The Hot Diseases of 2012: Yes, You Do Need to Worry!

Jennifer Guillard
Mandarin High School, Duval County
guillardj@duvalschools.org

Abstract
This unit will focus on the major infectious diseases that are covered in the AICE curriculum: cholera, AIDS, and malaria. Students will be instructed on the prevalence, symptoms, vectors, risk factors, and treatment of these pathogens as well as the biotechnology procedures used to identify them in environmental and patient samples. Instruction will include power point presentations created by University of Florida professors, discussions, Internet database research, working together in lab teams, and answering lab-based questions. The unit will include use of UF equipment lockers and will culminate in a visit to UF and lab activities at that facility (TBD).

Rationale
Diseases and immunity are a big part of the AICE (Advance International Certificate of Education) curriculum and cover two of 24 chapters in the textbook: Chapter 13 Infectious Diseases and Chapter 14 Immunity. Major topics within these chapters are: the worldwide importance of infectious diseases, cholera, malaria, AIDS, and active immunity. In addition, many of the biotechnologies that I learned through iCORE are lab skills that are part of the curriculum. The students in this class are highly motivated and high-achieving. Classes are 90 minutes each day, as the class is double-blocked. At the end of the year, students are required to take five exams that, upon passing them, will confer college credit. The activities that I have learned through iCORE and will use with my students will effectively ensure that they not only know the prevalence, symptoms, vectors, risk factors, and treatment of the emerging pathogens that are discussed, but they will also know the biotechnology procedures used to identify them in environmental and patient samples.

Description of teaching unit
I intend to create a unit much like the Viral Quest lab notebook that will include the topics that are pertinent to this action proposal, as outlined below. As part of the notebook and Disease/Immunity unit, I will also cover the following topics that were not included in the ICORE workshop and are not included in my descriptions here: tuberculosis, antibiotic structure and function, defense against disease, cells of the immune system, active and passive immunity, and measles.

This Action Proposal highlights the topics and activities that are specifically pertinent to those that we covered in the Emerging Pathogens workshop and include, by AICE biology textbook chapter:

- Chapter 13 Infectious Diseases
    - Day 1 Intro to Unit:
        - Journal Prompt (5 min.)
        - Unit Pretest (15 min.)
        - Worldwide importance of infectious diseases – class discussion (30 min.)
        - Meet the Menacing Microbes Activity (eLearning, stuffed “microbes” Locker) (20 min.)
        - Exit Slips (5 min.)

- Day 2 Cholera:
  - Journal Prompt (5 min.)
  - Pipetting practice (of some sort) (30 min.)
  - Dr. Johnson Vibrio typing ppt (30 min.)
  - Medical Mystery of Epidemic Proportions! Activity (25 min.)
    - Handout
    - Rapid-Test dipsticks
    - Antibody Test
    - DNA Microarray
- Day 3 Cholera (cont):
  - Journal Prompt (5 min.)
  - Finish Medical Mystery Activity (50 min.)
  - Students research SIFT database for cholera, malaria, and AIDS sites for recent outbreaks (30 min.)
  - Exit Slips (5 min.)
- Day 4 Malaria:
  - Journal Prompt (5 min.)
  - Dr. Connelly Disease Vectors ppt (30 min.)
  - Electrophoresis Activity with Scenario(50 min.)
  - Exit Slips (5 min.)
- Day 5 AIDS:
  - Journal Prompt (5 min.)
  - HHMI Holiday Lecture and animations (65 min.)
  - Dot blot with Scenario (15 min.)
  - Exit Slips (5 min.)
- Day 6 Unit Posttest and AICE past exam critical thinking questions based on these topics

- Chapter 14 Immunity (the following activities will take place after discussion and activities related to cells of the immune system and passive immunity and prior to discussion of antibiotics.)
  - Active Immunity
    - Linda Green ELISA Talk ppt
    - ELISA activity with Scenario
  - Unit Posttest

**I would also like to bring my class down to UF to tour the labs and do the proteomics lab

Learning Objectives

By the end of this unit, students will be able to:

- Explain what is meant by an infectious disease;
- Describe the causes of cholera, malaria, AIDS, and TB;
- Explain how these diseases are transmitted and assess the importance of these diseases worldwide;

- Discuss the roles of social, economic and biological factors in the prevention and control of these diseases;
- Discuss the reasons why vaccination has eradicated smallpox but not measles, TB, malaria, or cholera;
- Relate the molecular structure of antibodies to their functions.
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Standards Covered

AICE AS Syllabus I and J

SC.912.L.15.15 Describe how mutation and genetic recombination increase genetic variation.
SC.912.L.16.10 Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.
HE.912.C.1.8 Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.
SC.912.L.14.52 Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.

Data collection techniques and/or student assessments
Pretest (Multiple Choice, on Qwizdom remotes)
Lab "Notebook" packet
Journal entries
Performance-Based assessments (lab skills)
Posttest (Multiple Choice, on Qwizdom remotes)
AICE past exam questions on these topics

If applicable, use of equipment lockers and/or UF visit (either in the classroom or UF campus)
Equipment Lockers: Stuffed Pathogens, eGels, micropipettes, Medical Mysteries of Epidemic Proportions
UF Visit

ICORE summer institute elements specifically included (UF connections)
- Cholera ppt and Medical Mystery Activity
- Testing Techniques: DNA microarray, rapid test dipsticks, antibody test
- Malaria ppt and electrophoresis use
- Dot blot, ELISA
- SIFT research

References and Literature cited
Jones, Mary. "AS and A Level Biology." 2009. Cambridge University Press.
HHMI DVD "AIDS"
SIFT database
Dr. C. Roxanne Connelly, Historical and Emerging Mosquito-borne Pathogens in Florida ppt (eLearning)
Dr. Judith A. Johnson, Molecular Biology of *V. cholera* ppt (eLearning)
Medical Mystery of Epidemic Proportions! Activity (eLearning), adapted from *Science Take Out/ University of Rochester Medical School activity*
Linda Green ELISA Talk ppt (eLearning)

Budget and budget justification

Quantity	Item	Per Cost	Total Cost
7	eGel & chamber	*	*

*no cost due to using UF equipment lockers