



BODIES

THE EXHIBITION

"This exhibition taught my students more than I could ever teach them with mere words."

"I thought Science was hard for me but when I came here I learned that I loved it."

"This is a great place to come to when you are learning about the human body in Health class."

"I learned more here than I could in any classroom."

To See is To Know.

We invite you and your school group to **see** BODIES...THE EXHIBITION and to **know** more about how to enlighten, inform, and inspire your students to learn about the human body. This unique educational opportunity will be open for a limited time at Carnegie Science Center.

In BODIES...THE EXHIBITION you will see real bodies dissected to show various internal systems. You will also see individual organs – some healthy, some diseased. You will view the effects that diseases and unhealthy life choices have on the body – what happens to lungs, for example, when people smoke. You will discover how amazing the body is; how the pulleys, levers and fulcrums we know as muscles and bones function without our thinking about it.

BODIES...THE EXHIBITION provides an unprecedented opportunity for learning science, human anatomy, physics and biology. There are comprehensive Teacher's Guides available for elementary, middle and high school levels with experiential classroom activities aligned to the State Academic Content Standards for Pennsylvania, West Virginia, Ohio and Maryland. In addition, there is a Post-Secondary Guide for college and adult students.

By understanding how the body works, you can better take care of it and keep it healthy. By studying the systems of the body, you and your students will come away with a new appreciation for life.

Available Fall 2007

To request a Teacher's Guide:
Visit www.WhereScienceHappens.org

To inquire about special group rates, please call **412-237-3410**.

For Field Trip Guidelines and online group reservation forms, visit
www.WhereScienceHappens.org.

PREPARING TO VISIT THE EXHIBITION

The setting of this Exhibition lends itself to a quiet, respectful viewing of specimens. There are nine galleries – skeletal system, muscle system, nervous system, circulatory system, digestive system, reproductive system, an optional fetal gallery, and a gallery that shows how prosthetic joints and surgical tools are used to restore our health. The ninth gallery invites guests to write comments about their Exhibition visit and to thumb through age-appropriate books on anatomy.

BODIES...THE EXHIBITION allows students to learn about their own bodies and how to take better care of their health. The Exhibition enables students to see and understand medical conditions friends and family members face in a whole new way by highlighting pressing health concerns including smoking, cancer, cirrhosis, arthritis and bone fractures.

Please prepare your students by discussing what they will be seeing - real, preserved specimens of the human body. The specimens have been dissected to specifically illustrate each body system and function. Male and female reproductive organs are visible in most of the full body specimens. *The fetal room is entirely optional. All embryos or fetuses died of natural causes in utero.*

The specimens are preserved through a process called polymer preservation. This process is a revolutionary technique in which human tissue is permanently preserved using liquid silicone rubber. This prevents the natural process of decay, making the specimens available for study for an indefinite period of time. Polymer preservation unveils the mysteries of human anatomy and provides a closer look at the skeletal, muscular, nervous, respiratory, digestive, urinary, reproductive, endocrine, and circulatory systems.

BODIES...THE EXHIBITION offers a special children's audio tour in addition to comprehensive Teacher's Guides available Fall 2007 for Grades K - 2, 3 - 5, 6 - 8 and 9 - 12 plus a Post-Secondary Guide for advanced students.

This Educator Information Packet includes sample lesson plans and classroom resources for you to review and share.



SKELETAL SYSTEM

Grades 3 -5

ACTIVITY: Ruler Reactions

Students will experience how quickly their muscles can react to impulses.

National Science Standards: Standard A Science as Inquiry, Standard C Life Science, Standard F Science in Personal and Social Perspectives

INTRODUCING THE ACTIVITY

Our skeletal muscles, the muscles most people associate with bodybuilders, are voluntary muscles that make up the musculoskeletal system. The musculoskeletal system uses a combination of bones and muscles to achieve greater strength through mechanical advantage.

MATERIALS

- ruler
- partner

PROCEDURE FOR RULER REACTIONS

1. Hold the 12" end of the ruler so that the other end is between your partner's middle finger and thumb.
2. Drop the ruler and see if your partner can catch it. At what spot on the ruler did your partner catch it? Try it a few more times and see if the reaction time increases. The lower the number at the point where you catch the ruler, the quicker the reaction time.

EXPLANATION

Impulses from the nervous system cause muscles to contract and maintain a supply of ATP (adenosine triphosphate). This is what most of your body uses for energy. The reaction time, or how quickly you catch the ruler, is dependent on when you realize that the ruler is dropping.

EXTENSION

1. Trick your muscles. Stand next to a partner and try to raise your arm while your partner holds it down. Keep pushing up on your arm while your partner pushes down for about 30 seconds. Tell your partner to let go and let your arm relax. What happens? Your arm will try to lift itself because the nerves and muscles will adjust to the old position.
2. Examine different types of muscles. Obtain a chicken leg (skeletal muscle), tripe (smooth muscle), and chicken heart (cardiac muscle). Put on gloves and cover your work area with newspaper. Examine the meat of each one noting the similarities and differences.

The skeletal muscle of the chicken is fibrous and connected to white colored ligaments. Examine the areas where the muscle attaches to the bone. The muscle of the tripe is very smooth and rubbery. The heart muscle is fibrous and smooth and feels elastic.

URINARY SYSTEM

Grades 6 - 8

ACTIVITY: Kidney Capers

Students will identify the structures and functions of the urinary system by building a model containing the kidney, ureters, bladder and blood vessels.

National Science Standards Standard A Science as Inquiry, Standard C Life Science

MATERIALS (per student)

- one large marshmallow = the bladder
- glue
- three kidney beans = the kidneys
- 2 drinking straws = the urethra
- 1 pair of scissors
- 3 spaghetti pieces = the ureters
- 2 pieces of red yarn = the arteries
- 2 pieces of blue yarn = represents the veins
- 1 sheet of construction paper (8-1/2" x 11")

INTRODUCING THE ACTIVITY

The urinary system includes the kidneys, bladder, ureter and blood vessels. These organs control the amount of water and salts that are absorbed back into the blood and what is taken out as waste. The urinary system also acts as a filtering mechanism for the blood.

PROCEDURE

1. Glue the kidney beans two inches from the top of the construction paper. Glue the beans side by side with three inches between them.
2. Glue both pieces of the red and blue yarn to the middle of the kidney beans to represent the arteries and veins bringing blood to and from the kidneys.
3. Insert two spaghetti pieces (ureters) into the large marshmallow (bladder). This demonstrates the ureters draining down into the bladder.
4. Insert the piece of straw (urethra) into the bottom of the large marshmallow (bladder). This represents the connection of the urethra to the bladder.
5. You now have a wonderful model of the urinary system!

EXPLANATION for Kidney Capers

The two adult kidneys weigh, on average, 5.29 - 5.64 ounces. They are slightly different in size. The left kidney is generally bigger than the right kidney. However, both of them have a smooth surface. In fact, the lobe-shaped kidney of a fetus tends to disappear during the first years of one's life.

EXTENSION

1. Research renal calculi and the various methods for removing them from the body.

NERVOUS SYSTEM

Grades 9 - 12

ACTIVITY: How Sensitive Is My Skin?

Students will determine the relative number of nerve endings located in the skin by using the technique of two-point discrimination.

National Science Standards: Standard A Science as Inquiry, Standard C Life Science

INTRODUCING THE ACTIVITY

Humans learn a great deal about their immediate environment from the sense of touch. The brain is able to determine where the body has been touched and can often identify the object touching the body. Some areas of the skin have more touch receptors in a given area than others.

MATERIALS (per pair of students)

- 2 sheets large graph paper (1 per student) • Several toothpicks • 1 ruler

PROCEDURE

1. Take 2 toothpicks and gently touch the points of the toothpicks on the palm of your lab partner's hand and determine if they can feel one or two points. Start with the toothpicks 6 inches apart from each other. *It is important to touch the tips of the toothpicks to the skin at the same time.*
2. Ask the student how many points he or she feels. If the person feels two points, move the points of the toothpicks closer together – about 4 inches apart, and check again. Continue the procedure until you find the smallest distance the points can be separated for the person to feel the two points instead of one. When the person reports “one point” for the first time, move the two points apart only a few centimeters at a time and try to make a very accurate measurement.
3. When the smallest distance is found, measure and record the distance.
4. Try this experiment on the back of the hand as well as the inside and outside area of your forearm and your fingertips.
5. Record the data and perform the same experiments on the other partner. Use fresh toothpicks when you switch.

EXPLANATION

Students find that the ability to tell that two points rather than just one are pressing on the skin depends on two things: (1) the density of skin receptors and (2) the connections that the sensory nerve cells make in the brain.

EXTENSION

1. How do your results compare with those in other groups?
2. Are the two-point distances on different areas of the skin the same – for example, is the measurement on the palm of the hand the same as the measurement on your fingertips?
3. Which skin areas do you think have more receptors; areas that have small two-point distances or large two-point distances? Why do you think so?
4. How does information from sensory receptors in the skin get to the brain?

The Achilles Tendon

QUESTIONS

- Q1 What type of tissue is a tendon made of?
Q2 Describe the nature of the blood supply to a tendon.
Q3 With what muscle is the Achilles tendon associated?
Q4 To which bone does the Achilles tendon attach?
Q5 What is the function of the Achilles tendon?

PUTTING IT ALL TOGETHER

A young football player arrives in your office with a suspected torn Achilles tendon. What difficulty would the patient experience that would confirm to you that this diagnosis is correct? Assuming that surgery is necessary to repair the torn tendon, describe to the patient the circumstances surrounding the surgery and his expected time of recovery based on what you know about the Achilles tendon and its function. What advice might you give this player that could potentially minimize future damage to this important tendon?

1. During surgery the foot is plantar-flexed (the function of the gastrocnemius muscle) in order to bring the ends of the torn tendon together. The leg and foot are cast to stabilize the repair.
2. The healing process will take approximately 8-10 weeks. Tendons have a very poor blood supply and therefore heal very slowly.
3. Because of the nature of the injury and the length of time it will take to heal, the patient will not be able to put any weight on the foot during the healing process, thus requiring the use of crutches.
4. After the cast is removed, the foot will be in the plantar-flexed position (the result of immobilization of the foot without the ability to contract the gastrocnemius muscle). Returning the foot to its normal walking position will take some time. This is usually done by asking the patient to wear a boot-like appliance in which the inside surface of the boot is built up in layers to conform to the plantar flexed position of the foot. Then, week-by-week, one layer at a time is removed from the inside surface of the boot until the patient's foot again rests flat on the floor.

TAKE HOME MESSAGE

Protect your Achilles tendon - and all of your other muscle tendons - through regular exercise preceded by a warm-up stretching routine. The slow, controlled stretching of muscle tendons before rigorous exercise is an important way to protect them from tearing. Stretching exercises are important for everyone but particularly for those people who do not engage in regular exercise or for older individuals since tendons become more susceptible to injury under both circumstances.

BODIES

THE EXHIBITION

DO YOU KNOW?

1. A human being loses an average of 40 to 100 strands of hair a day.
2. A cough releases an explosive charge of air that moves at speeds up to 60 mph.
3. Every time you lick a stamp, you consume 1/10 of a calorie.
4. A fetus acquires fingerprints at the age of three months.
5. A sneeze can exceed the speed of 100 mph.
6. Every person has a unique tongue print.
7. According to German researchers, the risk of heart attack is higher on Monday than any other day of the week.
8. After spending hours working at a computer display, look at a blank piece of white paper. It will probably appear pink.
9. An average human drinks about 16,000 gallons of water in a lifetime.
10. A fingernail or toenail takes about 6 months to grow from base to tip.

CLASSROOM EXTENSION ACTIVITIES

Create A Travel Brochure for the Human Skeletal System. As the travel writer for a local newspaper or magazine, you have been asked to design a brochure for a luxury tour through the human body's skeletal system. Be sure to highlight the trendy spots, all the exciting activities, and the imports and exports of the area. For insurance considerations, point out all possible dangers or special precautions that tourists might encounter during their visit.

Complete An Anti-Tobacco Public Service Campaign. Create a series of multimedia ads aimed at convincing people not to smoke. Write the copy, select the graphics and edit your ads so that your message is effective, to-the-point, and is taken seriously. Present your final campaign to your classmates and/or family.

Create A Brain Health & Safety Handbook. What can you do to help develop and protect your brain? First, conduct research. Then, design and create a handbook that communicates the most important safety practices. Your final project could be an online virtual handbook as well as a printed product to be presented to your school.

BODIES

THE EXHIBITION

WEBSITES:

<http://kidshealth.org/kid/>

Discover how the body works and what can make the body sick by reading through these expert articles written just for kids.

<http://library.thinkquest.org/10348/>

An exploration of anatomy designed for students ages 11 to 16 years.

<http://yucky.kids.discovery.com/noflash/body/index.html>

This Web site explores the science behind eye gunk, ear wax, dandruff, and other bodily functions that are often considered “yucky” and “gross.” There is also a drop-down menu that provides information about systems of the body.

http://www.lung.ca/children/index_kids.html

How do the lungs work? What hazards threaten the respiratory system? And what can kids do about them? This engaging website has information, printed worksheets and games for students in grades 1-12.

BOOKS:

ELEMENTARY

Inside Your Outside! All About the Human Body. Tish Rabe. Random House, 2003.

Young children will love this Cat in the Hat -style introduction to the human body. Beginning readers will enjoy the rhyming and the illustrations. Whether children read this book independently or listen to it as a read-aloud, it will reinforce the science content. The topic is appropriate for early childhood education since learning about the body is included in national and most state standards. While other books on the subject of the human body go into greater detail and specificity and deal with the topic in a more scholarly way, this Seuss-like style has a great appeal for children. This book is a good choice for teachers looking to integrate reading and science.

MIDDLE SCHOOL

Human Body Revealed. Sue Davidson and Ben Morgan. DK Publishing, 2002.

Visual representations of the body are nothing new. This volume is unique in the spectacular quality and quantity of images displayed. Use of transparent templates allows the reader to “peel away” layers, revealing the interactions among bodily systems. Index.

HIGH SCHOOL

DK Guide to the Human Body. Richard Walker. DK Publishing, 2001

Dynamic computer-enhanced, three-dimensional illustrations reveal the inner world of the human body. Multiple imaging techniques such as X-ray, MRI, and CT scans present the reader with views of the human body from the microscopic to the macroscopic level. Each image helps to explain the complex functions of the body systems. Glossary, Websites, Index.