BACTERIUM MODELS YOU CAN EAT!

GRADES K-5

BACKGROUND

Bacteria are microorganisms found everywhere in our environment. They are vital to our existence and perform many important functions, such as digesting our food and keeping our ecosystem in balance. There are thousands of bacteria living in waterways such as streams, rivers, and lakes. We need bacteria to survive and most are harmless, but there are some bacteria that can cause diseases and make us sick. Many of these harmful bacteria are found in poop, especially fecal coliform bacteria, which can make us sick if we swim in or drink bacteria-contaminated water.

MATERIALS

- Your favorite recipe or mix for rolled sugar cookie dough (the kind cookie cutters are used on)
- Bacterium shape templates (provided at end)
- Bacterium illustrations (provided at end; print out one for each student)
- Bacterium organelles for students to add to the cookies:
    - Chocolate frosting or chocolate pudding = cytoplasm
    - Chocolate chips = nucleoid DNA
    - Small chocolate-coated candies (such as M&Ms Minis or Mini Reese's Pieces) = ribosomes
    - Icing in a tube, or sprinkles = plasma membrane, capsule, cell wall
    - Chocolate shavings or coconut shavings = pili and fimbrae
    - Gummy worms = flagella
- Bowls or plastic food storage containers to hold bacterium organelle ingredients

TEACHER PREPARATION

- Prepare cookie dough and roll it out.
- Use the templates provided to cut cookies in the shape of round, rod-shaped, and spiral-shaped bacteria. Cut out as many cookies as there are students (and maybe a few more for backup, in case some break or crumble).
- Bake the cookies, following recipe or mix instructions.

INSTRUCTIONS

1. Explain that there's a whole world we can't see with our naked eyes: the world of bacteria, single-celled organisms that live almost everywhere on earth. Bacteria are simpler and smaller than the cells of plants and animals (eukaryotes), which is why they have their own classification, prokaryotes. This activity will show the organelles in a bacterium.
2. Hand out the bacterium illustrations and go through the organelles one by one, writing new terms and definitions on the markerboard as you go (see Definitions).

GENERAL DEFINITIONS

DNA: A molecule that holds genetic information for living things.
Eukaryote: An organism whose cells hold DNA inside an enclosed, protected nucleus. Plants and animals are eukaryotes.
Prokaryote: A single-celled organism with no nucleus inside its cell; instead, the DNA just gathers together in a general area called a nucleoid (see below). Bacteria are prokaryotes.
Organelle: A cell part that has a specific function.

BACTERIUM ORGANELLES

Cytoplasm: The fluid inside a cell. It keeps the cell's pressure constant, and contains important molecules needed for cell functions, including the ribosomes.
Nucleoid: The brain of the bacterium, the area where DNA clump together in the middle of the cell.
Ribosomes: Tiny molecular machines that take orders from the nucleoid to build proteins for the cell.
Plasma membrane: An outer layer that controls what enters and leaves the cell.
Capsule and cell wall: Outer layers that maintain the shape of the cell and protect it from intruders.
Pili and fimbrae: Hair-like structures that surround the bacterium cell. These structures allow it to attach to different surfaces, and also to exchange genetic information with other bacteria.
Flagellum (plural flagella): A long tail on the bacterium cell that helps it move and sense its environment. Some bacteria have only one flagellum, others have many. Other bacteria are non-motile – completely stationary – as they have no flagellum at all.

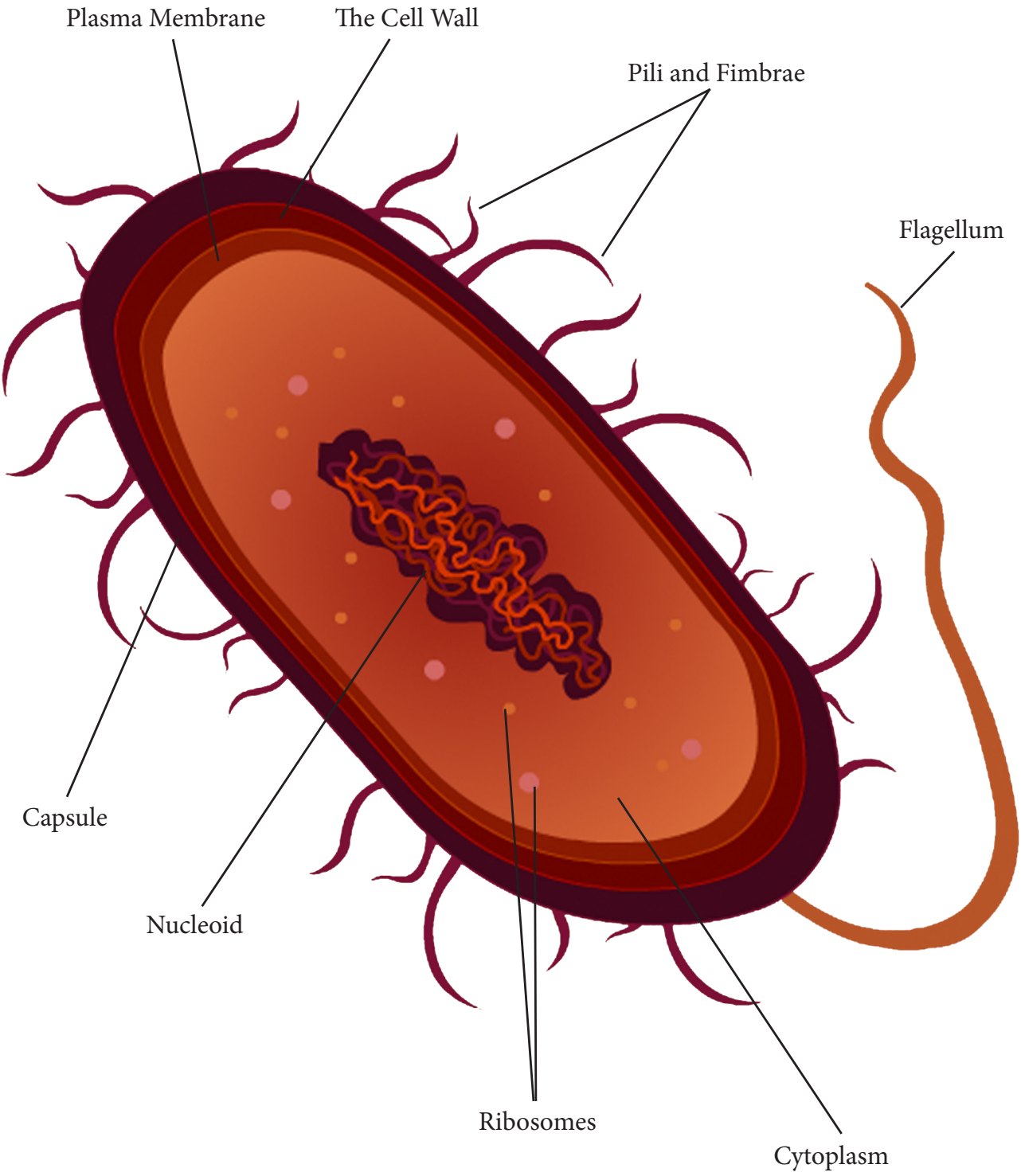
INSTRUCTIONS (CONT.)

3. Arrange students in whatever way is most practical for adding ingredients to the cookies: small groups, an assembly line process, or another configuration, depending on the circumstances.
4. Distribute the cookies.
5. Have students add the ingredients one at a time, reviewing the definitions as you go:
   - Spread cytoplasm on top of the cookie (put enough on so that all of the other elements will stick!)
   - Put a small cluster of nucleoid DNA in the center
   - Sprinkle ribosomes around the nucleoid
   - Surround the edges of the cookie with the outer layers: plasma membrane, capsule, and cell wall
   - Add the pili and fimbrae around the edges
   - Add the flagellum to one end
6. When the bacterium cookies have been fully decorated, do one final recap: quiz students on what a bacterium is and what each ingredient they've added represents.
7. Eat and enjoy!

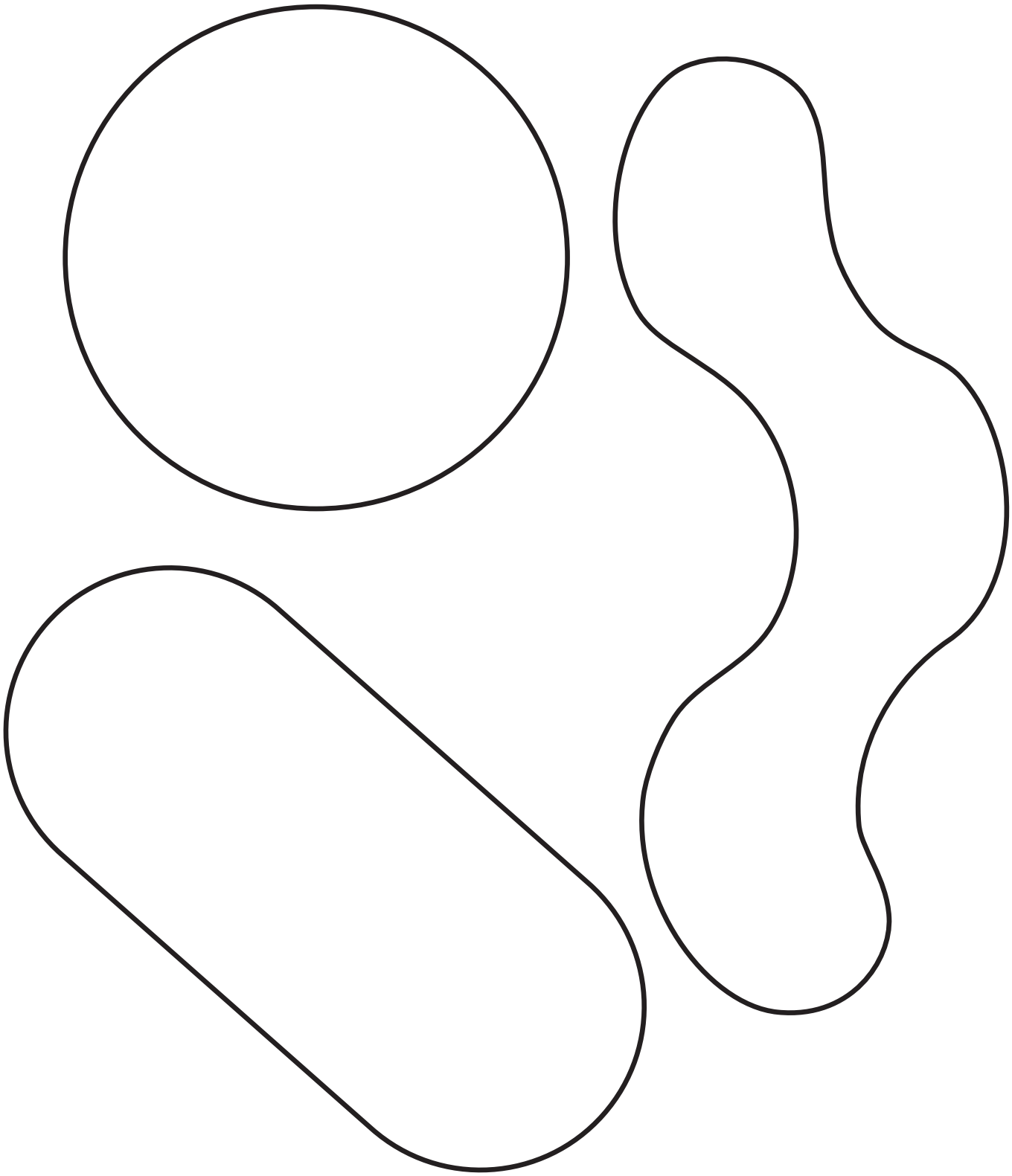
OPTIONAL FOLLOW-UP ACTIVITY

Now that they've been memorably (and tastily) introduced to the organelles of a bacterium cell, the students can create a class bulletin board display to help build vocabulary and word recognition.

BACTERIUM ILLUSTRATION



BACTERIUM SHAPE TEMPLATES



Adapted from
http://science-london.com/home/wp-content/uploads/2011/06/NEW-Bacteria-event-and-guide1.pdf

Additional Resources:
http://www.sheppardsoftware.com/health/anatomy/cell/bacteria_cell_tutorial.htm
(Tutorial and game to test students' knowledge on the different parts of bacteria)