Unit 1: Infectious Diseases

Content Area: **Science**
Course(s):
Time Period: **Semester 1**
Length: **3 weeks**
Status: **Published**

Enduring Understandings

- Infectious diseases have an impact on society and shape history and day to day lives.
- Scientists collect data to develop models to identify patterns of disease transmission to determine spread prevention.
- Understanding the relationship of a pathogen with its environment is useful to design transmission prevention strategies.
- Inheritance of a genetic change can lead to variation in a population. Genetic changes that provide a selective advantage can lead to adaptation of populations.

Essential Questions

-Why should we care about infectious diseases?

-What does it mean to have an infectious disease?

-How does a microbe become pathogenic?

-How do pathogens make us sick?

-How do we get better?

Knowledge and Skills

- **Knowledge:**
- Understand the difference between a disease and an infectious disease.
- Understand how infectious diseases have molded history
- Distinguish between correlation and causation.
- Behaviors people use to avoid the transmission of infectious diseases
- How vaccinations work
- How to prove infection causes disease
- Koch's postulates
- Properties of pathogenic microbes
- Define virulence, microbiota, and microbiome
- Bacteria and Viruses: sizes and structure identification
- Understanding transmission, symptoms and impact on society: Measles, Small pox, Tuberculosis, AIDS, Malaria, The Black Plague, Lyme disease, Ebola, and Malaria
- Calculate percent error in estimates vs actual numbers

- Identify globally significant infectious diseases and explain how they impact mortality
- Bio-terrorism
- The immune system: how does it protect us from pathogens and how do pathogens bypass the barriers in place?
- Properties of pathogenic microbes and their life cycle
- Symbiotic functions of commensal bacteria
- How pathogens cause direct and indirect damage
- Toxin-related diseases: Botox, tetanus, MRSA
- Bacteria and viral replication and adaptation
- Structures of immune T-cells that play a role in the viral life cycle
- Causes of drug resistance
- Anti-viral drug development
- Common symptoms caused by an immune response to infection
- Natural Selection

- **Skills:**
- Explain what a disease is and what makes it infectious.
- Explain the societal effects of disease
- Explain effects of vaccination on disease spread
- Apply Koch's postulates to investigations of infectious diseases
- Design an experiment to test the hypotheses that an infectious agent is the cause of a disease.
- Predict and interpret the experimental results relating to the hypotheses.
- Identify the methods used to diagnose infectious diseases
- Describe preventative measures to limit spread of certain diseases
- Think critically and strategically to provide evidence to support ideas and defend opinions
- Address the potential scale of infectious disease on world populations using Our World in Data
- Analyze how a population of microbes becomes pathogenic over time
- Explain the difference between a pathogen and a microbe
- Describe the advantages and disadvantages of a microbe that has a symbiotic relationship with a host.
- Explain the role of reservoirs and vectors in a pathogen's life cycle.
- Describe preventative measures used to limit infectious spread
- Incorporate knowledge about commensal flora, reservoirs and vectors for various diseases
- Discuss the differences between intra and extracellular pathogens
- Describe symptoms of toxin-related diseases and how bacteria use toxins to infect a host
- Explain how adaptations benefit bacteria in the right environments
- Research and explain the replication of DNA and RNA viruses
- Relate the concepts of antigenic drift and shift to flu vaccines
- Distinguish between direct and indirect host cell damage
- Relate the location and rate of replication to patterns of disease symptoms
- Develop a model for natural selection
- Understand and identify the structures that play a role in the viral life cycle and explain which would be good candidates for an anti-viral drug.
- Apply knowledge of viral replication to design drugs against HIV
- Explain why drug targets are rarely self molecules
- Explain how multi drug therapies slow the development of drug resistance

Transfer Goals

- Develop comprehensive approaches for understanding and addressing infectious diseases.
- Evaluate and compare different treatment options for infectious diseases, considering factors such as drug efficacy, resistance patterns, and patient-specific factors.
- Apply research findings and emerging technologies to the prevention, diagnosis, and treatment of infectious diseases, demonstrating an understanding of how cutting-edge science can be translated into practical applications.

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=sharing