

Immunology

Submitted as a Best Practice by
Susan Terry, Temple High School

OBJECTIVES/RATIONALE

An essential area of study in health care is the mechanism by which the human body protects itself and responds to disease. The student will understand the immune system and analyze its relationship to the disease process.

TEKS 121.13 (c) 10A, 10B

TAKS ELA 1, 2, 3, 5, 6
Social Studies 5
Science 3

National Science Education Standards A9-12; C9-12; F9-12; G9-12

National Health Care Skills Standards.01, .07, .09

National Curriculum Standards for School Mathematics S1; S3; S11

KEY POINTS

- I. The lymphatic system
 - A. Lymph organs
 - 1. Lymph nodes
 - 2. Spleen
 - 3. Thymus
 - B. Lymph vessels
 - 1. Lymph capillaries – blind-ended vessels in spaces between cells
 - 2. Lymph nodes
 - 3. Lymph ducts
 - C. Lymph fluid
- II. Defense mechanisms
 - A. Nonspecific Immunity
 - 1. Skin and mucous membranes
 - 2. Antimicrobial substances,
 - 3. Interferons (IFNs).
 - 4. Natural killer (NK) cells
 - 5. Complement system
 - 6. Natural killer (NK)
 - 7. Phagocytes
 - B. Specific Immunity
 - 1. Antigen/Antibody production
 - a. IgG
 - b. IgA
 - c. IgM

- d. IgD
- e. IgE
- 2. Formation of T and B cells
- 3. Antibody-Mediated Immunity
- 4. Cell-Mediated Immunity
- 5. Immunological Memory

III. Disorders: homeostatic imbalances

- A. Acquired immune deficiency syndrome (AIDS)
- B. Autoimmune diseases and disorders (autoimmunity) result when the body does not recognize "self" antigens and produces antibodies against them.
 - Rheumatoid Arthritis (RA)
 - Systemic Lupus Erythematosus (SLE)
 - Autoimmune Thyroiditis
 - Rheumatic Fever
 - Glomerulonephritis
 - Encephalomyelitis
 - Autoimmune Hemolytic And Pernicious Anemias
 - Addison's Disease, Graves Disease
 - Insulin-Dependent (Type I) Diabetes Mellitus
 - Myasthenia Gravis
 - Multiple Sclerosis (MS)
 - Chronic Fatigue Syndrome
 - Severe Combined Immunodeficiency
- C. Hypersensitivity (allergy) is an overaction to an antigen.
- D. type I anaphylaxis
- E. type II cytotoxic
- F. type III immune complex
- G. type IV cell-mediated
- H. Tissue rejection
- I. Hodgkin's disease (HD) and Nonhodgkin's Lymphoma are usually curable malignant disorders, generally arising in the lymph nodes.

ACTIVITIES

- I. Read *The First Horseman*.
- II. Complete ***The First Horseman Worksheet***.
- III. Write a disease report using the ***Guideline Sheet***.
- IV. Complete ***The First Horseman Essay Test***.

**Teacher Note **

The novel was given to the students several weeks before spring break. The reading was to be complete the week after break.

The novel involves the use of Spanish flu as a biological weapon. It begins as pure fiction and draws the reader into the story using cutting-edge science to identify and

modify the virus. There is mystery and intrigue. In the end, the reader is left to wonder if this is a fictional account, or perhaps a government cover-up.

MATERIALS /RESOURCES

- *The First Horseman* by John Case ISBN # 0345435796
- US News and Word Report, Nov 8, 1999, “The Invisible Microbes”
- Howard Hughes Medical Institute Monographs www.hhmi.org
 - [Arousing the Fury of the Immune System](#)
 - [The Race Against Lethal Microbes](#)

<http://www.cdc.gov>

ASSESSMENT

Writing Rubric

Oral Presentation Rubric

Completion of Essay Test

ACCOMMODATIONS

For reinforcement, the student will create a flow chart of antibody production.

For enrichment, the student will research how the United States is preparing for the possibility of biological warfare.

REFLECTIONS

The First Horseman
Worksheet

“ALL THIS, SPANISH LADY. SPANISH LADY DID THIS.”
Korean Infectious Disease Expert

1. What symptoms were seen in Korea?
2. What happened in 1918? What were the symptoms and the death toll in America and the world?

3. Define these terms:

CDC

WHO

AMRID

NIH

Virulence

Pandemic

Epidemic

Herald wave

Chimera virus

RNA

DNA virus

4. Discuss the characteristics of the Spanish Flu:
Vector and main reservoir
Compare to Ebola and AIDS
Viral sources for study
Vaccine development limitations
RNA virus mutation rate
5. Biological Warfare:
Why Korea, why now?
Why does the US allow work with toxins and infectious agents?
What techniques are used to weaponize flu?

Can it be controlled? How?

What problems are associated with disaster response to biological weapons?

6. What is the Temple of Light's mission and symbol?
How are they involved with Korea?
How was the virus altered?
What effect does it have on the immune system?
What is microencapsulation?
What methods are used to spread the virus?
7. How do the terrorists plan to disperse the virus? What is Plan B? Does it work?
8. How does the government bury the story? What is their justification?

IMMUNOLOGY DISEASE REPORT

Written Report

The report should be typed and written on one side of the paper. Edit carefully. The bibliography must be current, unless a historical perspective is included. Web Page citation must include complete address and date viewed.

Format

- Title Disease name
-
- Organism Give the scientific name and the common name for the causative Agent
- Characteristics Describe the microorganism and any specific growth requirements (anaerobic, parasite, etc.)
- Transmission How is the disease spread? Discuss the incubation period
-
- Symptoms What are the usual signs of this illness. Are there any unique features?
- Immunity Is there any immunity? Is there a vaccine? If so, discuss the vaccination schedule.
- Treatment Briefly discuss the treatment of choice. Include any experimental therapy or technology related to treatment.

Questions

Write 3 short answer questions that relate to the disease. The questions will allow students to identify the unique features of this illness. Provide the answers in the oral report.

TURN IN QUESTIONS WITH THE WRITTEN REPORT

Oral report

Discuss the important features of the disease with the class in a 3-5 minute presentation. Use multimedia technology.

Essay Question Topics To Enhance Student Questions

1. Predict how the lymphatic system facilitates the spread of cancer.
2. Under what conditions would tonsils be removed?
3. Compare and contrast the cell-mediated immune response and the humoral immune response. Include the distinctive cells and molecules that affect the appropriate response.
4. Discuss the weaponization of “Spanish Lady”. Why could this virus become a perfect biological weapon?