

How Do We Use Water?

from *The Science of Water Teacher's Guide* and for *Mystery of the Muddled Marsh*

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BioEdSM

Teacher Resources from the
Center for Educational Outreach at
Baylor College of Medicine

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Third edition. First edition published 1997.
Printed in the United States of America

ISBN: 978-1-888997-61-3

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Development of this unit was supported, in part, by grant numbers R25 ES06932 and R25 ES010698 from the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health (NIH). The opinions, findings and conclusions expressed in this publication are solely those of the authors and do not necessarily reflect the official views of Baylor College of Medicine, NIEHS or NIH.

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ACKNOWLEDGMENTS

The Science of Water educational materials, first developed as part of the My Health My World® project at Baylor College of Medicine, have benefited from the vision and expertise of scientists and educators representing a wide range of specialties. Our heartfelt appreciation goes to Michael Lieberman, M.D., Ph.D., William A. Thomson, Ph.D., and Carlos Vallbona, M.D., who have lent their support and expertise to the project.

Special acknowledgment is due to our original partners in this project, the Texas Medical Association and the American Physiological Society (APS). We especially thank Marsha Lakes Matyas, Ph.D., of APS, for her direction of field test activities and ongoing collaboration.

Several colleagues provided valuable assistance during the development of this guide. In particular, we would like to thank Cassius Bordelon, Ph.D.; Zenaido Camacho, Ph.D.; Ronald Sass, Ph.D.; Sandra Saunders, M.A.; Linda Thomson, M.A.; Cathey Whitener, M.S.; Ellison Wittels, M.D.; and Rosa Maria Ynfante, B.S.

Special thanks go to the National Institute of Environmental Health Sciences, Allen Dearry, Ph.D., Frederick Tyson, Ph.D., and Liam O’Fallon for their support of the My Health My World project and the related Environment as a Context for Opportunities in Schools (ECOS) project.

We are especially grateful to the many classroom teachers in Washington, D.C., and Houston and Austin, Texas, who participated in the field tests of these materials and provided invaluable feedback.



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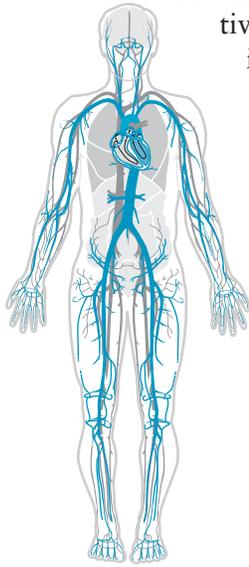
Water in Our Bodies



Life Science Basics

Every living organism, whether it consists of one cell or billions, relies on water for the transport of nutrients and, in most cases, oxygen. Water also is used to carry waste products away from cells. Even the countless reactions that happen inside cells must take place in water.

Organisms consisting of one to just a few cells interact directly with their environments. In such organisms, obtaining raw materials and eliminating wastes are relatively simple processes, because each cell is in contact with the outside (usually water-containing) environment. More complex organisms, however, must find ways to maintain a constant internal fluid environment. They also must provide cells with the materials they need and remove waste products.

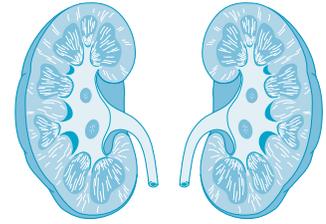


Human circulatory system

In vertebrate animals, nutrients, gases and wastes are carried throughout the body by the circulatory system—which consists of a heart and numerous blood vessels. Water is a significant component of blood and also is the base for the solutions that surround cells throughout the body. In fact, about 50% of the water in the body of a complex animal is found in fluids outside of cells.

Vertebrates take in water and food through the mouth. Materials reach the stomach, where food is mixed and broken up. Food exits the stomach as a soupy mixture, which passes into the small intestine, where most digestion and absorption of nutrients occurs. Most food molecules must be broken down into smaller components before they can be absorbed into the body. These and other nutrients, like salts and minerals, pass through the cells that form the walls of the small intestine into the bloodstream. Water is essential to transport nutrients released during digestion. Materials that have passed through the small intestine enter the large intestine, where much of the water used during the digestive process is reabsorbed.

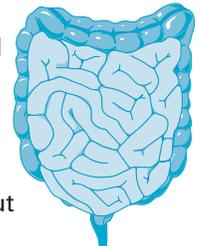
The removal of wastes from cells also depends on water. Cells release waste products into the blood, which carries them to the kidneys, organs located near the lower back that remove potentially toxic materials from the blood. The kidneys use very little water in this process. Waste materials are concentrated as urine, which is stored in the bladder until being eliminated. The kidneys also control the relative amounts of water retained within the body and/or released in urine.



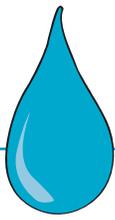
The kidneys filter more than 170 liters of liquid each day. Imagine how many glasses of water this represents!

Water loss always is a threat to the survival of living organisms. Water can be lost by evaporation from surfaces involved in breathing (inside the lungs, for example), by evaporation from other surfaces (such as through perspiration), and by elimination (both in urine and in feces). Water that is lost must be replaced. Additional water can come from food, from drinking liquids and as a byproduct of energy-releasing reactions inside cells.

The small intestine of an adult human is about 23 feet long and about an inch in diameter.



The large intestine is about 5 feet long and about 3 inches in diameter.



How Do We Use Water?

Life Science

CONCEPTS

- We use water in many ways each day.
- Some ways in which we use water are not essential for life.

OVERVIEW

Students keep a personal Water Use Journal for a day to become aware of the ways in which they use water.

SCIENCE, HEALTH & MATH SKILLS

- Making and recording observations
- Collecting data
- Drawing conclusions

TIME

Preparation: 10 minutes
Class: 30 minutes to set up; two 30-minute sessions on successive days

MATERIALS

- Each student will need:
- Copy of "Water Use Journal" page

Water is essential for life, and each of us uses water in many ways. For example, each person needs to have about eight cups of water each day to stay healthy. The water we need can come from liquids we drink and the foods we eat. We also use water to wash dishes and food items, to remove microorganisms that can cause illnesses. We prevent other kinds of diseases when we use water for bathing and for brushing teeth.

However, many daily uses of water are non-essential. We use water to wash our cars or driveways, because they look better when they are clean. We sprinkle our flower gardens and lawns with water, even though we don't use those plants for food. In addition, we often use more water than necessary to carry out essential tasks. Examples include leaving the water running while brushing teeth, taking long showers or filling the bathtub to the brim before bathing.

This activity will make students aware of the ways they use water each day. Each student will keep a personal Water Use Journal for 24 hours. If desired, students can keep journals over the course of the entire unit, saving all of their worksheets and observations, writings, drawings, magazine clippings, etc., related to water and human health. Such a journal is useful for review and reinforcement. It also can serve as an assessment tool during and at the end of the unit.

SETUP

This activity will take place over at least two class periods. On Day 1, students will take their journal sheets home to record their uses of water. Classroom activities on Day 2 may be conducted with the whole class or with students in smaller groups.

PROCEDURE

Day 1: How do you use water?

1. Open a short discussion by asking students to list ways that people use water every day. Some uses might include: washing, drinking, cooking, watering plants, etc.
2. Pass out one copy of the "Water Use Journal" sheet to each student. Explain that students will be investigating how they use water for the next 24 hours. Stress that each student should record only his or her own uses of water.



Unit Links

Mystery of the Muddled Marsh

Story, pp. 13–17;
Science box, p. 7

Explorations

Cover activity; Not
Such a New Issue, p. 5



TYPICAL AMOUNTS OF WATER USED IN AMERICAN HOMES

AMOUNT	ACTIVITY
2 gallons	Brush teeth
2 gallons	Run faucet until water is cold
2–7 gallons	Flush toilet
12–20 gallons	Run dishwasher
50 gallons	Run clothes washer
25–50 gallons	Take a 10 minute shower
25–50 gallons	Fill bathtub
50 gallons	Run garden hose for 5 minutes

Source: U.S. Environmental Protection Agency, Office of Water, <http://www.epa.gov/ow>.

3. Have students take their sheets home. Specify the period of time during which they should record their water use (for example, from the moment they leave the classroom until the moment they return; from the time they arrive home until the time they leave home in the morning; etc.).

Day 2: What are essential uses of water?

1. Divide classes of older students into groups of 3 to 4. Have each group discuss and compile a list of the uses of water that they reported in their journals. With younger students, conduct this session as a full class activity. Ask each student to contribute one of the uses of water that he or she recorded. List the uses on the board.
2. Ask, *How many uses of water on your list* (or on the list on the board) *help you stay healthy?* Have each group divide the water uses on its list into two categories: “Uses Important for Health,” and “Other Uses.” With younger students, create the same categories and lists on the board.
3. Have each group share its list of uses with the rest of the class. Encourage discussion of the students’ ideas. Now, present each group with a new challenge. Ask, *In how many of these uses could you save water without affecting your health?* Have each group revisit its list and create a new list of “Ideas for Saving Water.” Let each group share its ideas.
4. Display the “Ideas for Saving Water” in a central place in the classroom. If desired, have each group create a colorful poster illustrating one of its ideas.

WATER USE FACTS

- Each person needs 8–10 cups (2.5 quarts) of water each day for health.
- Americans each use about 183 gallons of water each day for cooking, washing, flushing and watering.
- Most home water use is in the bathroom.
- 4,000 gallons of water are needed to produce one bushel of corn.
- It takes 1,400 gallons of water to produce a meal of a hamburger, French fries and a soft drink.
- 39,000 gallons of water are required to produce an automobile.

Source: U.S. Environmental Protection Agency, Office of Water.



Water Use Journal

Name _____

Day of Observations _____

These are the ways I used water.

- | | |
|-----------|-----------|
| 1. _____ | 11. _____ |
| 2. _____ | 12. _____ |
| 3. _____ | 13. _____ |
| 4. _____ | 14. _____ |
| 5. _____ | 15. _____ |
| 6. _____ | 16. _____ |
| 7. _____ | 17. _____ |
| 8. _____ | 18. _____ |
| 9. _____ | 19. _____ |
| 10. _____ | 20. _____ |

Diario de uso de agua



Nombre _____

Fecha de las observaciones _____

Usé el agua para:

- | | |
|-----------|-----------|
| 1. _____ | 11. _____ |
| 2. _____ | 12. _____ |
| 3. _____ | 13. _____ |
| 4. _____ | 14. _____ |
| 5. _____ | 15. _____ |
| 6. _____ | 16. _____ |
| 7. _____ | 17. _____ |
| 8. _____ | 18. _____ |
| 9. _____ | 19. _____ |
| 10. _____ | 20. _____ |