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Curriculum Units by Fellows of the National Initiative
2025 Volume V: Infectious Respiratory Disease

Introduction

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Infectious respiratory disease is a major cause of illness and death worldwide. In the United States alone, there are more than 1 billion respiratory infections each year, significantly impacting both public health and economic stability. Despite this burden, effective therapeutics for many respiratory infections remain lacking, while new viral strains and antibiotic-resistant bacteria continue to emerge.

This seminar provided a broad overview of infectious respiratory diseases. We explored the physiology and biology of bacterial and viral pathogens and examined both innate and adaptive immune responses to infection. The seminar also covered routes of transmission, introduced key epidemiological concepts and modeling techniques, and focused on technical and social strategies for infection control—including vaccines, building ventilation, masking and social distancing.

The individual units that resulted from this seminar covered a variety of topics including the history of infectious disease, mathematical concepts for understanding pandemic data, computer coding of epidemiological models, and approaches for preventing infections. While some units emphasized scientific and mathematical content, others explored the social challenges that inevitably arise during pandemics. One unit on tuberculosis in Philadelphia highlights how a dedicated nurse advocated for improved housing conditions within the Black community to reduce the prevalence and suffering caused by TB. Another unit on smallpox draws compelling parallels between 18th-century vaccine hesitancy and current attitudes. A unit designed for K–5 students teaches young learners how diseases spread and encourages a sense of social responsibility when they are ill.

This collection of units acknowledges that robust solutions to human health and environmental problems must consider not only technological advancements but also the economic, cultural, and historical contexts of the affected populations. This collection includes units suitable for both science and humanities courses, ranging in level from elementary to high school.