

# **Recommended Curriculum Guidelines for Undergraduate Microbiology Education**



2012

# CONTRIBUTING AUTHORS

## ASM Task Force for Curriculum Guidelines

**Susan Merkel, Chair**

Department of Microbiology  
Cornell University, NY

**Jackie Reynolds, Chair**

Department of Biology  
Richland College, TX

**Kai “Billy” Hung**

Department of Biological  
Sciences  
Eastern Illinois University, IL

**Heidi Smith**

Biology Department  
Front Range Community College, CO

**Amy Siegesmund**

Department of Biology  
Pacific Lutheran University,  
WA

**Ann Smith**

Department of Cell Biology and  
Molecular Genetics  
University of Maryland, MD

*Ex Officio*

**Neil Baker**, Chair, ASM  
Education Board  
The Ohio State University  
(Professor Emeritus)

**Amy Chang**, Director, ASM  
Education

## Ad Hoc Reviewers

2011 ASMCUE attendees

© 2012

American Society for Microbiology

Please send comments to [education@asmusa.org](mailto:education@asmusa.org)



- 
1. Cells, organelles (e.g., mitochondria and chloroplasts) and all major metabolic pathways evolved from early prokaryotic cells.
  2. Mutations and horizontal gene transfer, with the immense variety of microenvironments, have selected for a huge diversity of microorganisms.
  3. Human impact on the environment influences the evolution of microorganisms (e.g., emerging diseases and the selection of antibiotic resistance).
  4. The traditional concept of species is not readily applicable to microbes due to asexual reproduction and the frequent occurrence of horizontal gene transfer.
  5. The evolutionary relatedness of organisms is best reflected in phylogenetic trees.

- 
6. The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
  7. Bacteria have unique cell structures that can be targets for antibiotics, immunity and phage infection.
  8. Bacteria and Archaea have specialized structures (e.g., flagella, endospores, and pili) that often confer critical capabilities.
  9. While microscopic eukaryotes (for example, fungi, protozoa and algae) carry out some of the same processes as bacteria, many of the cellular properties are fundamentally different.
  10. The replication cycles of viruses (lytic and lysogenic) differ among viruses and are determined by their unique structures and genomes.

- 
11. Bacteria and Archaea exhibit extensive, and often unique, metabolic diversity (e.g., nitrogen fixation, methane production, anoxygenic photosynthesis).
  12. The interactions of microorganisms among themselves and with their

17. The regulation of gene expression is influenced by external and internal molecular cues and/or signals
18. The synthesis of viral genetic material and proteins is dependent on host cells.
19. Cell genomes can be manipulated to alter cell function.

- 
20. Microorganisms are ubiquitous and live in diverse and dynamic ecosystems.
  21. Most bacteria in nature live in biofilm communities.
  22. Microorganisms and their environment interact with and modify each other.
  23. Microorganisms, cellu

