

Microarray Day-to-Day

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Abstract:

We are going to learn about the different types of immunities active/passive, acquired/natural) and different viruses. Discuss how they are contracted, modes of transport, vectors, organ system affected, discuss antibodies and antigens and the medical terminology that goes with this. We will do the virus microarray simulation lab as a conclusion to the unit.

Mission Statement:

The development of this proposal will reinforce the relationship between all organ systems in the human body. It will show how when the body receives a virus, it fights back forming antibodies, symptoms arise and we feel “sick.” We will also show how science is used to diagnose disease.

Description:

During the chapter on immunity, we will do the lab on virus microarrays. This lab will show how certain tests are done in the lab to determine how a patient is infected with a particular disease, virus, bacteria or other pathogen. Students will be able to demonstrate a greater understanding of how antibodies and antigens work, passive or active immunity. They will be required to turn in a lab report showing a competency of the material in the unit.

Plan of Action:

Background: Applying real-life applications of how science works, cutting edge technology and what is going on with current events is important to capturing a student’s interest. Is it important? Is it relevant? Does this affect me? In my anatomy and physiology course, we will be discussing the immune system. How does the body fight infection? Why do some people get sick when a “bug is going around” and others don’t? Learning about the development of antibodies from antigens is an integral part of this chapter. This unit is a perfect place to show the application that organ systems work in tandem and how the lymphatic system and circulatory system are very similar.

Implementation: This lab activity will reinforce the concept of testing for several viruses and how antigens and antibodies work within the body. After explaining the concept of antibodies and antigens, we will reinforce the concept with the Virus Microarray simulation lab developed by Charles Lawrence. I will present 10 groups of three students with different scenarios for potential transmission of a virus (SARS, Avian flu, Hepatitis, etc). Each student will be required to wear goggles, protective gloves and an apron to simulate what happens in a real medical lab. We will do the simulation lab and between every step, they will be required to answer a few questions about the immune system, and in the end, they will have to determine what virus is present.

Expected Outcomes: The students will have a greater understanding of the relationship between our body, viruses, antibodies and antigens. They will get a glimpse into a real world application to science, why it’s important and potential career opportunities. It is very important to me to get students enthusiastic about science. With this simulation lab, they will feel like real scientists because of the lab safety rules I will expect them to follow, including wearing gloves, goggles, lab aprons and taking extra care to handle the “dangerous” virus-containing serum.

Expertise:

I have been a science teacher for seven years at Buchholz High School in Gainesville, FL. I have taught physical science, biology, chemistry and anatomy and physiology. Before I started teaching, I lived in Atlanta, GA and worked as a chiropractor, so my understanding of human biology, anatomy and physiology is strong.

Budget and Budget Justification:

The following is a list of the needed supplies for the stated lab:

Item	Quantity	Source	Item #	Unit Cost	Total	
Forceps	10	Flinn Scientific	AB1013	\$2.05	\$ 20.50	
Small bag	10	Publix			2.95	
Large bag	10	Publix			3.95	
Paper towels	10 rolls	Publix		2.50	25.00	
50 mL conical tubes	240	USA Scientific	1500-1200	110.00	110.00	
Test tube racks	10	USA Scientific	2304-8042	9.50	95.00	
Containers	20	Publix		3.50/5	14.00	
Labeling stickers	240	Publix		5.50	<u>5.50</u>	
Microarray slide	10	received as a part of the ICORE workshop				
					\$276.00	

LESSON PLAN

TITLE: Microarray Day-to-Day

KEY QUESTIONS:

What are some differences and similarities between passive and active immunity?
What are some differences and similarities between natural and acquired immunity?
Why do some people get “sick” when a “bug is going around” and others don’t?
What are antigens?
What are antibodies?
How does the body fight infection?

GRADE LEVEL: 10-12

GLOBAL STUDIES TOPICS: Disease and the spread of disease, medical care, population growth

SUBJECTS: Biology, Anatomy and Physiology

TIME ESTIMATE: 5 days

VOCABULARY: Definitions obtained from Campbell & Reece (2005) and Merriam-Webster.com.

Antigen – any substance foreign to the body that evokes an immune response

Antibody - produced normally by cells after stimulation by an antigen and act specifically against the antigen in an immune response

Parasite – an organism that benefits by living in or on another organism at the expense of the host

Immunity - a condition of being able to resist a particular disease especially through preventing development of a pathogenic microorganism or by counteracting the effects of its products

Virus – a non-living package of genes in a protein coat

Bacteria – a type of prokaryotic cell

Pathogen – a disease-causing agent

LESSON SUMMARY:

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STUDENT LEARNING OBJECTIVES:

SCIENCE

The student will be able to...

1. define the vocabulary terms and use them appropriately in a sentence.
2. describe the relationship between a host and parasite.
3. name several major diseases and the type of organism that causes each disease.
4. list two reasons why people have difficulty receiving adequate medical attention.
5. explain how different diseases are spread from host to host
6. explain the difference between active/passive and natural and acquired immunities

MATERIALS:

It is necessary to have basic items such as: overhead projector, notes, pencil, paper for a class size of 30 students.

Forceps	10
Small bag	10
Large bag	10
Paper towels	10 rolls
50 mL conical tubes	240
Test tube racks	10
Containers	10
Labeling stickers	240
Microarray slide	

ASSESSMENT:

Day 1: Lecture and notes on the Lymphatic system and how immunity works. Discuss vocabulary and medical terminology.

Day 2: Spend day in library and computer lab. Break students into ten groups of three. Assign a different disease (H1N1, Avian flu, SARS, hepatitis, etc) to each group. They are responsible for researching and finding the following answers about their particular disease:

1. What organism transmits this disease
2. What is the mode of transport for this disease
3. What are some effective ways of preventing this disease
4. What part of the body is affected by this organism
5. Physiologically speaking, what homeostatic imbalance is present

Day 3: Finish doing research and create a presentation to give to the rest of the class

Day 4: Present your findings to the rest of the class. The class is to take notes on each group's disease

Day 5: Do microarray lab, identify the disease present, and write a lab report on your findings and answer the questions about the organism, mode of transport, anatomy affected and prevention.

RESOURCES/REFERENCES:

Campbell, N. A. & Reece, J. B. (2005).

Merriam-Webster.com

Essentials of Human Anatomy and Physiology (2006)

MerriamPreston, R. (1995). *The hot zone*. New York: Anchor B.