONS:

Foam - a gas dispersed or spread throughout a liquid (for example, air beaten into an egg white).

Stability - the ability to **not** change or fluctuate.

Stiff peak - The stage in egg white beating at which the egg white peaks stand up straight when the beaters are removed. Egg whites should not be beaten beyond the stiff peak stage.

PROCEDURE

1. You will need to record the exact time as you begin to beat each egg white. Record the time on the chart.

2. In a mixing bowl, beat one egg white with the electric mixer or rotary beater until stiff peaks form when the beaters are lifted out of the egg white. Record the minutes and seconds this took. Keep this egg white for comparison.

3. As you begin to beat the second egg white, record the time. Beat the second egg white in the remaining bowl until it is foamy. Add the cream of tartar and immediately start beating again at the same speed until stiff peaks form. Record the total beating time.

4. Pour each beaten egg white into a clear glass. Label the glasses "with cream of tartar" and "without cream of tartar." Let the egg whites stand for one hour.

5. Pour off the accumulated liquid and measure the liquid in the measuring cup. Record the amount.

	Egg White without Cream of Tartar	Egg White with Cream of Tartar
Starting time		
Total amount of beating time		
Amount of accumulated liquid		

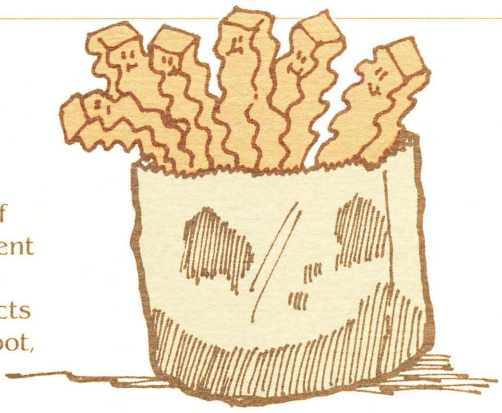
6. See if you can answer the following questions based on what you observed:

- Did it take longer to beat to stiff peaks the egg white with cream of tartar or the egg white without cream of tartar?
- Which egg white lost **less** liquid after one hour?
- What can you conclude about how cream of tartar affects egg whites when beaten?
- Why would you want egg whites to be stable after beating?

Turn to page 8 for an explanation of **Baffling Beaters**.

EXPERIMENT 2

Where's the Fat?



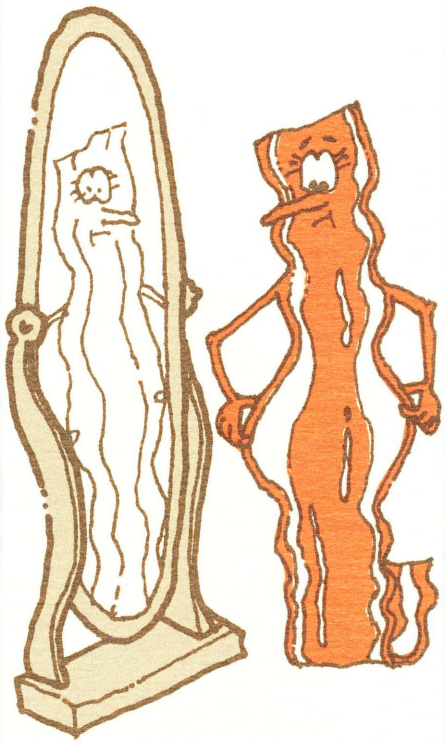
You can find out if a food contains fat by rubbing it on a piece of brown paper bag. If the food contains quite a bit of fat, a translucent spot will appear where you have rubbed. (Translucent means that light will pass through the spot, but you won't be able to see objects through the spot.) Water in food will also produce a translucent spot, but a water spot will disappear when the water dries.

INGREDIENTS

- ☐ **1 uncooked macaroni shell**
- ☐ **1 raw potato slice**
- ☐ **1 potato chip**
- ☐ **1/8 teaspoon mayonnaise**
- ☐ **1 shelled peanut**
- ☐ **part of 1 raw bacon strip**
- ☐ **1/8 teaspoon water**
- ☐ **1/8 teaspoon margarine**
- ☐ **other available foods**

EQUIPMENT

- ☐ **brown paper bag**
- ☐ **measuring spoons**
- ☐ **knife**
- ☐ **cutting board**
- ☐ **marker**



PROCEDURE

1. Rub each food item on a flat piece of brown paper bag.
2. Label the spots with the name of the food.
3. Allow the spots to dry for 20 minutes.
4. Record on the chart whether fat was present.

Food	Fat	Little or No Fat
Macaroni		
Potato slice		
Potato chip		
Mayonnaise		
Peanut		
Bacon		
Water		
Margarine		

5. See if you can answer the following questions based on what you observed.

- Did the raw potato slice give you different results than the potato chip? If yes, why did they test differently? How do you think a french fry would react?
- Did you find a peanut has fat or does not have fat? How do you think peanut butter would test?
- Did the macaroni test as having fat or not having fat? Since macaroni is made from grain, what can you conclude in general about grain foods? How do you think a slice of bread would test?

Turn to page 8 for an explanation of **Where's the Fat?**

The Protein Name Game

Directions: Fill in the blanks in the sentences below. Many of the answers are found throughout this book. Then find the words that are hidden across, down or diagonally in the puzzle.

1. The key to good nutrition is including a _____ of foods in your diet.

2. A favorite protein food at Thanksgiving is _____.

3. Haddock is a type of is _____.

4. _____ are all kinds of beans and peas such as lentils or split peas.

5. Your body uses the nutrient _____ for growth and maintaining body cells.

6. You can fry, poach or scramble this protein source: _____.

7. The nutrient _____ is needed to help your blood carry oxygen throughout your body.

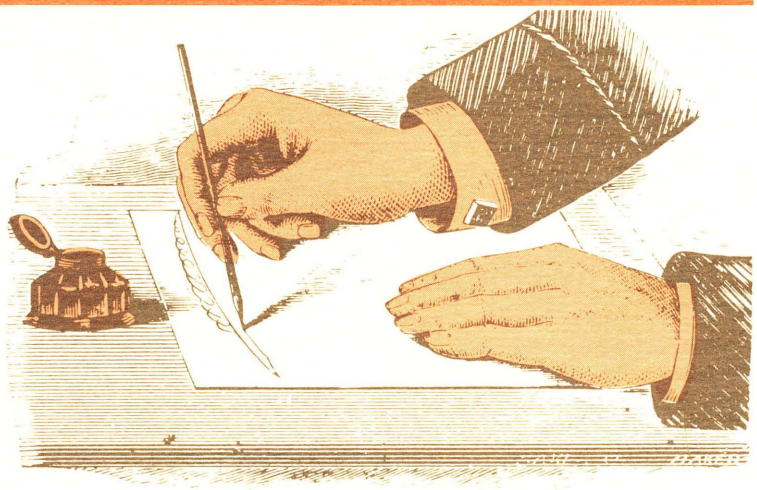
8. This food is featured in a famous Kentucky colonel's restaurant: _____.

9. Many fast foods are high in _____.

N	S	N	S	Y	O	E	P	C	E	S	C
E	E	Q	P	G	C	A	N	G	I	G	T
K	I	A	I	E	G	S	B	O	I	R	O
C	R	G	R	N	I	E	T	O	R	P	B
I	O	H	F	H	U	M	C	M	Q	I	T
H	L	I	I	S	A	U	Z	I	O	D	P
C	A	T	S	N	M	G	A	I	D	P	E
A	C	S	H	Y	T	E	I	R	A	V	D
T	U	R	K	E	Y	L	A	P	S	T	R

Turn to page 8 for the answers.

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:

_____

_____

An Activity to Try

Ground beef is sold under different labels, including hamburger, ground chuck and ground round. It can also be labeled regular, lean or extra lean, which indicate a certain percentage of fat. In recipes that call for browned meat, it is okay to use ground beef with a higher percent of fat. Just be sure to drain the meat well after browning. This will help decrease the fat and calorie content of the final dish.

Type of ground beef as listed on the label	Price per pound	Is this a high, medium or low fat ground beef?

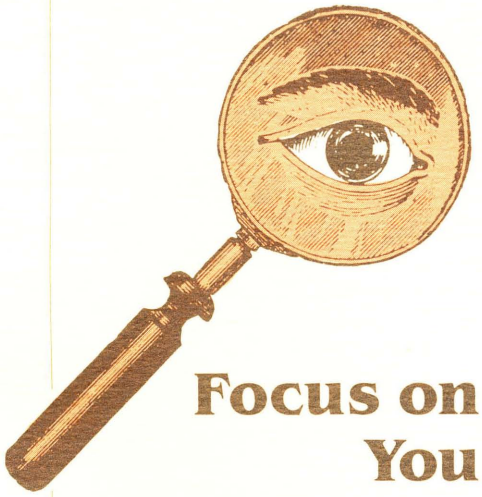
Make a trip to your local supermarket and talk with the butcher in the meat section. Ask if he or she trims the fat off the cuts of meat. Look at the different kinds of ground beef the supermarket sells. Can you **see** a difference in the amout of fat present? Compare the ground beef prices, and discuss with the butcher which type of ground beef has the most fat. Fill in the chart with what you learn.

Mystery Message

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

Unscramble them to solve the mystery sentence:

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



Focus on You

Q. With my busy school, social and job activities, I eat a lot of meals at fast food restaurants. Are these foods bad for me?

A. All foods, including fast foods, have nutrients that your body needs. However, you should be aware that many fast foods are:

- High in calories
- High in salt
- Low in calcium
- Low in vitamins A and C

Keep the following in mind when you eat fast foods:

1. Be choosy. Before you place your order, think about what you have already eaten, what you will eat later and what you need for a balanced diet. Remember that it is best to eat a wide variety of foods in moderation from each of the food types.

2. Go for variety. Include a trip to the salad bar for a wide range of fresh vegetables and fruits. Choose milk instead of a soft drink. (Some restaurants even offer 2 percent milk.) Substitute a baked potato for french fries to avoid too much fat. Be sure you don't add a lot of butter or sour cream to your potato!

3. Limit "add-on" foods. Remember, when you "add on" toppings, sauces, catsup or an extra meat patty, you add calories. If you are concerned about added calories, watch out for the "add-on" foods.

How Did You Do?

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

Explanation: Baffling Beaters (page 4)

The white of an egg is approximately 10 percent protein and 85 percent water. By beating air into an egg white foam, the protein coats the air bubbles and holds in the water. When an acid like cream of tartar is added to the foam, this helps the protein to continue to coat the air bubbles and holds in the water. Adding an acid increases the time it takes to beat the egg white foam to stiff peaks but makes the foam more stable and therefore less likely to lose water.

Explanation: Where's the Fat? (page 5)

About 90 percent of the fat we eat comes from three categories of food: fats and oils; meat, poultry and fish; and dairy foods. Fruits and vegetables (except olives and avocados) and grains are very low in fat. Foods that are low in fat can become a high fat food by the way they are processed. For example, since potato chips are fried in fat, they are higher in fat than baked potatoes.

The Protein Name Game (page 6)

1. variety
2. turkey
3. fish
4. legumes
5. protein
6. eggs
7. iron
8. chicken
9. calories

The Mystery Message (page 7)

Protein is needed by all body cells.

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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