Walch Hands-on Science Series

Nutrition, Mind, and Body

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illustrated by Lloyd Birmingham

Contents

To the Teacher

This is one in a series of hands-on science activity books for middle school and early high school students. A recent national survey of middle school students conducted by the National Science Foundation (NSF) found that

- more than half listed science as their favorite subject.
- more than half wanted more hands-on activities.
- 90 percent stated the best way for them to learn science was to do experiments themselves.

The books in this series seek to capitalize on that NSF survey. The books are not texts but supplements. They offer hands-on, fun activities that will turn some students on to science. You and your students should select which activities are to be carried out. All of the activities need not be done. Pick and choose those activities that best meet the needs of your students. All of these activities can be done in school, and some can be done at home. The authors are teachers, and the activities have been field tested in a public middle school and/or high school.

Students will need only basic, standard scientific equipment that can be found in most middle and high school science laboratories. The activities range from the simple (looking at optical illusions) to the difficult (measuring expiratory reserve volume). There is something for every student.

THE ACTIVITIES CAN BE USED:

- to provide hands-on experiences pertaining to textbook content.
- to give verbally limited children a chance to succeed and gain extra credit.
- as the basis for class or school science fair projects or for other science competitions.
- to involve students in science club undertakings.
- as homework assignments.
- to involve parents in their child's science education and experiences.
- to foster an appreciation of the relationships between nutrition, the mind, and the body.

Students can learn important scientific principles from carrying out these activities. For example:

- Sensations may be complex rather than simple. Multiple sensations can produce a single consequence. Activities 14, 15, and 16, for example, explore the components of the sensation of taste.
- Mathematics, science, and technology are interwoven in some of the nutrition activities (for example, Activity 12: Milk, Hot Dogs, and Nutritional Math).

Each activity has a Teacher Resource section that includes, besides helpful hints and suggestions, a scoring rubric, quiz questions, and Internet connections for those students who wish to go further and carry out the follow-up activities. Instructional objectives and the National Science Standards that apply to each activity are provided to help you meet state and local expectations.

Where Is the Fat?

TEACHER RESOURCE PAGE

INSTRUCTIONAL OBJECTIVES

Students will be able to

- record and analyze data.
- analyze mathematical relationships and concepts.
- draw conclusions based upon data.

NATIONAL SCIENCE STANDARDS ADDRESSED

Students demonstrate an understanding of

- big ideas and unifying concepts, such as cause and effect.
- health and nutrition.

Students demonstrate scientific inquiry and problem-solving skills by

- distinguishing causes and effects.
- working in teams to collect and share information.
- identifying the outcomes of an investigation.

Students demonstrate effective scientific communication by

- explaining scientific concepts to others.

MATERIALS

- Four test tubes
- Fat-free (skim) milk
- 1% milk
- 2% milk
- Whole milk
- Sudan IV crystals
- Water
- Medicine dropper
- Microscope
- Four plastic or glass microscope slides
- Four plastic or glass coverslips
- Red crayon
- Lens paper
- Chemical scoop
- Test tube rack

HELPFUL HINTS AND DISCUSSION

Time frame: One to two periods
Structure: In cooperative learning groups
Location: In class

Review how to use the microscope and prepare a wet mount. You may wish to substitute a hemacytometer for slides in order to make the task of counting the stained fat droplets easier. If you decide to use the hemacytometer, your students will need instructions for its use. A brief review of ratios may be necessary.

ADAPTATIONS FOR HIGH AND LOW ACHIEVERS

High Achievers: These students should be encouraged to carry out the Follow-up Activities.

Low Achievers: These students should work with the high achievers and have their counts of stained fat droplets checked.

SCORING RUBRIC

Full credit should be given to those students who accurately record observations and who provide correct answers in full sentences to the questions. Extra credit can be given if any of the Follow-up Activities are completed.

INTERNET TIE-INS

http://www.goaskalice.columbia.edu/1036.html
http://www.itlnet.net/users/k21/DIET/math.html
http://www.med.virginia.edu/docs/heart/docs/education/healthy.html

QUIZ

1. Why has the name of skim milk been changed to fat-free milk?
2. Describe an experiment to compare the relative amounts of fat in whole milk, 2% milk, 1% milk, and fat-free (skim) milk.

Name _____ Date _____

Where Is the Fat?

STUDENT ACTIVITY PAGE

BEFORE YOU BEGIN

Many people think of fat as being bad for you. The truth is that fats are essential to good health. Your body stores energy in fat. Your body fat also acts as an insulator against the cold and as a shock absorber, preventing serious injury if you should fall or be bumped. In addition, the cells in your body contain fat in their cell membranes. In this activity, you will test several kinds of milk for the presence of fat. You will also attempt to determine relative amounts of fat in several types of milk, including whole milk, 2% milk, 1% milk, and fat-free (skim) milk.

MATERIALS

- Four test tubes
- Fat-free (skim) milk
- 1% milk
- 2% milk
- Whole milk
- Sudan IV crystals
- Water
- Medicine dropper
- Microscope
- Four plastic or glass microscope slides
- Four plastic or glass coverslips
- Red crayon
- Lens paper
- Chemical scoop
- Test tube rack

PROCEDURE

1. Fill a test tube half full of water. Using a chemical scoop, add five or six crystals of Sudan IV. Shake the test tube to dissolve the crystals.
2. Add 40 drops of whole milk, using a clean medicine dropper. Shake the test tube and its contents well.
3. Clean both the microscope slide and coverslip with lens paper. Place a drop of the liquid you prepared in steps 1 and 2 onto a microscope slide.
4. Cover the liquid with the coverslip.
5. Examine the drop under the low-power objective of the microscope. See if the Sudan IV in your mixture has turned red. If this reaction did take place, then you will find red-stained little round fat droplets. Count the number of red-stained fat droplets that you see under low power. Record that number in the space provided in the Data Collection and Analysis section. Draw and color what you see in the appropriate circle in the Data Collection and Analysis section.
6. Repeat steps 1 through 5, substituting fat-free (skim) milk for the whole milk.
7. Repeat steps 1 through 5, substituting 1% milk for the whole milk.
8. Repeat steps 1 through 5, substituting 2% milk for the whole milk.

Name _____ Date _____

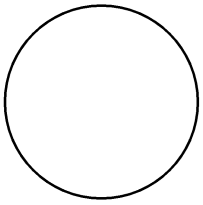
Where Is the Fat? *(continued)*

STUDENT ACTIVITY PAGE

DATA COLLECTION AND ANALYSIS

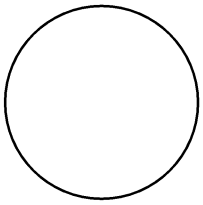
whole milk

Number of red-stained fat droplets is _____.



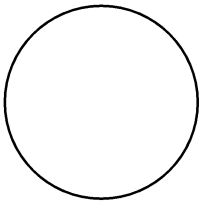
fat-free milk

Number of red-stained fat droplets is _____.



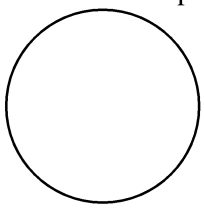
1% milk

Number of red-stained fat droplets is _____.



2% milk

Number of red-stained fat droplets is _____.



CONCLUDING QUESTIONS

1. Which milk had the most stained fat droplets? _____
2. Which had the fewest stained fat droplets? _____
3. Was the fat-free (skim) milk really fat free? Justify your answer. _____

   _____
4. What was the ratio of the number of stained fat droplets in 2% milk to 1% milk? Is the ratio close to 2:1? Explain your answer._____

   _____

Follow-up Activities

1. Prepare a chalkboard chart for the entire class to enter their data. Are every group's data similar? How can you account for any differences?
2. Repeat this activity, but use buttermilk or cream instead of milk.
3. Research the role of cholesterol in the formation of useful body chemicals called **steroids** and in the formation of plaque inside arteries. Report your findings to the class.