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MB 541 Microbial Genetics

Prerequisites: A minimum of two years of science teaching and at least one college level course in either biology or microbiology.

Course Description

This course will provide an inquiry based study of prokaryotic genetics. Emphasis will be placed on the advances in microbial genetics and effects on technological and medical advances. The goal of this course is to provide a rigorous examination of the topics for students in the Masters of Science in Science Education (MSSE) Program.

This course will be designed to provide an understanding of the fundamentals of genetic processes in bacteria (prokaryotes). The study of bacterial genetics has provided much of the understanding of fundamental genetic processes for all organisms, especially through the use of *in vivo* and *in vitro* genetic tools. Prokaryotic genetics is somewhat simpler than eukaryotic genetics due to the organization of the cell, its genome and transfer of genetic information. However, the basic concepts such as transcription, translation, mutation and recombination are similar if not identical in all organisms. The short generation time of bacteria lends themselves to genetic studies. Bacterial genetics labs are becoming easier to use, are relatively inexpensive and provide an ideal platform for genetic studies in the secondary school setting. This course will provide science teachers with the information necessary to understand the fundamental processes of genetics particularly as they apply to microorganisms.

Major topics to be covered:

1. Why study Prokaryotic genetics
2. DNA and RNA
 - Bacterial chromosomes
 - Plasmids
 - Protection of DNA
3. Mutations
 - DNA Repair
4. Genetic recombination
 - Genetic transfer
 - Transformation
 - Conjugation
 - Bacteriophage

- Transposable elements
- 5. Gene Maps
 - Operons
 - Gene expression
- 6. Current Research
 - Tools and protocols
 - World Wide Web Databases
- 7. Issues
 - Genetically modified organisms (GMOs)
 - Technological advances
 - Controls and cautions

Texts

Current literature including research and review articles will provide the material for the course. In addition, students will be directed to a number of websites, such as the American Society of Microbiology and Centers for Disease Control.

My Expectations

As an introduction to the course syllabus I would like to offer some expectations as well as some disclaimers:

I will not be covering basic genetic concepts (DNA, RNA, translation, and transcription). I will suggest some sites to review. My philosophy with this course is to be more of a generalist in terms of microbial genetics. I guarantee that some of the reading will be difficult, but I hope to overcome that by addressing the big picture in terms of processes. Bacteria are really cool and they do some amazing things!

During the course, I would really appreciate feed back from all of you. Please do not feel like you are stupid if you don't understand something. **MAKE SURE YOU ASK.** You can email me or you can use the discussion portion of the class to ask other class members to help you out. It is important to me that you enjoy taking this course and that you get something out of it.