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## How Much Water Do Humans Need?

The Science of Water:  
Activity 7

Nancy Moreno, PhD.  
Barbara Tharp, MS.

Center for  
Educational Outreach  
Baylor College of Medicine



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### How Much Water Do Humans Need?

*\*Previously entitled, "Water Any Body?"*

This activity teaches students that the human body loses water through a variety of normal daily activities, and allows students to observe and measure the volume of water lost. Possible follow-up discussions might address the need for water conservation and the relationship between clean water and healthy people. Specific science concepts covered in this activity include the following.

#### Concepts

- Water is essential for survival.
- Under normal circumstances, our bodies take in and release the same amount of water each day.

#### Reference

Moreno N., and B. Tharp. (2011). *The Science of Water Teacher's Guide*. Third edition. Baylor College of Medicine. ISBN: 978-1-888997-61-3. Development of this student activity was supported, in part, by grant numbers R25 ES06932 and R2510698 from the National Institute of Environmental Health Sciences of the National Institutes of Health to Baylor College of Medicine.

**Image Reference**

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**Key Words**

lesson, experiment, water, liquid, human, health, kidneys, urinary tract,

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## Materials

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### Materials

Have students work in groups of four. Place all materials in a central location for Materials Managers to pickup.

Each group of students will need one clean, empty one-gallon milk jug. Ask students one from home.

This activity also will require beakers or graduated cylinders for this activity. If none are available, you can make your own by calibrating clear plastic cups ahead of time.

### Materials per Student Group

- 1,000-mL beaker
- 15-qt dishpan, or a plastic tub with a minimum capacity of 3 liters
- Plastic funnel, 2 3/4-in. size
- Plastic milk jug, gallon size
- 3 liters of water

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## **Image Reference**

Photo by JP Denk © Baylor College of Medicine.

## **Key Words**

materials list, materials needed,

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## Science Safety Considerations

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- Follow all instructions.
- Begin investigation only when instructed.
- Do not taste, drink or smell any substances.
- Report accidents or spills.
- Wash hands thoroughly after the investigation.



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### Science Safety Considerations

Students always must think about safety when conducting science investigations. This slide may be used to review safety with your class prior to beginning the activity.

#### *Safety first!*

- Always follow school district and school science laboratory safety guidelines.
- Have a clear understanding of the investigation in advance.
- Practice any investigation with which you are not familiar before conducting it with the class.
- Make sure appropriate safety equipment, such as safety goggles, is available.
- Continually monitor the area where the investigation is being conducted.

## References

1. Dean R., M. Dean, and L. Motz. (2003). *Safety in the Elementary Science Classroom*. National Science Teachers Association.
  2. Moreno N., and B. Tharp. (2011). *The Science of Water Teacher's Guide*. Third edition. Baylor College of Medicine. ISBN: 978-1-888997-61-3.
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## Key Words

science, classroom, safety, lab, laboratory, rules, safety signs,

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## Water Cycles Through Our Bodies

- The human body is composed of 70% water.
- How much water does the human body need each day? Why?
- The average human body loses 3,000 mL of water a day? How?
- Let's investigate!



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## Water Cycles Through Our Bodies

Under normal conditions, our bodies take in and release balanced amounts of water each day (about 3,000 mL in an average adult). Ask students, *How much water do you think enters the body in food and liquid each day?* Encourage them to record their predictions.

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### Image Reference

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**Key Words**

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## Let's Get Started

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1. Measure 3,000 mL of water into the dishpan. This is the typical amount of water that enters the body each day.
2. Using the funnel, pour the following quantities of water from your dishpan into the milk jug.
  - 150 mL
  - 600 mL
  - 1,500 mL
  - 750 mL
3. What do you think these amounts of water represent?



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## Let's Get Started

Have each group use a 2,000-mL handled beaker to measure 3,000 mL of water into its large dishpan. Explain that this is the amount of water that enters the body each day through food and beverages. Ask students, *What happens to the water in our bodies? Where does it go?*

Present the volumes below, but do not provide the corresponding explanations. Have students hypothesize what each volume of water represents. For example, they might suggest (incorrectly) that 150 mL is the amount of water lost from tears every day.

Have one student in each group measure one of the following quantities of water from the tub into the milk jug. Be sure students use the funnel when pouring the water.

- 150 mL (water eliminated through the intestines)
- 600 mL (water lost as vapor during breathing)

- 1,500 mL (water eliminated as urine)
- 750 mL (water lost as perspiration)

After students have finished measuring out all four examples, ask, *How much water is left in the dishpan? What would happen if no water entered the body?* and *How can you replace water that is lost from the body?*

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### **Key Words**

Lesson, experiment, water, liquid, human, health, kidneys, urinary tract, water loss,

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## Let's Talk About It

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- Water Loss
  - 1,500 mL in urine
  - 600 mL through evaporation during breathing
  - 750 mL as sweat
  - 150 mL by elimination from the digestive system
- Water Replacement
  - 1,500 mL by liquid water
  - 1,200 mL from food
  - 300 mL from respiration



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## Let's Talk About It

Lead a class discussion in which students suggest different ways the body can replace water lost through natural processes. Emphasizing the body's need for water to survive, have each group create a plan or strategy to replace the 3,000 mL of water lost by the body each day. Note that about half of the water can come from food, and that about 300 mL of water is produced inside the body daily, as energy is released from food. Have each group share its ideas with the rest of the class.

An average human doing light work in a temperate climate loses approximately 6 pints (3 liters) of water each day. This water must be replaced. Vigorous exercise can lead to a loss of even more water. Someone doing hard work in the sun can lose as much as 20 pints of water in a day. The greatest daily loss of water ever recorded was 50 pints (more than 6 gallons)!

Healthy humans show the effects of water deprivation (dehydration) after about three days. Death is likely when the body loses about 20%

of its total volume of water.

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## The Science of Water in Our Bodies

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- All life depends on water.
- Water is lost by evaporation through the skin and lung surfaces, elimination in feces, and excretion in urine.
- Water that is lost must be replaced.
- Water enters the body in liquids and food.
- Most water is absorbed into the body through the large intestine.
- Kidneys in land-dwelling vertebrates filter out waste products and extra water
- The body also reabsorbs water used in digestion.



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### The Science of Water in Our Bodies

Water is a unique substance upon which all life depends. It is essential inside cells, where it provides the medium in which all chemical reactions take place. It also is needed outside cells, where it provides a mode of transport for nutrients, oxygen, wastes and other materials.

Organisms that consist of one or just a few cells interact directly with their environments. It is relatively simple for them to obtain raw materials and excrete wastes because each cell is in contact with the outside (usually water-containing) environment. More advanced organisms depend on more complex processes to maintain a constant internal fluid environment that provides cells with the materials they need and removes waste products.

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## Extensions

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- What are some special strategies that desert-dwelling animals have adopted to conserve water in very dry environments?
- What strategies have aquatic animals adopted to tackle the opposite problem—too much water?



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## Extensions

The threat of water loss from the body is especially significant for animals living in very dry environments. Most of these animals have evolved special strategies to conserve water. Kangaroo rats living in deserts, for example, hardly ever drink water. They obtain almost all the water they need through the chemical breakdown of the grains they eat. To reduce water loss from their bodies, kangaroo rats are not active during the hottest parts of the day. They also produce very dry feces and release extremely concentrated urine. Use resources in the library or on the Internet to investigate some of the unique characteristics of desert dwellers.

Aquatic organisms (plants and animals that live in water) have a very different problem: too much water. See what you can learn about strategies used by aquatic organisms to survive while submerged.

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### **Image References**

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3. Photo of New Zealand Fur Seal pup courtesy Avenue CC-BY-SA 3.0.

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