Title: Pathogens

Name: Mary Stannard
Palm Bay, Fl 32908
Teach: Health Science 2, Nursing Assistant, Home Health Aide, First Responder, Introduction to Health Care, Medical Terminology

Abstract:

Health Care workers, of tomorrow as well as concerned citizens will be educated about emerging pathogens. within their Infection Control curriculum. The Health Science 2 students will receive their basic education on pathogens as related to human disease to include types of microorganisms, pathogens in each category with identification, signs and symptoms of disease, the chain of infection, diagnosis, treatment and research.

Rational: Increase the education of the health care students of up to date information on Human Emerging Pathogens

DESCRIPTION OF TEACHING UNIT: NATURE OF MICROORGANISMS

- **Factors That Influence Microbial Growth**
- **Types of Microorganisms**

- Bacteria—.
- Fungi—.
- Protozoa—
- Rickettsiae—
- Viruses—

Discuss the need for the TB skin test, hepatitis B vaccine, and influenza vaccine for health care workers and information on children with HIV AIDS

Also included resistant pathogens Explain to students the types of organisms that cause each disease and why the students should be protected.

- Student Motivation Giant Microbes game

Cooperative Learning. Divide the class into two groups, each half has question or answer find your pathogen then proceed to basket for representation for demonstration Each group should describe their microorganism to the rest of the class and, using sample. Identify and describe the diseases caused by their class of microorganisms.

Guest Speaker : Brevard County Health Department STDs

Teach

PRINCIPLES OF INFECTION

Chain of Infection :Dengue Fever Model

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5919a1.htm

Discussion. Factors must be present for infection to occur. The links are:

- Infectious agent.
- Reservoir—.
- Mode of transmission—.
- Portal of entry—
- Susceptible host
- Show spread of disease with maps by Dr Andy Tatem
-

Signs and Symptoms of Infection

Discussion. Local infection results from trauma or injury to the skin. Common signs include redness, swelling, tenderness, warmth, and drainage. Signs of general or systemic infections include fever, malaise, anorexia, and swollen lymph glands.

Methods to diagnosis of disease

Lab procedure Through gaming two weeks

Virus Microarray (HS and PCA) ID multiple disease

ELISA (HS) ID HIV

Methods to Contain Pathogens for Research and community

Photos At Emerging Pathogens Institute with explain Levels 1-4

Exercise of Rift Valley Fever : First Responder Class Spring (see separate lesson plan)

- **Nosocomial Infections**
- **Asepsis**

Prepare the students to practice the following procedure.

- Hand Washing, and hand gel

Demonstrate the technique for proper hand washing. Use glow in the dark powder

Assessment Sheet for student practice and evaluation.

Teach

STANDARD AND TRANSMISSION-BASED PRECAUTIONS

- **Standard Precautions**

Protects the health care worker and the client from the transfer of disease. The assumption is made that all clients are contaminated. Personal protective equipment is worn to protect health care workers from contamination from blood and body fluids.

- **Transmission-Based Precautions**

Discussion. One of the three types of transmission-based precautions should be followed depending on the infectious disease of the client.

- Airborne precautions—.

- Droplet precautions—
- Contact precautions—followed for infectious diseases of the skin or wounds. These precautions are especially important for MRSA (methicillin-resistant staphylococcus aureus) and VRE (vancomycin-resistant enterococcus). A gown and gloves should be worn, and hands should be carefully washed. Resistant TB Multi drug resistant, extensively drug resistant TB

Procedure Donning and Removing Personal Protective Equipment, contaminated.

Assessment Sheet for student practice and. Evaluation

- **Methods That Destroy Microorganisms**

Discussion. Three common methods destroy microorganisms:

- Antiseptics—
- Disinfection—
- Sterilization—

Assess

Complete lab worksheets, tests and progression on Biotech game.

Expected outcomes:

Recognize and Practice Infection Control Procedures
Identify the five factors that affect microbial growth.
. List the methods used to destroy microorganisms.
. Relate the characteristics of the five types of microorganisms.
examples for each including emerging pathogens Dengue Fever, Malaria, HIV Rift Valley Fever
. Trace the chain of infection: Use Dengue Fever for demonstration of the path
. Identify common signs and symptoms of infection.
. Name standard and transmission-based precaution guidelines.
. Successfully complete five safety procedures
Use information technology tools use photos from labs. and Biotech gaming
Demonstrate Knowledge of Blood Borne Diseases, Including HIV/AIDS
Discover Diagnosis with appropriate procedures (Lab) ELIZA and Microar ray
Treatment s of Disease and pathogen
Explain the Epidemiologic data of Emerging Pathogens

Data collection techniques//Student Assessments:

Lab completions, tests quizzes and gaming progression
Mass casualty Training using Dr Paul Gibbs Model .

ICORE connection:Dr. Morris , Dr. Lawrence, Dr. Connelly

Literature cited:

Center for Disease control. http://www.cdc.gov/tb/topic/drtb/default.htm
Florida Department of Education http://www.fldoe/
Florida Department of Health: www.doh.state.fl.us
Morris, J. Glenn. Age of Pandemics
Dept of Entomology Roxanne Connelly
Green, Linda. ELISA
Lawrence, Robert. HIV 201 for Pediatricians
Lawrence, Chuck. Antibody Microarray
Gibbs, Paul. Rift Valley Fever exercise (First Responder class)

Budget justification: Borrow:

Virus Microarray kits 50 Fall (2 classes Nursing Assistant and Health Science)
Spring with Introduction to Health Care Classes (90 last year)
20-200uL micropipets 12 student workstations
200ul pipet tips

ELIZA Immuno Explorer kit
Catalog # 166- 2400 EDU $ 124

Exercise of Rift Valley Fever : First Responder Class Spring (see separate lesson plan)

LESSON PLAN

***TITLE:** Bugs Out

KEY QUESTION(S): Identify key question or questions the lesson will explore.

SCIENCE SUBJECT*: *Health Science 2 8417110

***GRADE AND ABILITY LEVEL**: Grades 10-12 Average ability

SCIENCE CONCEPTS: Principles of Infection Control, blood borne pathogens, emerging pathogens and testing. .

OVERALL TIME ESTIMATE: 10 hours.

LEARNING STYLES: Will appeal to visual, auditory, and or kinesthetic.

VOCABULARY:

CDC
OSHA
MSDS
FDA
USDA
FDA
ELISA
Microorganisms
Pathogens
Bacteria
Fungi
Protozoa
Rickettsiae
Viruses
Antiseptics
Disinfection
Sterilization
Chain of infection
Contagious
Nosocomial infection
Personal Protective equipment (PPE)
Standard Precautions
VISA
MRSA
Hepatitis
Tuberculosis
AIDS
Escherichia coli
Salmonella
Staphlococci
Streptococci

CDC Center for Disease control: a system that monitors and prevents the outbreaks of disease.
OSHA: Occupational Safety and Health Administration oversee safety in the workplace.
MSDS: material safety data sheet contains name and address of manufacturer, safety exposure limits, chemical names, health hazards, flammability, PPE and First Aid.
FDA: Food and Drug Administration: Regulates the safety of food, drugs, cosmetics and medical devices.
USDA:
ELISA
Microorganisms- germs
Pathogens – microorganisms that cause disease
Bacteria- one cell plant infect humans, round and rods
Fungi- plantlike that lives on dead matter
Protozoa- tiny animals in contaminated areas.
Rickettsiae- parasite live inside the cell of other living organisms
Viruses – smallest microorganism , grow and reproduce inside other living cells
Antiseptics – solution to slow the growth of pathogens
Disinfection – kills many pathogens
Sterilization- kills all microbes
Chain of infection – Infectious agent, Reservoir, Exit, Transmission, Entry and Host
Contagious – infection able to spread to other people
Nosocomial infection – Acquire an infection in the health care facility
Personal Protective equipment (PPE): equipment to wear if exposure to blood and body fluids.
Standard Precautions –Protocol to follow to minimize spread of disease.
MRSA- Methicillin- resistant staphylococcus aureus is a bacterial infection that does not respond to normal antibiotic therapy
Hepatitis B virus that effects the liver
Tuberculosis – contagious bacterial disease spread through the air.
AIDS- Acquired Immune Deficiency syndrome caused by HIV resulting in decreased resistance to infections transmitted by blood and body fluids
Escherichia coli- both pathogenic and non pathogenic (normally lives in the intestinal tract.
Salmonella
Staphlococci- bacteria that is arrange in clusters
Streptococci- bacteria arranged in chains.
VISA/VRE/VRSA: Vancomycin-Intermediate/Resistant *Staphylococcus aureus*
antimicrobial-resistant staph bacteria

LESSON SUMMARY:
The students will be introduced to infection control, blood borne pathogens, testing and control. Governmental agencies such as OSHA and CDC create rules and regulation to protect health care workers and their patients. Basic safety guidelines should be followed so that the environment, equipment and client are safe.
Microorganisms are tiny forms that can be seen only through the microscope. Discussion about pathogenesis. Specific environmental conditions are needed to support the growth and reproduction of microorganisms. There are disease causing microorganisms that are newly recognized or increasing in human, animal or plant populations. The chain of infection is a cycle

that describes how infections occur. Hand washing is the most important practice to prevent the spread of disease. All blood and body fluids are considered contaminated according to standard precautions guidelines. There are resistant microorganisms that are resistant to antibiotic therapy. There is testing available for bacteria as well as viruses. There are medications to decrease the activity of the viruses to be discussed. Laboratory experience and hands on activities for better understanding of emerging pathogens and biotechnology will be performed by the students as related to humans.

STUDENT LEARNING OBJECTIVES WITH STANDARDS:

12.0Recognize and practice infection control procedures. – The student will be able to:

This standard supports the following Sunshine State Standards: [HE.912.C.2.4]

12.01Define principles of infection control.
12.02Demonstrate knowledge of medical asepsis and practice procedures such as hand washing and isolation.
12.03Demonstrate knowledge of surgical asepsis.
12.04Describe how to dispose correctly of biohazardous materials, according to appropriate government guidelines such as OSHA.

14.0 Explain the importance of employability skill and entrepreneurship skills. – The student will be able to:

14.10 Compare careers within the health science career pathways (diagnostic services, Therapeutic services, health informatics, support services or biotechnology research and development).

15.0 Demonstrate knowledge of blood borne diseases, including HIV/AIDS. – The student will be able to:

This standard supports the following Sunshine State Standards: [HE.912.P.2.1 HE.912.B.1.4 HE.912.C. 1.1, 1.5, 1.6, 1.7, 1.8, 2.2, 2.7, and 2.8]

15.01 Recognize emerging diseases and disorders.
15.02 Distinguish between fact and fallacy about the transmission and treatment of diseases caused by blood borne pathogens including Hepatitis B.
15.03 Identify "at risk" behaviors that promote the spread of diseases caused by blood borne pathogens and the public education necessary to combat the spread of these diseases.
15.04 Identify community resources and services available to the individuals with diseases caused by blood borne pathogens.
15.05 Apply infection control techniques designed to prevent the spread of diseases caused by blood borne pathogens to the care of all patients following Centers for Disease Control (CDC) guidelines.
15.06 Demonstrate knowledge of the legal aspects of AIDS, including testing. Complete ELISA testing

DESCRIPTION OF TEACHING UNIT: NATURE OF MICROORGANISMS

Discussion. Microorganisms that cause disease are called "pathogens." Most microorganisms are harmless. Some microorganisms found in the body are beneficial to human beings. However, when a microorganism enters a part of the body other than where it is intended to be, it can be harmful. For example, *E. coli* from the colon can enter the urinary tract and cause an infection.

■ Factors That Influence Microbial Growth

Discussion. Five factors affect the growth of microorganisms:

- Temperature
- pH (amount of acidity or alkalinity)
- Moisture
- Food
- Oxygen

These factors must be favorable if microorganisms are to live. Different microorganisms require different conditions for survival. For example, aerobic microorganisms grow best with high levels of oxygen, and anaerobic microorganisms grow best in the absence of oxygen.

■ Methods That Destroy Microorganisms

Discussion. Three common methods destroy microorganisms:

- Antiseptics—used on the skin, not effective against spores, slow or prevent the growth of pathogens.
- Disinfection—bleach solution, not used on the skin because irritation results, not effective against spores.
- Sterilization—use of high-temperature steam under pressure to kill all microorganisms including spores.

■ Types of Microorganisms

Discussion. Explain the five types of microorganisms:

- Bacteria—one-celled organisms classified by shape and arrangement.
- Fungi—plantlike organism that lives on dead matter.
- Protozoa—tiny animals found in contaminated water supplies.
- Rickettsiae—parasites that live inside the cells of other organisms; a type of bacteria carried by ticks, lice, and fleas.
- Viruses—the smallest microorganisms, the most difficult to destroy, and the greatest risk to health care employees.

Discuss the need for the TB skin test, hepatitis B vaccine, and influenza vaccine for health care workers. Explain to students the types of organisms that cause each disease and why the students should be protected.

- Student Motivation: Giant Microbes game Questions and Answers

Cooperative Learning. Divide the class into two groups, each half has question or answer find your pathogen then proceed to basket for representation for demonstration Each group should

describe their microorganism to the rest of the class and, using sample. Identify and describe the diseases caused by their class of microorganisms.

Teach

PRINCIPLES OF INFECTION

Chain of Infection: Dengue Fever Model

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5919a1.htm (Florida case)

http://www.healthmap.org/dengue/index.php Prevalence

Background: Dengue Fever Use slides 4,8, 9,11-16, 19-22-26, 29, 34-36,40,,44,46, 55,57

CLINICAL FEATURES

- Sudden onset of fever, severe headache, myalgias and arthralgias, leukopenia, thrombocytopenia and hemorrhagic manifestations
- Occasionally produces shock and hemorrhage, leading to death

ETIOLOGIC AGENT

- Dengue viruses (DENV 1, DENV 2, DENV 3, and DENV 4) –
- flaviviruses A family of viruses transmitted by mosquitoes and ticks that cause some important diseases, including dengue, yellow fever, tick-borne encephalitis virus, and West Nile fever. The flaviviruses are positive-strand RNA viruses containing three structural proteins and a host-derived lipid bilayer.

TRANSMISSION

- Mosquito-borne (*Aedes Aegypti*)


Aedes Albopictus virus

Discussion. Six factors must be present for infection to occur. They are called the chain of infection. If any link in the chain is broken, infection is prevented. The links are:

- Infectious agent—the microorganisms that grow and multiply and become virulent, or harmful.
- Reservoir—the site of growth for microorganisms, including humans, insects, food, and water.

- Portal of exit—the route by which the infectious agents leave the reservoir. In a human, the portals of exit are the respiratory tract, skin, blood, gastrointestinal tract, and mucous membranes.
- Mode of transmission—the way a pathogen is transmitted from one source to another, including direct and indirect contact. Hand washing is the most important method for preventing the transmission of microorganisms.
- Portal of entry—the route by which a microorganism enters the host.
- Susceptible host—an individual who is capable of being infected. People may be immune to certain pathogens because of natural events (exposure) or artificial events (immunization).
- Show spread of disease with maps by Dr Andy Tatem

■ **Signs and Symptoms of Infection**

Discussion. Local infection results from trauma or injury to the skin. Common signs include redness, swelling, tenderness, warmth, and drainage. Signs of general or systemic infections include fever, malaise, anorexia, and swollen lymph glands.

■ **Nosocomial Infections**

Discussion. An infection acquired by clients in a health care facility unrelated to their current condition is a nosocomial infection. This type of infection is a serious problem in health care and can be prevented by proper and frequent hand washing.

■ **Asepsis**

Discussion. Keeping an area free of disease-producing microorganisms is known as asepsis. Medical asepsis is "clean technique" and reduces the number of microorganisms. It includes hand washing, using personal protective barriers, and routine cleaning of the environment. Surgical asepsis is "sterile technique" and eliminates microorganisms and spores. Surgery and catheterization require sterile technique. Special guidelines are followed to prevent contamination when practicing sterile technique.

Prepare the students to practice the following procedure.

- Procedure 3D Hand Washing

Demonstrate the technique for proper hand washing. Have students practice the various rubbing techniques for cleaning their hands before they practice the procedure.

Follow these steps:

1. Assign the procedure.
2. Demonstrate the procedure in class.
3. Assign the Lab Activity Manual Procedure Assessment Sheet for student practice and evaluation.

Teach

STANDARD AND TRANSMISSION-BASED PRECAUTIONS

Pre-Lab Focus Questions

1. How does the immune system protect us from disease?
2. What are some ways that diseases spread?
3. What is an example of a disease that attacks the human immune system?
4. What problems can prevent the immune system from working properly?
5. Why is rapid detection of disease exposure important?
6. What does ELISA stand for?
7. Why do you need to assay positive and negative control samples as well as your experimental samples?

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PROTOCOL I

TRACKING DISEASE OUTBREAKS

■ **Standard Precautions**

Discussion Standard precautions are developed to protect the health care worker and the client from the transfer of disease. The assumption is made that all clients are contaminated. It is always better to use precautions than not to use precautions. Personal protective equipment is worn to protect health care workers from contamination from blood and body fluids.

■ **Transmission-Based Precautions**

Discussion. One of the three types of transmission-based precautions should be followed depending on the infectious disease of the client.

- Airborne precautions—followed for diseases spread by tiny airborne droplets such as tuberculosis. Anyone entering the client's room should wear a high-efficiency particulate air (HEPA) mask. Negative air pressure is used in the room to prevent the airborne droplets from entering other rooms in the facility. The door should remain closed. These types of precautions have also been known as isolation.
- Droplet precautions—followed for diseases that can be transferred when a client coughs or sneezes. A mask should be worn by anyone coming in contact with such a client.
- Contact precautions—followed for infectious diseases of the skin or wounds. These precautions are especially important for MRSA (methicillin-resistant staphylococcus aureus) and VRE (vancomycin-resistant enterococcus). A gown and gloves should be worn, and hands should be carefully washed. Resistant TB Multi drug resistant, extensively drug resistant TB

Prepare the students to practice the following procedure:

Donning and Removing Personal Protective Equipment,

Demonstrate the procedure for properly donning and removing personal protective equipment. Make sure that students practice each step carefully and do not contaminate their hands while removing the isolation garments. Remember that gloves should go up and over the cuffs of the gown. The outside of the gloves and mask and the front of the gown are considered contaminated.

Follow these steps:

1. Assign the procedure.
2. Demonstrate the procedure in class.
3. Assign the Lab Activity

Diagnosis : Elisa Testing **What Is ELISA?**

ELISA stands for enzyme-linked immunosorbent assay. This powerful antibody-based test is used to diagnose diseases such as HIV/AIDS and SARS and to track pathogenic agents in water, food, and the air, whether these emerge naturally or through acts of aggression. ELISA is also used to identify genetically modified organisms (GMOs) and to trace food allergens and molecular markers of pregnancy and drug use.

Prepare Class for Bio Rad Lab ELISA use photos from labs and laboratory equipment

Follow Lab procedures

Assess

Proper Hand washing Technique
Recognize and Practice Infection Control Procedures
Identify the five factors that affect microbial growth.

. List the methods used to destroy microorganisms.
. Relate the characteristics of the five types of microorganisms.
And examples for each including emerging pathogens Dengue Fever, HIV
. Trace the chain of infection: Use Dengue fever for demonstration of the path
. Identify common signs and symptoms of infection.
. Name standard and transmission-based precaution guidelines.
. Successfully complete five safety procedures.

Use information technology tools.
Demonstrate Knowledge of Blood Borne Diseases, Including HIV/AIDS and Lab

Post-Lab Focus Questions

1. The samples that you added to the micro plate strip contain many proteins and may or may not contain the disease antigen. What happened to the proteins in the plastic well if the sample contained the antigen? What if it did not contain the antigen?
2. Why did you need to wash the wells after every step?
3. When you added primary antibody to the wells, what happened if your sample contained the antigen? What if it did not contain the antigen?
4. When you added secondary antibody to the wells, what happened if your sample contained the antigen? What if it did not contain the antigen?
5. If the sample gave a negative result for the disease-causing agent, does this mean that you do not have the disease? What reasons could there be for a negative result when you actually do have the disease?
6. Why did you assay your samples in triplicate?
7. What antibody-based tests can you buy at your local pharmacy?
8. If you tested positive for disease exposure, did you have direct contact with one of the original infected students? If not, what conclusions can you reach about transmissibility of disease in a population?p36 BioRad Lab manual

PROTOCOL I

TRACKING DISEASE OUTBREAKS

Expected outcomes: Describe pathogens, to include bacteria, viruses. Signs and symptoms of infected patient
Explain path of pathogen from Host to human using emerging pathogens
Include Dengue fever.
All diseases how they effect patient and the health care worker.
Discover if positive or negative test with appropriate procedures (Lab) ELISA Test

Student Assessments:

Lab completions, tests quizzes and gaming progression.
ICORE connection: Dr. Morris , Dr. Lawrence, Dr. Connelly
Use photos from labs and laboratory equipment

Literature cited:

Biotechnology Explorer™ELISA Immuno Explorer™ Kit Instruction Manual. Retrieved from www.Bio-Rad.com .
Center for Disease Control. http://www.cdc.gov/tb/topic/drtb/default.htm
Center for Disease Control. Dengue Fever Fact Sheet Retrieved. http://www.cdc.gov/
Connelly PhD, Roxanne. (2010) Insect Vectors and Florida's Public Health. PP
Florida Department of Education http://www.fldoe/
Florida Department of Health: retrieved www.doh.state.fl.us
Oliver, Drew. (2009) Giant Microbes, Inc

Theme: Emerging Pathogens

Lesson Title	**Chapter 16: Multiple – Casualty Incidents, Triage and Incident Management System**
Grade Span	**12th**
Content Emphasis (Mathematics or Science)	**Describe the criteria for multiple casualty situation Discuss the role of the Emergency Medical Responder during Rift Valley Fever outbreak to include incident management training Perform Triage, Team work**
Targeted Benchmark(s)	**Priorities in an Incident , incident command system, resources and multiple agencies .**
Teacher	**Mary Stannard**
School	**Bayside High School**
District	**Brevard**
Email address	
Phone number	

Lesson Preparation

Learning goals: What will students be able to do as the result of this lesson?

- **Learn the role of EMT in a biological complex disease incident.**
- **Aware of integration of state regulatory/ emergency agencies and responses of the local, state and federal governments.**
- **Aware of the importance of crisis communication**
- **Acquire an increased awareness of disease response issues associated with a vector-borne disease versus a disease spread by direct contact**
- **Learn about the disease response when bioterrorism is suspected**

Estimated time: Please indicate whether this is a stand-alone lesson or a series of lessons.
2 Class periods (4 hours)
One Field trip (6 hours)

Materials/Resources: Please list any materials or resources related to this lesson.

Bergeron, J. David. *First Responder*. Pearson/ Prentice Hall. 8th Ed 2009. Gibbs, Paul. *Rift Valley Fever*: RVF Exercise 2010.pptx. : July 2010.

Teacher Preparation: What do you need to do to prepare for this lesson?

Develop teams/ agencies
Have video segments from Rift Valley fever available

Contact Health First for date of Mass Casualty exercise. (WWWW)

Posters for enlarged time line: Prior events and real-time events

Lesson Procedure and Evaluation

Introduction: Describe how you will make connections to prior knowledge and experiences and how you will uncover misconceptions.

Students will prepare for class by completing assigned background information on Rift Valley Fever. www.flsart.org/rvf

We are going to simulate an outbreak of Rift Valley fever in Florida and discuss with the class how they might work to control the outbreak.

Discuss the effect of RVF on human population, animals and economics.

What are the signs and symptoms of the Disease?

What is a quarantine, vector, ELISA

Exploration: **Describe in detail the activity or investigation the students will be engaged in and how you will facilitate the inquiry process to lead to student-developed conclusions.**

Divide students into 5 focus groups

Follow PP to include video and breaks for discussion of situation progress of disease. At Slide # 10, 19, 26

Post conference

Application: **Describe how students will be able to apply what they have learned to other situations.**

After completion of general information about mass casualties and completion of simulation with Rift Valley fever simulation the students will participate in Mass casualty training with multiple agencies including fire/ rescue, hospital and disaster team. (Students have been victims for the last few years with themes such as explosion and on campus sniper)

Assessment: **Describe how student knowledge is being assessed at the appropriate cognitive level for the targeted benchmarks.**

Written test on basic knowledge of multiple casualty training. Evaluation at the scene of Disaster team simulation with post conference discussions after RVF and local mass casualty training.

Animal Health
Human Health
Legal and Law Enforcement
Entomology
Public Relations