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ARE YOU GOING TO GET ZIKA?

ACTION PROPOSAL

TITLE: Are you going to get Zika?

KEY QUESTION: What is zika? How is it transmitted? How does it affect humans?

SCIENCE SUBJECT: Biology (honors and regular), Honors Anatomy and Physiology, AP Biology, AP Environmental Studies

GRADE AND ABILITY LEVEL: Can vary from 9th through 12th grades depending on the activity and amount of learning required. For this lesson, we will focus on the upper level student.

SCIENCE CONCEPTS: Emerging diseases, arthropods, team building, research concepts.

OVERALL TIME ESTIMATE: 3-5 periods, depending on the level of the class

LEARNING STYLES: Visual, auditory, and kinesthetic

VOCABULARY: Virus, zika, arthropod

ACTION PROPOSAL SUMMARY: These lessons will cover an introduction to vector borne viral diseases, and specifically zika, carried on the *Aedes aegypti* mosquito. Students will build their own mosquito trap and then identify, with the use of a dissecting microscope, the *aedes aegypti* mosquito. They will then obtain DNA from the mosquito and amplify it with the use of a thermocycler, after which they will identify the viral DNA, if present, and compare it to that known to produce zika using Blast. They will then learn the symptoms of zika and the consequences of the disease. They should also learn the ways to control the mosquito and the disease.

STUDENT LEARNING OBJECTIVES WITH STANDARDS: The student will be able to:

1. Understand vector borne diseases
2. Emerging diseases
3. Human disease states caused by the pathogen
4. Team learning

HS-LS-1-1

HS-LS-1-A

WHST.9-12.7

SC.912.CS-CC.1.1

SC.912.CS-CC.1.3

SC.912.CS-CP.1.4

SC.912.L.16.1

SC.912.L.16.7

MATERIALS: Supplied mosquito traps, 2 L soda bottles (sugar, water, and yeast), collected mosquitoes, dissecting microscopes, crushing apparatus (for mosquitoes), thermocycler and reagents, computers (with access to the internet), simulated patients with arthropod borne diseases (including zika).

BACKGROUND INFORMATION: Zika infection is in the news every day. The belief is that the students don't pay attention to the news and, therefore, don't know much about the disease. How is it contracted? How does it affect our organ systems? How can it be prevented? The students will be tested as to their knowledge of this disease with a pre-test utilizing TBL (iRAT and tRAT) and how it spreads and manifests in the organ systems of the human body. It is anticipated that the student will know very little about these problems. The students should have some knowledge from their review of homework material (videos) prior to class. Following their iRAT and tRAT (where the students who prepared will aid those that did not), they will have a mini lecture with power points to understand what they have learned. All of this will be in preparation for the actual experiments that follow. They will collect and identify the correct mosquito (*Aedes aegypti*) and perform PCR and DNA identification to look for the zika virus. While it is anticipated they will not find this virus in their collected specimens, simulated codes will be provided that they can research on Blast. They will then be introduced to several patients, whom they can question, that might or might not have zika. This will introduce them to diagnosing the correct disease. Following this they will come up with a treatment and also a means or prevention of zika.

ADVANCE PREPARATION: The students will be shown how to make a mosquito trap and collect the specimens. The pretest will be available to administer. Appropriate videos and assignments will be posted on Edsby for the students to study prior to class. Appropriate power points will be prepared prior to the mini lecture.

PROCEDURE AND DISCUSSION WITH TIME ESTIMATES:

1. Fabrication and collection of mosquitoes at home 4 days prior to beginning of lesson.
2. The students will have studied the material provided to them prior to the lesson. (1 hour)
3. The students will be given a 15 question "test" (iRAT) to determine the knowledge they have obtained from the homework
4. The students will then take the same test in groups of four, discussing their answers and then scratch off the correct answer from the "scratch off" provided to each team.
5. Each team will then begin the application process that will allow them to review material concerning what is a virus, how is it transmitted, what is *Aedes aegypti*, how does it infect a human, and what is zika.
6. Next these questions will be answered in the mini lecture with power point slides.
7. The above should cover 2 periods.

8. The students will collect, freeze, identify (with dissecting microscopes) the *Aedes aegypti* mosquito.
9. After freezing, the students, in groups of 4, will pulverize the *Aedes aegypti* mosquitoes and begin the PCR process, which should take one period. Identification of the DNA will allow them to research Blast for identification of the zika virus. *Due to the inability and cost of obtaining the reagents necessary to conduct the PCR, we abandoned this method of identification and went instead to an ELISA test. The results of this are still pending and will be submitted as soon as completed.*
10. Student actors will simulate various arthropod borne disease with the students identifying the zika symptoms from their homework lessons. *This was done using the Thespian Society, who were trained with symptoms of yellow fever, dengue, ebola, and zika. The student learners were then asked which disease went with which symptoms. 100% were able to identify the respective diseases.*
11. Once identified, the students will discuss treatments, including eradication of mosquito breeding grounds.
12. The above should take 2 periods.

STATISTICAL ANALYSIS: I will use the paired t-test, comparing the correct answers to the questions administered to the students before the unit begins and at the completion. *The post-test has not been given yet, so this data will be included with the results of the ELISA test*

RESOURCES/REFERENCES:

1. www.teambasedlearning.org
2. www.youtube.com
 - a. <https://www.youtube.com/watch?v=1MFC4-k6Png>
 - b. <https://www.youtube.com/watch?v=lx696VcXaJg&t=308s>
3. CBS News 60 Minutes video on Zika *Not shown due to cost of showing this video. Videos from You Tube were shown instead.*

Report

ABSTRACT: the zika virus, carried by the *Aedes aegypti* mosquito, has been in the news for the past year and, most recently, has been discovered in the Tampa Bay area. These lessons will cover an introduction to vector borne viral diseases, and specifically zika, carried on the *Aedes aegypti* mosquito. Students will build their own mosquito trap and then identify, with the use of a dissecting microscope, the *Aedes aegypti* mosquito. They will then obtain DNA from the mosquito and amplify it with the use of a thermocycler, after which they will identify the zika viral DNA, if present, and compare it to that known to produce zika using Blast. They will then learn the symptoms of zika and the consequences of the disease, utilizing actors who will portray having the zika virus, and other disease carried by the *Aedes aegypti* mosquito. They will then learn the ways to control the mosquito and the disease through research of the literature.

RATIONALE: in the honors courses, we teach students to be independent. We teach them to be willing to learn by studying and researching the literature for “new” ideas. We want them to keep up with science, especially that which directly affects them, by reading and paying attention to what goes on around them. Daily TV news reports and articles in the newspaper are filled with news about the zika virus and how it impacts our society. Transmission by the *Aedes aegypti* mosquito, which also transmits yellow fever, dengue, and chickamauga, through it’s bite, and sexual transmission through human contact can have a serious impact on each and every citizen of the State of Florida. Birth defects and Guillian-Barre are the most serious consequences of this disease. Discovering whether this mosquito exists in our backyards and school grounds can be an important first step to keeping this mosquito and the diseases it carries in check.

INTERVENTION: The intervention that follows will involve independent research, observation, and collaborative activities to learn about the mosquito, the disease, the human effects, and treatments, if any. While this lesson plan is for AP and Honors students, it can be and will be modified for any student involved in a biologic subject.

CONNECTIONS TO BENCH TO BEDSIDE SUMMER INSTITUTE: I believe we were exposed to independent research dealing with various diseases, including those very rare, that have an impact on our society. I have chosen this to incorporate what I learned this summer as well as that which I learned in the Emerging Pathogens course several summers ago. Indeed, aren’t we as teachers supposed to incorporate *all* that we learned in allowing our students to get the best education possible and achieve great results.

DATA COLLECTION AND ANALYSIS: Students will tally the number of *Aedes aegypti* mosquitoes “captured in the one profession mosquito trap and the many improvised traps. They will utilize skills taught to them in obtaining DNA and replicating it from the mosquitoes identified as being *Aedes aegypti*. Once done, they will record the DNA sequences and compare these to known sequences of zika. A paired T-test will be utilized to compare what the students know at the beginning of the lesson and what they have learned at the end by testing them with the same questions.

LITERATURE CITED:

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2. Mumtaz N, van Kampen JJ, Reusken CB, Boucher CA, Koopmans MP. Zika Virus: Where Is the Treatment? *Curr Treat Options Infect Dis.* 2016;8:208-211. Epub 2016 Jul 8.
3. Atif M, Azeem M, Sarwar MR, Bashir A. Zika virus disease: a current review of the literature. *Infection.* 2016 Aug 10
4. Calvet GA, Santos FB, Sequeira PC. Zika virus infection: epidemiology, clinical manifestations and diagnosis. *Curr Opin Infect Dis.* 2016 Aug 4
5. Boeuf P, Drummer HE, Richards JS, Scoullar MJ, Beeson JG. The global threat of Zika virus to pregnancy: epidemiology, clinical perspectives, mechanisms, and impact. *BMC Med.* 2016 Aug 3;14(1):112. doi: 10.1186/s12916-016-0660-0
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7. Grischott F, Puhan M, Hatz C, Schlagenhauf P. Non-vector-borne transmission of Zika virus: A systematic review. *Travel Med Infect Dis.* 2016 Jul-Aug;14(4):313-30. doi: 10.1016/j.tmaid.2016.07.002. Epub 2016 Jul 15
8. Mahecha MP, Ojeda E, Vega DA, Sarmiento-Monroy JC, Anaya JM. Guillain-Barré syndrome in Colombia: where do we stand now? *Immunol Res.* 2016 Jul 15

NAME: _____ **PERIOD:** _____ **DATE:** _____

PRE-TEST AND POST-TEST QUESTIONS ZIKA VIRUS

1. Zika is transmitted by:
 - a Ticks
 - b Aedes aegypti mosquito
 - c Anophales mosquito
 - d Fleas

2. People having zika obtained it in:
 - a. Somewhere other than Florida
 - b. Anywhere the aedes aegypti mosquito proliferates
 - c. From a relative through aerosol transmission
 - d. Having an open sore

3. The best time to get this disease is:
 - a. Night time
 - b. Dusk
 - c. Day time
 - d. Anytime

4. The aedes aegypti mosquito transmits:
 - a. Only zika
 - b. Only dengue and chikungunya
 - c. Yellow fever
 - d. All the above

5. Diagnosis of zika is based on:
 - a. Recent travel history
 - b. Symptoms
 - c. All the answers
 - d. Blood or urine tests

6. Symptoms of zika include:
 - a. Vomiting
 - b. Joint pain
 - c. Diarrhea
 - d. Urinary tract infection

7. Symptoms last for:
 - a. 2 days
 - b. 7-10 days
 - c. 1 month
 - d. 5 days

8. Treatment for zika includes:
 - a. Antibiotics
 - b. Fluids
 - c. Aspirin
 - d. Hospitaization

9. The group most seriously affected by zika with complications include:
 - a. Children
 - b. Pregnant women
 - c. The elderly
 - d. People with immune deficiencies

10. Transmission from person to person exists:
 - a. By transfer of sputum
 - b. Blood transfusions
 - c. Touching a person infected with the disease
 - d. Through sexual contact

11. The virus can persist in semen for:
 - a. 10 weeks
 - b. 1 month
 - c. 1 year
 - d. 1 week

12. Most important prevention is:
 - a. Use insect repellents with DEET, picaridin, IR3535, oil of lemon eucalyptus, para-methane-diol
 - b. Wear protective clothing
 - c. Use mosquito netting
 - d. Wash with treated soap

13. To prevent sexual transmission:
 - a. Avoid sex
 - b. Use birth control pills
 - c. Use an intra-uterine device
 - d. Use condoms

14. Women who want to get pregnant should:
 - a. Wait at least 8 weeks after symptoms
 - b. Not ever get pregnant
 - c. Freeze their eggs
 - d. Have a blood test before sex

15. Women who are pregnant and contract zika:
 - a. Should expect no problems
 - b. Could expect microcephaly in the offspring
 - c. Could expect children with exceptional IQs
 - d. Could expect genetic malformations

16. If zika is contracted, monitoring the fetus is by:
 - a. Ultrasound every 3-4 weeks
 - b. Palpation of the abdomen
 - c. Vaginal exam
 - d. Amniocentesis

17. Complications include:
 - a. Permanent vision problems
 - b. Heart disease
 - c. Ataxia
 - d. Guillain-Bare syndrome

18. Vaccines to prevent zika:
 - a. Are not available
 - b. Must be administered 2 weeks before exposure
 - c. Are not fully effective
 - d. Completely prevent the disease