

Harvard Summer Program Immunology Project Resource Information Form	
Title	Online Textbook Unit 9 – Human Evolution “Resistance to HIV”
Resource Type	<input checked="" type="checkbox"/> Lesson Plan <input checked="" type="checkbox"/> Activity <input type="checkbox"/> Lab Activity <input type="checkbox"/> Web-quest
Description	The topic of this resource is HIV Resistance. This resource includes a Lesson Plan, PowerPoint Presentation with links to video clips and animations, along with three web based activities.
Author(s)	Amanda Pedersen
Author Institution(s)	Fairhaven High School
Objective	<ul style="list-style-type: none"> • The objective of this lesson is to have students explore HIV Infection as well as HIV resistance in certain individuals. • Students will be able to explain and diagram how an HIV infection occurs. • Students will be able to explore and discuss HIV resistance on both the historical level and the molecular level. • Students will be able to navigate through the National Center for Biotechnology Information Website as well as through the Chromosome Viewer.
Key Concepts	<ul style="list-style-type: none"> • Viruses need a host cell in order to replicate. • The process of HIV infection. • Immune Responses • Vaccinations as a tool to protect against certain viruses. • Mutations can lead to evolution. • HIV resistance • Problems associated with designing drugs to combat viruses such as HIV.
Student Prep	<p>Students should have prior knowledge about the immune system and how it functions. Here is a vocabulary list that will help your students understand HIV Resistance.</p> <ul style="list-style-type: none"> - B cells - CD4+ T-cells - CD8+ t-cells - Antibodies - Cytokines - Viral structure in general and viral replication - HIV structure and replication - Surface receptors - Antigen - Cellular immunity - Humoral immunity - gp120 - reverse transcriptase
Materials	<ul style="list-style-type: none"> • Computers (must be online) • Blank paper • Colored pencils, crayons, or markers • TV or projector with computer hookup to show PowerPoint presentation with video clips and animations • Worksheets and readings

Grade level(s)	9-12
Teacher Prep Time	<p>~ 1 hour</p> <ul style="list-style-type: none"> • Check computers for internet connections for student activities • Download Real Player and Quicktime to computer if needed • Open web pages for videos to make smoother transitions in PowerPoint Presentation
Class Time	2 – 60 minute class periods
National Standards	<p><i>THE CELL</i> Cells store and use information to guide their functions. The genetic information stored in DNA is used to direct the synthesis of the thousands of proteins that each cell requires.</p> <p><i>THE MOLECULAR BASIS OF HEREDITY</i> Changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism, whereas others can change cells and organisms. Only mutations in germ cells can create the variation that changes an organism's offspring.</p> <p><i>BIOLOGICAL EVOLUTION</i> Species evolve over time. Evolution is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring.</p> <p><i>THE BEHAVIOR OF ORGANISMS</i> Like other aspects of an organism's biology, behaviors have evolved through natural selection. Behaviors often have an adaptive logic when viewed in terms of evolutionary principles. Behavioral biology has implications for humans, as it provides links to psychology, sociology, and anthropology.</p>
State Standards	<p>Human Anatomy and Physiology <i>Broad Concept:</i> There is a relationship between structure and function in organ systems of humans.</p> <p>4.1 Explain how major organ systems in humans (e.g., kidney, muscle, lung) have functional units (e.g., nephron, sarcome, alveoli) with specific anatomy that perform the function of that organ system.</p> <p>Evolution and Biodiversity <i>Broad Concept:</i> Evolution and biodiversity are the result of genetic changes that occur in constantly changing environments.</p> <p>5.1 Explain how the fossil record, comparative anatomy, and other evidence support the theory of evolution.</p>
Sources	<p>Video clips and questions</p> <ul style="list-style-type: none"> • Bubonic Plague (from HHMI 1999 Holiday Lectures on Science – Lecture One: Microbe Hunters: Tracking Infectious Agents, by Donald E. Ganem, M.D.) <ul style="list-style-type: none"> ○ http://www.hhmi.org/biointeractive/disease/lectures.html • Immune system <ul style="list-style-type: none"> ○ http://www.teachersdomain.org/9-12/sci/life/cell/immune/index.html • Double immunity <ul style="list-style-type: none"> ○ http://www.teachersdomain.org/9-12/sci/life/gen/doubleimmunity/index.html • HIV immunity <ul style="list-style-type: none"> ○ http://www.teachersdomain.org/9-12/sci/life/gen/hivimmunity/index.html

	<p>Animations</p> <ul style="list-style-type: none"> • Molecular Biology of an HIV infection: an interactive animation <ul style="list-style-type: none"> ○ http://www.galaxygoo.org/hiv/hiv_lifecycle.html • Immune System Overview <ul style="list-style-type: none"> ○ http://www.learner.org/channel/courses/biology/units/hiv/images.html • HIV Infection <ul style="list-style-type: none"> ○ http://www.learner.org/channel/courses/biology/units/hiv/images.html <p>Readings Available Online</p> <ul style="list-style-type: none"> • Resistance to HIV <ul style="list-style-type: none"> ○ http://www.learner.org/channel/courses/biology/textbook/humev/humev_9.html • What is HIV? <ul style="list-style-type: none"> ○ http://www.galaxygoo.org/hiv/hiv.html
References	<ul style="list-style-type: none"> • National Center for Biotechnology Information <ul style="list-style-type: none"> ○ http://www.ncbi.nlm.nih.gov/ • Chromosome Viewer <ul style="list-style-type: none"> ○ http://www.teachersdomain.com/9-12/sci/life/gen/hglandmarks/index.html
Assessment	<ul style="list-style-type: none"> • Molecular Biology of an HIV Infection Drawing and Descriptions • National Center for Biotechnology Information Web Hunt • Chromosome Viewer Activity • Questions for Discussion completed in small groups <ul style="list-style-type: none"> ○ “Immune Cells in Action” ○ “Double Immunity” ○ “HIV Immunity” • Short paper connecting HIV/Bubonic Plague resistance to evolution