* **Submitted:** 7/6/2018 11:00:18 AM
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* **Name of Resource or Collection of Recourses:** Microbiology (OpenStax)
* **URL to the Resource:** <https://openstax.org/details/books/microbiology>
* **Class of Record the Resource Review:** Micro 5
* **Link to the most current Course Outline of record:** <https://portal.santarosa.edu/srweb/SR_CourseOutlines.aspx?CVID=38210&Semester=20187>
* **Is the course currently under revision or will be under revision soon? (Many courses outlines are in the process of being revised so the course can be approved by the C-ID):** No
* **Topic Coverage:** Objectives:

In order to achieve these learning outcomes, during the course the students will:

1. Outline the history of major microbiological discoveries and describe their contributions to

world civilization. Section 1.1

2. State Koch's postulates and apply them to different types of pathogens and to new

diseases. Section 15.2

3. Relate basic principles of chemistry and cell biology to structure and function of microbes. Sections 3.3 and 3.4

4. Explain how the unity of basic cell processes contributes to difficulties in treating

infectious disease. Section 14.3 and 14.4

5. Describe the principles and mechanisms of microbial genetics and coevolution and apply them to the problem of increasing drug resistance in microorganisms. Sections 11.1-11.7, 14.5

6. Describe viruses and their relation to cells. Sections 6.1 and 6.2

7. Compare and evaluate the various mechanisms of control and prevention of microbial disease. Sections 13.1-13.3

8. Discuss the mechanisms of pathogenicity in microbes. Sections 15.2-15.4

9. Compare and contrast the epidemiology of community acquired and hospital acquired

infections. Sections 16.1 and 16.3

10. Describe the functions of the human immune system, its relations to disease, and how vaccination contributes to immunity. Chapters 17 and 18

11. Describe the etiology, epidemiology, treatment and prevention of a variety of important infectious diseases. Chapters 21-26

12. Safely and aseptically perform a variety of microbiological laboratory techniques.

13. Collect and analyze data.

Topics and Scope

I. Historical development

A. Discovery of the microbial world and development of the microscope. Section 1.1

B. Spontaneous generation vs. biogenesis Section 3.1

C. Koch's postulates Section 15.2

D. Contribution of microbiology to biochemistry and molecular biology Section 10.1, Chapter 12

E. Contribution of microbiology to world civilization Section 1.1, 16.4

II. Cell biology

A. Chemistry and biochemistry review Chapter 7

B. Lipids, membranes and transport Section 3.3, 7.3

C. DNA, RNA, protein: structure, function and flow of information Section 7.4, 10.2, 10.3, Chapter 11

D. ATP synthesis and cell work Chapter 8

E. The eukaryotic cell: structure and function; endosymbiotic theory Section 3.2, 3.4

F. The prokaryotic cell: structure and function Section 3.3

G. Comparison of bacteria and archaea Section 3.3, 4.6

III. Antimicrobial agents

A. Sterilization, disinfectants, antiseptics Chapter 13

B. Antibiotics Chapter 14

1. mode of action Section 14.3, 14.4

2. resistance mechanisms Section 14.5

IV. Microbial genetics

A. Genome and phenotype Section 10.4, 11.1

B. Mutation, selection, adaptation Section 11.5

C. Horizontal gene transfer Section 11.6

1. transformation

2. conjugation

3. transduction

D. Relation to virulence and antibiotic resistance Section 11.6, 14.5

V. Viruses

A. Definitions and historical background Section 6.1, 6.3

B. Interactions with cells Section 6.1, 6.2, 15.3

C. Viral diseases of importance Chapters 21-25 (each contain a section about viral infections)

VI. Ecological principles

A. The human as ecosystem Section 4.1, Ch. 21-24 (each contain a section about normal microbiota of different body regions),

B. Symbiosis Section 4.1

C. Impact on model of infectious disease Section 4.1, 17.1

VII. Infectious disease

A. Role of microbiome Section 15.2

B. Mechanisms of pathogenicity Section 15.2, 15.3, 15.4

C. Epidemiology Chapter 16

D. Role of the host in disease

1. innate resistance Chapter 17

2. acquired resistance Chapter 18

E. Vaccination, prevention and treatment Section 18.5, Chapter 13, Chapter 14

F. Specific diseases of the human population Chapters 21-26

VIII. Applied microbiology

A. Modern biotechnology Chapter 12

B. Environmental microbiology Section 8.7

1. wastewater treatment not in this textbook (find info online)

2. antibiotic isolation Section 14.7

3. environmental sampling and analysis Section 4.1, 7.5

C. The role of hospital and public health laboratories Section 6.3, Section 7.5, Section 9.6, Chapter 20

D. Fermentation applications Section 8.4

Laboratory Exercises. Most information is in students’ lab text and need not be covered in this textbook. I am noting supplementary information that is provided by this textbook where applicable.

I. Laboratory safety and sanitation

II. Laboratory Techniques

A. Aseptic technique

B. Bacterial culture (liquid and solid medium) Section 9.6

C. Microscopy and staining techniques Chapter 2

D. Preparation and sterilization techniques Section 13.2

E. Analyses of bacteria in water, soil, and the community at large

F. Antibiotic sensitivity Section 14.6

G. Metabolic tests and bacterial identification Section 7.5

H. Bacterial mutagenesis Section 11.5

I. Transformation Section 12.5

J. Polymerase chain reaction and gel electrophoresis Section 12.2

K. ELISA (enzyme-linked immunosorbent assay) Section 20.4

* **Optional Topic Coverage:** No additional topics
* **Supplements to Complete Coverage:**

The course outline topic of Wastewater Treatment is not covered in the OpenStax textbook. However, there is information at the Santa Rosa Laguna Water Treatment Plant’s website: https://srcity.org/1056/Treatment-Process Also, an instructor could easily make a handout containing the details they want the students to know.

Also, there is some information for one laboratory exercise (Eukaryotes lab) that cannot be found in this resource. However, we have multiple copies of another textbook in the lab that the students can use for this exercise. If needed in the future, we can provide students with handouts containing the required information for this one laboratory exercise.

* **Rigor and Quality of Resource:** I have been very pleasantly surprised by this textbook! I thought that a free online resource couldn’t possibly be as high-quality as the paid nonmajors microbiology text that my colleagues and I have been using for years. However, I was wrong! This textbook covers all of the required topics that I teach (nonmajors microbiology for pre-allied health students), and actually frequently goes into more depth than the paid textbook I’ve used in the past. For example, when describing major breakthroughs, it mentions the scientist who is usually credited with the discovery as well as providing additional information about other scientists whose work may have been overlooked / who also contributed to the ideas. In the metabolism chapter, it includes simplified diagrams to understand the basics, but also includes more complex diagrams in an appendix. It includes more connections to the “real world,” for example industrial applications and information about current strategies for antimicrobial drug discovery. I won’t go into further examples here, but suffice it to say that I learned quite a few new anecdotes while reading this book that I’m excited to share with my students! The text is definitely readable and concepts are clearly defined and explained. There are many practice questions for students, as well as case studies to illustrate clinical applications. The diagrams are clear and simplified so that extraneous or distracting information is omitted (unfortunately, some diagrams are a bit small and thus look grainy when placed on a PowerPoint slide). In short, this is an excellent resource that I am looking forward to using in place of a paid textbook for my course next semester. It’s amazing that it is available for free for my students! And yes, I would pay to use it if it were not free.
* **Did the resource pass the Accessibility Review? :** Yes, it is an OpenStax Resource.
* **What date did/will you present the review to your department (at a department meeting):** 8/24/2018
* **Include a link to the review that you posted on the MERLOT website:** <https://www.merlot.org/merlot/viewMaterial.htm?id=1245308>