

Disease Vectors

National Science Content Standards

Evidence, models, and explanation; interdependence of organisms; behavior of organisms

TEKS Concepts – Biology 11D

Summarize the role of microorganisms in maintaining and disrupting equilibrium, including diseases in animals

Objectives

Students will . . .

1. Describe mosquitoes as vectors of disease in animals and humans
2. Describe and exhibit behavior that controls or manages mosquito populations in the student's local community

Materials

Per student – 1 copy of the Pathogen Puzzle [Appendix H]
Class set of scissors

Duration

One 45-minute class period

Vocabulary

Dog Heartworm
Host
Incubation
Malaria
Nematode
Pathogen
Protist
Vector
Virus
West Nile Fever
Yellow Fever

Background

1. Disease vectors
 - a. Definition of vector = an animal that carries a disease (but doesn't "catch" it)
 - b. Host = the animal that contracts the disease
 - c. Pathogen = the disease-causing organism
 - d. Not all mosquitoes carry diseases
 - e. Most diseases that mosquitoes vector affect other animals, but not humans.
 - 1) Only females can be vectors, because only females feed on blood

2. Diseases

- a. West Nile Fever (virus)
 - 1) Pathogen - a group B togavirus
 - 2) Symptoms -
 - 3) Tends to be seasonal
 - 4) Vector -
 - 5) Birds are the major vertebrate reservoir (therefore humans are "accidental" hosts)
- b. Malaria (*Plasmodium*)
 - 1) Pathogen - protozoan, class Apicomplexa, genus *Plasmodium*, four species
 - 2) Symptoms - alternating chills and fever with sweating
 - 3) Incubation - 12-30 days, depending on specific species
 - 4) Vector - *Anopheles*, about 60 species of *Anopheles* vector malaria
 - 5) Life cycle -
- c. Yellow Fever (virus)
 - 1) Pathogen - a group B togavirus, genus *Flavivirus*
 - 2) Symptoms - severe liver damage, leading to jaundice on day 4 or 5; headache, backache, fever, prostration, nausea, vomiting
 - 3) Treatment -
 - 4) Vector - *Aedes aegypti*
 - 5) Humans are the primary or secondary vertebrate hosts, monkeys are another major host
 - 6) Tends to be seasonal
 - 7) Treatment -
 - a) Vaccine available
 - 8) Incubation 3-6 days
- d. Dog Heartworm (nematode)
 - 1) Pathogen -
 - 2) Symptoms
 - 3) Vector
 - 4) Life cycle (not in humans)
 - 5) Treatment

3. Impact on History

- a. Yellow fever - Erie Canal
- b. Malaria
 - 1) Erie Canal
 - 2) Panama Canal
- c. West Nile Fever - today, here

4. Control (limiting factors)

- a. Major types of applied insect control
 - 1) Mechanical control
 - a) Window screens
 - b) Clothing - long sleeves

- 2) Physical methods
 - a) Empty water from standing containers
- 3) Biological control
 - a) Nematodes
 - b) Elephant mosquito, *Toxorhynchites rutilus*
 - c) Stock ponds with fish
 - d) Bat houses
 - e) bti
- 4) Chemical poisons
 - a) DDT
 - b) DEET

What to Do

1. Present information about disease vectors and impact on history.
2. Give each student a copy of the Pathogen Puzzle. Instruct them to note that each box has four words or phrases written along its sides. These words/phrases are a vocabulary word, their definition, or an example of the words. As the boxes are arranged on the worksheet, the word or phrase along the side of one box corresponds to the word or phrase that is written along the side of the adjoining box. Have the students cut apart the boxes on their worksheet, mix up the boxes, and match up vocabulary words with the correct definition or example to reassemble the boxes in the original pattern.

Suggestions:

- Place a sticker or stamp in the center box before photocopying, to make puzzle a little easier.
 - Whiteout the twelve words around the outside edges of the puzzle, to make the puzzle a lot easier.
 - Photocopy, laminate, and cut out a class set. Store each set in a separate envelope.
3. Assign each team one of the above diseases to research and present a report to the class. The students need to make sure they thoroughly address the following criteria in their report:
 - a. Describe the mosquito's role in the life cycle of the pathogen
 - b. Describe the historical and economic impact of the disease
 - c. Describe the allergic reaction of the immune system to the bite of the mosquito
 - d. Describe the symptoms of the disease
 - e. Identify methods of controlling these mosquito vectored diseases, including mosquito management, immunization, and drug treatment

Pathogen Puzzle



