Bacteria and viruses - essays

Mechanisms of Bacterial Genetic Recombination

1. a. Describe briefly what is happening in each of the processes below.

b. Explain how each increases genetic diversity in a bacterial population.

c. Why are these processes important to the bacteria?

d. Why are these processes important to us?

A. Transduction B. Transformation 



2. How is bacterial conjugation similar to and different from sexual reproduction?

Evaluate the overall concept of bacterial recombination. What are some of the strengths and limitations of these approaches?

3. Make labeled drawings of the Lytic and Lysogenic cycles of viruses.

4. Compare viral and bacterial infections:

Reproductive strategies

Mechanisms for genetic variability

Modes of attack and effects on the human body

Go over tests:

Rewrites on essays on Sat.

Today’s lab: First, Use data from a bacterial growth experiment to understand how antibiotic resistance occurs among bacteria.

In 1943, penicillin was introduced as the "magic bullet" for curing many infectious diseases. By 1946, however, approximately 14 percent of *Staphylococcus aureus* strains isolated at a London hospital were resistant to penicillin. Today, scientists estimate that more than 95 percent of all *S. aureus* strains are penicillin-resistant.

After the introduction of penicillin, additional antibiotics were rapidly isolated and developed, including streptomycin and the tetracylines. Today, there are more than 100 antibiotics available. Nevertheless, some strains of at least three bacterial species (*Enterococcus faecium*, *Mycobacterium tuberculosis*, *Pseudomonas aeruginosa*) are resistant to all of these antibiotics, and health care workers fear the time is rapidly approaching when more deadly organisms escape the effects of all known antibiotics.

The primary reason for the increase in antibiotic resistance is evolution. When mutant genes arise that make a bacterium less sensitive to an antibiotic, that bacterium survives and produces descendants in an environment rich in antibiotics. That is, the process of natural selection operates. Multiple mutations may be required to result in fully resistant bacteria. However, once resistant genes appear, bacteria have a variety of mechanisms for exchanging those (and other) genes both within and across species. These mechanisms include conjugation, transformation, transduction, and transposon-mediated exchange. This exchange allows for "accelerated evolution" of bacterial species (accelerated in the sense that random mutations that result in antibiotic resistance need not occur in every individual bacterium, nor even in every species of pathogen, but can simply be acquired from another organism).

This activity invites students to explore one reason for the re-emergence of some infectious diseases: the evolution of antibiotic resistance among pathogens. In Activity 4, *Protecting the Herd*, students explore another reason for the re-emergence of infectious diseases.

Review: Theory of Evolution:

1. Variations exist in a population
2. Some of these can be inherited
3. There is competition among individuals for resources in an environment
4. Some individuals/variants are better adapted to their environment and they survive and reproduce passing on their genes. = NATURAL SELECTION

Complete Questions on antibiotic resistance.

Go to computers and watch Debi’s story. Answer the questions on the handout.