

PREFACE

Benson's Microbiological Applications has been the "gold standard" of microbiology laboratory manuals for over 30 years. This manual has a number of attractive features that resulted in its adoption in universities, colleges, and community colleges for a wide variety of microbiology courses. These features include "user friendly" diagrams that students can easily follow, clear instructions, and an excellent array of reliable exercises suitable for beginning or advanced microbiology courses.

In revising the lab manual for the twelfth edition, I have tried to maintain the proven strengths of the manual and further enhance it by moving some of the exercises to sections in which they more appropriately belong. I have separated the immunology and medical microbiology sections, which is more consistent with the current presentation of these subjects. Included in this presentation are new diagrams for those sections. I have also updated the introductory material of many exercises to reflect changes in scientific information. Finally, the names of microorganisms used in the manual are consistent with those used by the American Type Culture Collection. This is important for those users who rely on the ATCC for a source of cultures.

Organizational Changes

Changes to the twelfth edition include:

- Learning Outcomes have been added to the beginning of each exercise to outline the concepts to be learned and the techniques to be mastered.
- New questions have been added to many of the laboratory reports.
- Capsular Staining, Exercise 14, features a new staining procedure.
- Updated information on the Kinyoun method for acid-fast staining has been added to Exercise 17.
- Exercise 21, Enumeration of Bacteria: The Standard Plate Count, has expanded information on the mathematics of absorbance/optical density and how absorbance and colony counts can be combined to generate standard curves for growth determinations.
- Additional information on viral replication steps has been added to Exercise 23, Determination of a Bacteriophage Titer.
- Exercise 27, Effects of Oxygen on Growth, has been revised. Definitions of aerobes, anaerobes, microaerophiles, and aerotolerant bacteria have been updated. This exercise originally appeared in the Culture Methods part, but now appears in Part 7, Environmental Influences and Control of Microbial Growth.
- Exercise 34, Antimicrobial Sensitivity Testing: The Kirby-Bauer Method, has an expanded discussion of antibiotics and the increasing problem of new strains of antibiotic-resistant bacteria, such as MRSA.
- For Exercise 61, Reductase Test, major revisions were made to the introductory material and exercise procedure with a standard plate count added to show a correlation between the numbers estimated in the reductase test and the actual numbers of bacteria present in milk samples.
- Exercise 62, Temperature: Lethal Effects, originally appeared in the Environmental Influences and Control of Microbial Growth part, but now appears in Part 11, Applied Microbiology. This exercise has been updated so that it is more consistent with the importance of temperature in the control of microbes in food production.
- Exercise 63, Microbial Spoilage of Canned Food, has expanded information on the role of endospore-formers in food spoilage, and the exercise procedure has been updated.
- Plasmid Isolation, Exercise 68, has been revised. Plasmid isolation scheme steps have been shortened to make the exercise more succinct.
- The Staphylococci: Isolation and Identification, Exercise 69, has been extensively updated, including the introduction. Updates include new photographs of a Gram stain of *staphylococcus* and growth of staphylococci on mannitol salt agar. The isolation procedure for staphylococci has been modified with an upgraded procedure and tests.
- Exercise 70, The Streptococci and Enterococci: Isolation and Identification, has been updated with new introductory information, the procedure for the isolation of streptococci and enterococci has been streamlined with the elimination of many redundant tests, the pertinent information in former appendix E has been incorporated into this exercise, and new photographs depicting the three kinds of hemolysis have been added.
- Gram-Negative Intestinal Pathogens, Exercise 71, has been updated with information in the introduction, and the procedure for isolating these organisms has been modified and improved to include *Yersinia*.
- Exercise 72, A Synthetic Epidemic, has an updated introduction, including epidemiology information, the procedure has been modified and improved by using a chemical that fluoresces under UV light as the "infectious agent," alternate procedures are also included that involve the use of a test tube to demonstrate the transfer of an infectious agent, and a procedure using a live organism.
- A new part has been added: Part 14, Immunology and Serology. In previous editions, immunology was included with Medical Microbiology. In this edition, the immunology exercises are now in a separate and expanded part with an introduction to the immune system.
- The introductory material in Exercise 74, Slide Agglutination Test for *S. aureus*, has been updated. Two new figures, antibody molecules adsorbed to a latex sphere, and reaction between antibodies adsorbed to latex spheres and soluble antigens resulting in agglutination, have been added.
- Exercise 75, Slide Agglutination Test for *Streptococcus*, is a new exercise involving the extraction of carbohydrate groups important in the Lancefield classification

of streptococci and their application in a slide agglutination test for identifying streptococci. This exercise appears in Part 14, Immunology and Serology.

- Tube Agglutination Test: The Heterophile Antibody Test, Exercise 76, has been updated with new information on heterophile antibodies and why they are used in screening for infectious mononucleosis.
- Two exercises, Slime Mold Culture and White Blood Cell Study, have been moved to the Connect site. Visit www.mcgrawhillconnect.com.

Laboratory Reports

The laboratory reports are designed to guide and reinforce student learning and provide a convenient place for recording data. The reports consist of observation sections, results sections, short answer questions, multiple-choice questions, and fill-in-the-blank questions. Instructors may choose to either post the answer key from the instructor's manual so students can check their work or collect and grade the laboratory reports.

Instructor's Manual/Image Library

The accompanying instructor's manual provides: (1) a listing of equipment and supplies needed for performing all of the experiments, (2) procedures for setting up the experiments, and (3) answers to all the questions for the laboratory reports. An image library containing figures from the laboratory manual is available. Please contact your sales representative for additional information.

Digital Tools for Your Lab Course

New! McGraw-Hill Connect™ Microbiology for *Benson's Microbiological Applications, Laboratory Manual in General Microbiology* allows instructors and students to use art and animations for assignments and lectures. Instructors now have access to a variety of new resources including assignable and gradable lab questions from the lab manual, additional pre- and post-lab activities, case study activities, interactive questions based on atlas images, lab skill videos, and more. In addition, digital images, PowerPoint slides, and instructor resources are available through Connect. Visit www.mcgrawhillconnect.com.



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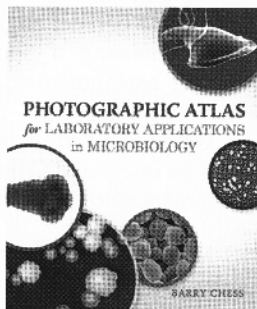
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Student Resources

New! *Photographic Atlas for Laboratory Applications in Microbiology* (0-07-737159-3), prepared by Barry Chess at Pasadena City College, can be packaged with this laboratory manual. This beautifully-prepared photo atlas contains more than 300 color photos that bring the microbiology laboratory to life. The photo atlas is divided into eight major sections: staining techniques; cultural and biochemical tests; bacterial colonial morphology; bacterial microscopic morphology; fungi; protists; helminths; and hematology and serology. A picture is worth a thousand words, and this is definitely the case with this beautifully prepared atlas. Contact your McGraw-Hill sales representative for additional information and packaging options.



Annual Editions: Microbiology 10/11 (0-07-738608-6) is a series of over 65 volumes, each designed to provide convenient, inexpensive access to a wide range of current articles from some of the most respected magazines, newspapers, and journals published today. **Annual Editions** are updated on a regular basis through a continuous monitoring of over 300 periodical sources. The articles selected are authored by prominent scholars, researchers, and commentators writing for a general audience. The **Annual Editions** volumes have a number of common organizational features designed to make them particularly useful in the classroom: a general introduction; an annotated table of contents; a topic guide; an annotated listing of selected World Wide Web sites; and a brief overview for each section. Visit www.mhhe.com/clc for more details.

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