

Immunology Lesson Plan
Harvard Summer Program
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Tiffany Testa

Title:

What's so great about a little Cell?

Relating Cell Structure to Function in the Immune System

Learning Standards Addressed:

National Science Educational Standards

Life Science

CONTENT STANDARD C: As a result of their activities in grades 9-12, all students should develop understanding of

- * The cell
- * Molecular basis of heredity
- * Biological evolution
- * Interdependence of organisms
- * Matter, energy, and organization in living systems
- * Behavior of organisms

Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

Massachusetts State Standards

Life Science:

CELLULAR:

Broad Concept: All living things are composed of cells. Life processes in a cell are based on molecular interactions.

- Relate cell parts/organelles to their functions.
- Differentiate between prokaryotic cells and eukaryotic cells, in terms of their general structures and degrees of complexity.
- Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport).

ANATOMY:

Broad Concept: There is a relationship between structure and function in organ systems of humans.

Overview:

This activity focuses learning on cell structure and function in the immune system. Learning occurs through independent web research. Students will choose a cell in the immune system. After reviewing websites on the immune system, students apply their knowledge and critical thinking to address prompts around cell structure and function. **This lesson could be used within a unit on: The cell, Anatomy and Physiology or Immunology**

Objectives:

Students will:

- Use internet resources to understand the way specific cells function in the immune system.
- Create an annotated bibliography for resources used.
- Apply knowledge to address connections around cell structure and function

Concepts:

- Organelles structure and function
- Structure of cell membrane
- Diffusion, osmosis, active transport
- Connections between cell structure and function
- Variation of cells in the immune system

Prior Knowledge:

- Introduction to cell organelles
- Introduction to membrane structure and transport across membranes
- Annotated Bibliography format

Teacher Preparation: 1-2 Hours

This activity can be done as a print out, or students can access activity directly from a computer. Depending on the mode chosen, the following preparations must be done:

1. Check computer access. Computers must be linked to the internet.
2. Print out and photocopy student sheets: 1. Introduction, 2. Prompts, 3. Annotated Bibliography Guide Sheet.
3. Check websites. Some may require downloading of certain multimedia players, such as Flash.

Time Required and Activity Structure: 3 Hours

This activity can be structured various ways to accommodate different schedules and various learning styles.

1. The activity can be done entirely in class. It will require 2 or 3, 1 hour class periods.
2. It may also serve as an assessment. It could be introduced in class, but done independently at home.
3. Some class time could be devoted to introducing the activity and starting the research and the remaining work could be assigned as homework.

Links:

General:

<http://www.cellsalive.com/toc.htm#immun>

<http://www.blink.uk.com/immunoanimations/index1.html>

<http://brodylab.eng.uci.edu/cgi-bin/jpbrody/animation/files/12-974484448.html>

<http://www.albany.net/~tjc/immune-system.html>

<http://www.learner.org/channel/courses/biology/units/hiv/index.html>

<http://science.nhmccd.edu/biol/ap2int.htm>

<http://press2.nci.nih.gov/sciencebehind/immune/immune01.htm>

Virus infection:

<http://www.dukecancervaccines.org/latestflash.htm>

Dendritic Cells:

<http://CSI.Washington.edu/education/info/dendritic.html>

T Cells

http://www.hhmi.org/biointeractive/animations/tcell/tcell_frames.htm

<http://www.cellsalive.com/ctl.htm>

B Cells

<http://www.cellsalive.com/antibody.htm>

Natural Killer Cells

<http://www.cat.cc.md.us/courses/bio141/lecguide/unit3/intro/nk/nk.html>

http://www.cancervaccines.com/media/natural_killer_cells.cfm

Bacterial Infection

<http://www.hhmi.org/biointeractive/disease/animations.html>

Mast Cells

<http://www.cellsalive.com/mite1.htm>

Phagocytic Cells

<http://www.cellsalive.com/mac.htm>

References:

Richard A. Goldsby, Thomas J Kindt, Barbara A Osborne, Janis Kuby. Cells of the immune system. In *Immunology*, 5th ed., P. 25. WH Freeman and Co., New York

Assessment Options:

1. Immune Response Teams: Students are broken up into collaborative groups. Each student in the group is responsible for one cell type. After completing this activity, students teach their peers about their cell. In groups, or individually, students create story boards, cartoons or books that show their understanding of cell players in the immune system.
2. This lesson as it is can serve as an assessment.
3. Students can demonstrate their understanding by presenting their information in pamphlets, to an audience or integrated into a larger project on disease.