

## **A Phagocyte in Action**

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Phagocyte means “cell-eater”. Phagocytes are a kind of white blood cell, and they play a very important role in the body’s immune response. They are a “first line, non-specific defense”, in that they do not need to specifically identify a pathogen intruder to go into action. They rove throughout the circulatory system, gobbling up debris, bacteria and viruses, and infected or worn out cells. Some phagocytes migrate to the tissues of selected organs – the lungs, liver, kidneys, and brain, and enlarge into macrophages (“big eaters”). When a phagocyte digests a pathogen, it displays an identifying piece, or epitope, of the pathogen on its membrane. When T-cells “see” this marker, they order B-cells to produce antibodies for that particular pathogen.

The following activity demonstrates how a phagocyte surrounds and digests a pathogen, presents identifying material, and ejects waste.

### **Materials:**

Your students

A piece of colored paper or cloth for the “pathogen” to hold

### **To Do and Notice:**

Tell the class they will be acting out the role of a phagocyte, a white blood cell in the body’s immune system.

Have the students form a circle, holding hands, facing out. This represents the outer, hydrophilic layer of the bilayer cell membrane.

Take 3 or 4 students and have them form a smaller, inner-facing circle within the cell, representing the lysosome, full of digestive enzymes.

The teacher is then the pathogen – bacteria or virus – which will be ingested by the phagocyte. The pathogen carries the colored paper or cloth that is its identifying marker.

As the pathogen nears the phagocyte, the students in that area of the membrane “engulf” the pathogen without letting go of their joined hands.

When the pathogen is enclosed by a circle of students, they quickly break off from the outer circle, which reconnects again. There is now a pathogen INSIDE the cell, but it cannot damage the cell because it is surrounded by the outer layer of cell membrane.

What now? The lysosome migrates over to the encapsulated pathogen, fuses with it, releasing its digestive enzymes, which kill the pathogen. (The teacher could scream in agony at this point.)

Then the dead pathogen-containing vacuole migrates to the cell membrane, and joins it so that the contents of the vacuole are dumped out, except for the colored marker, which a student holds up. This presentation of a bit of the identifying

material of a pathogen is how T-cells are alerted to activate B-cells to make antibodies.

(This activity is adapted from a similar one developed by Michael J.V. Lazaroff)