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TRAFFIC SIGNAL**
have in common?
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unit on page 56



The ABC's of DNA

Genetics activities with a twist

by Jordan D. Brown

Genetics is a hot topic these days. Newspapers, magazines, and TV programs feature stories about cloning animals, using DNA evidence to solve crimes, and exploring the human genome. Before students can understand these news stories, they first need to get a handle on the basics. The following activities can help students learn what DNA is, find out where DNA is located in the human body, and explore some of the ways DNA influences our lives.

Getting Ready

ALL GRADES Physical traits are passed from parent to child through DNA.

Introduce students to genetics by showing them some color photographs of children with their biological parents—the closer the physical resemblance in these pictures, the better. (These photographs can be clipped from magazines, printed from the Internet, or borrowed from family albums.) Ask: *What are some of the physical features that these children share with their parents?* Students may mention characteristics such as hair color, hair texture, eye color, skin color, nose shape, and so on.

Then ask: *Why do these children look like their parents?* After a brief discussion, explain that the answer has to do with three letters: DNA. Point out that DNA is the short way of saying a long chemical name—**deoxyribonucleic acid** (pronounced “dee-OX-ee-rye-boh-new-CLAY-ic acid”). Explain that DNA helps pass along information from parents to children to grandchildren and so on.

Jordan D. Brown, a freelance writer, editor, and educational consultant, has created funny songs about DNA, earthquakes, bacteria, and mutts.

Children get half of their DNA from their mother and half from their father. The part of DNA that carries information from one generation to the next is called genes.

Tell students that DNA is found inside every living thing. It's the chemical that contains each plant or animal's code or recipe and tells each cell what to do. Although a molecule of DNA is too small for even the most powerful microscope to see, scientists have figured out its shape—a long, twisted ladder. Show students an illustration of DNA, and encourage them to practice drawing it, using the instructions at right.

Separated at Birth

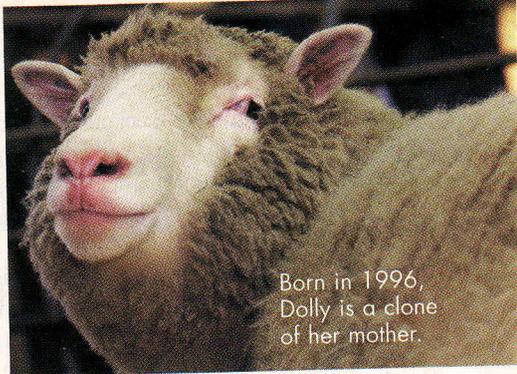
Some traits are inherited and others are formed from interaction with the environment.

Ask students to imagine that a pair of identical twins has just been born. One of the twins is adopted by a family in your town or city. The other twin is raised by a family in a distant country such as France or China. Imagine that these twins grow up separately, never meeting each other. Ask: *When the twins turn 12 years old, in what ways do you think they will be the same?* (eye color, hair color, shoe size, hair texture, etc.) *In what ways will the twins be different?* (speak different languages, have different hairstyles, etc.) Finally, ask: *Since identical twins have the same DNA, what does this tell you about how DNA affects your life and how it doesn't?*

Tricks of the Trait

Genes determine some behavior.

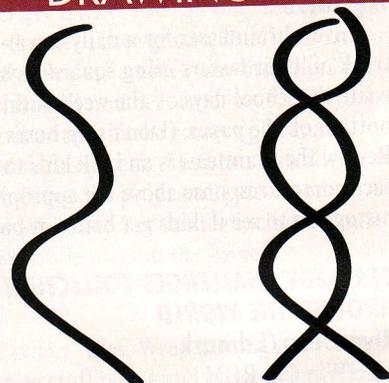
Genes not only control physical features such as foot size and eye color, but also some behavior. Ask students if they can demonstrate any



Born in 1996, Dolly is a clone of her mother.

of these four traits: tongue curling; ear wiggling; bending a “double-jointed” thumb backwards; and raising just one eyebrow. Explain that some people have the genes for these traits, and others don't. Students can investigate this phenomenon with a wider audience by conducting a survey. Have them make a chart, listing the four traits mentioned above along the top of the chart. Along the left side, have students write the names of the people they survey. Then for homework, ask each student to interview at least 10 people to determine

DRAWING DNA

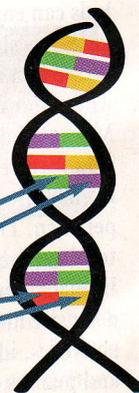


1 Use a dark color to draw a squiggly line.

2 Using the same color, draw another squiggly line that goes back and forth in the opposite direction.

3 Inside every “loop” of the ladder, draw colored “rungs.” Each rung should be made of two different colors which stand for two different chemicals that are attracted to each other. Designate one color for each chemical—**adenine (A), thymine (T), guanine (G), and cytosine (C).**

A always pairs with T; G always pairs with C.



which of the four genetic traits they have. The next day have students compare their results.

DNA at Your Fingertips

GRADES 4-8 Every living thing has DNA.

With this experiment, students will be able to see clumps of onion DNA. You can also use other DNA sources, such as broccoli, spinach, peas, and chicken liver.

Important safety note: *Since this activity involves a blender and rubbing alcohol, it is strongly recommended that you conduct this experiment as a demonstration or with close adult supervision.*

You will need:

- ✓ medium-sized onion, ✓ water, ✓ knife and cutting board, ✓ blender, ✓ salt, ✓ strainer, ✓ mixing bowl, ✓ dishwashing liquid, ✓ clear glass, ✓ meat tenderizer (available in your supermarket's spice section), ✓ rubbing alcohol (70% or higher), ✓ measuring spoons, ✓ coffee stirrer or Popsicle stick

Follow these steps:

1. Chop the onion into chunks and put in the blender. Add a teaspoon of salt and twice as much water as onion chunks. Blend for 10 seconds.
2. Pour the onion mixture into a strainer over a mixing bowl. Discard the onion "slush" in the strainer. Pour the onion "juice" from the mixing bowl into a clear glass.
3. Add dishwashing liquid to the glass (about 1/6 the amount of onion juice).
4. Add 1/2 teaspoon of meat tenderizer to the glass. Stir *gently* and wait 10 minutes.
5. SLOWLY pour alcohol into the glass. Do not stir. The alcohol will float to the top. After a few minutes, stringy white globs will appear. They're bunches of onion DNA!
6. Slowly drag a coffee stirrer or Popsicle stick through the alcohol at the top of the mixture until some of the DNA sticks to it.
7. Touch the onion DNA if you want, but make sure to wash your hands well afterward.

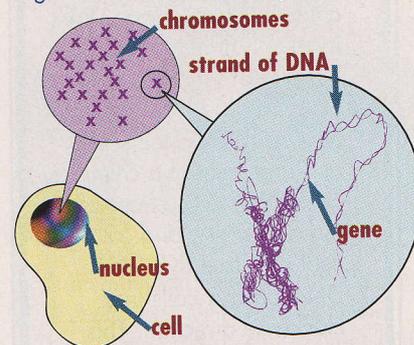
Clone Controversies

There are different opinions about whether humans should be cloned.

A clone is an animal that's a genetic duplicate of another animal. Normally, an animal gets half its DNA from its mother and half from its father. But when an animal is cloned, it gets 100 percent of its DNA from its mother. In 1996, a sheep named Dolly was born. She was cloned from her mother. Although Dolly is six years younger than her mother, both sheep share the same DNA. (Note: Human identical twins are naturally existing clones.) Scientists have also been able to clone monkeys, cows, and mice. Currently, the cloning of humans is illegal throughout the world. Ask students to list reasons why many people are opposed to cloning humans (it is considered unnatural, the technology could be misused, and so on) and why others approve of the idea (doctors could create needed organs, it could help with scientific research, etc.). Hold a debate so that

WHERE IS DNA?

Most cells have a nucleus, which is the cell's mission control center. In the human nucleus, there are 46 chromosomes in 23 pairs (X's). Each chromosome is made up of DNA, and segments of the DNA are genes.



students can hear both points of view.

Resources

Web Sites

www.ology.amnh.org/genetics The Gene Scene is a kid site from the American Museum of Natural History.

www.genome.gov/ The Human



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