

Mosquitoes as Vectors for Emerging Pathogens

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Abstract

This plan incorporates a lesson and student research on Mosquitoes as Vectors for Emerging Pathogens. My AP Bio and IB Bio students will be involved in this project. A presentation, ELISA lab, and Immuno Assay simulation will be incorporated. Students will learn about global diseases like Dengue, Malaria, and West Nile including their distribution, symptoms, method of transmission, and currently available treatments for these diseases.

Rational

The AP curriculum does not currently have clear course standards. However, this is a college level biology class and students are expected to have a basic knowledge of biotechnology including: gel electrophoresis, PCR, stem cell research, genetically modified organisms and bacterial culturing and transformation. They also have to study viruses and bacteria along with an overview of most of the other phyla of species on the planet. We need to include pathogens, transmission, and immune response as part of the AP course.

The IB curriculum has clear standards called assessment statements. The assessment statements that apply to this project are:

- 6.3.5 Distinguish between antigens and antibodies
- F.6.8 Discuss the origin and epidemiology of one example of a pandemic.
- F.6.9 Describe the cause, transmission and effects of malaria, as an example of disease caused by a protozoan.

Description of teaching unit

I plan to teach about mosquitoes as vectors for disease transmission by using some of the presentations given by presenters in the ICORE program. In this lesson, I will also teach about detection of disease in the human population via antibody/antigen reaction. Then have them do an ELISA test. After conducting the simple ELISA test, I will use Dr. Charles Lawrence's PowerPoint with the ImmunoAssay simulation as further application. Then we will conduct the simulated ImmunoAssay.

Data collection and/or student assessments

I plan to give a practice AP test (multiple choice version) before beginning the unit and then again after. Since passing the AP exam is the main goal, measuring whether or not this unit affects their AP test score is what matters for this class.

For the IB classes, I will give a pre and post test written like an IB test. This means about 30% multiple choice, one long response, and the rest will be short answer. The IB questions are specifically written to the standards.

ICORE elements specifically included

Information from Dr. Connelly's and Dr. Tatem's presentations

ELISA lab

Dr. Charles Lawrence's presentation on the Immunoassay

Immunoassay simulation

Literature Cited

Diploma Programme Guide Biology first examinations 2009. International Baccalaureate Organization (2007). Cardiff: United Kingdom.

Tatem, Dr. A. (2010). *Malaria: measuring, mapping, and litigating*. Gainesville: UF.

Connelly, Dr. C. R. (2010). *Insect vectors and florida's public health*. Gainesville: UF IFAS.

BioRad Catalogue 2010

Integrated Pest Management for Mosquito Control Gainesville: University of Florida IFAS extension

Materials needed from ICORE program

PowerPoint presentations from Dr. Connelly and Dr. Tatem

DVD from Dr. Connelly on "Integrated Pest Management for Mosquito Control" created by University of Florida IFAS extension

Directions for Paul's pipette exercise

Budget and budget justification

ELISA Immuno Explorer kit#166-2400EDU cost = \$124.00 x2 = \$248

Immunoassay simulation cost=\$0 (provided by Dr. Charles Lawrence from CPET)

Well plates(96 wells) for pipeting cost = ?

Lesson Plan (105 minute periods every other day)

Prior to day 1

- Give the pre-test

Day 1

1. Essential Question = How do mosquitoes play a role in spreading disease? (5 min)

2. Presentation by me adapted from Dr. Connely's Power Point on Mosquito vectors (50 min)
3. Pipette use – practice with Paul's exercise (30 min)
4. Summarize what we discussed today (5 min.)

Day 2

1. Essential Question = What emerging diseases are important in relation to mosquitoes? (5 min)
2. Presentation by me on emerging pathogens and global mapping of Malaria using Dr. Tatem's Power Point(40 min)
3. Have students work in pairs with computers or previously pulled handouts from websites on various emerging pathogens related to mosquitoes to create a 2 to 3 minute presentation (30 min)
4. Have students present their pathogen to the class (30 min)
5. Summarize what we discussed today (5 min)

Day 3

1. Essential Question = How can we test for exposure to pathogens in humans? (5 min)
2. Presentation by me on antigen/antibody reactions (25 min). This Power Point will be created by me.
3. Conduct the BioRad ELISA kit (60 min)
4. Review everything we have completed on this topic so far
5. Summarize what we discussed today (5 min)

Day 4

1. Essential Question = How can an ImmunoAssay be used to detect disease? (5 min)
2. Presentation using the PowerPoint with the ImmunoAssay simulation from Dr. Lawrence. (15 min)
3. Conduct the Immuno Assay (20 min)
4. Review using remotes (50)
5. Summarize what you have learned about emerging pathogens and mosquitos.

Day 5

1. Post test

*Note – I plan to include many other elements from ICORE into my lesson plans throughout the year.

Some of these elements are:

- Gel electrophoresis – either at UF for AP lab 6 or borrowing the equipment to do this in my school
- PCR – borrowing the equipment and maybe a person
- DNA extraction – borrowing equipment or at AP lab 6
- Power Points from Dr. Morris, Dr. Funderburk, Dr. Tatem, Dr. Salemi, Dr. Connelly, and Dr. Lawrence
- I would love to have Dr. Salemi come give a guest lecture at my school if I can arrange it.
- Examples of various diseases from many of the presenters
- *Mission Biotech*