To my father, the late Joseph Paul Truant, Ph.D. (1923–1988);

my mother, Flora Rina (Lenardon) Truant;

my children, Patti, Kathleen, and Steven;

and my sisters, Linda Ann Thompson and Anita Louise Ryan, and their families
## Contents

Coordinating Authors / ix  
Contributors / xi  
Foreword Gary V. Doern / xiii  
Preface / xv  
Acknowledgments / xvii  
Important Notice / xix

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Role of the U.S. Food and Drug Administration in Regulation of Commercial Clinical Microbiology Products</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Commercial Blood Culture Systems and Methods</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Rapid Systems and Instruments for the Identification of Bacteria</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>Anaerobic Bacteriology</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Rapid Systems and Instruments for the Identification of Viruses</td>
<td>84</td>
</tr>
<tr>
<td>6</td>
<td>Human Immunodeficiency Virus</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>Chlamydia trachomatis</td>
<td>128</td>
</tr>
<tr>
<td>8</td>
<td>Mycoplasmas</td>
<td>201</td>
</tr>
<tr>
<td>9</td>
<td>Commercial Methods for Identification and Susceptibility Testing of Fungi</td>
<td>225</td>
</tr>
<tr>
<td>10</td>
<td>Mycobacteria</td>
<td>256</td>
</tr>
<tr>
<td>11</td>
<td>Diagnostic Medical Parasitology</td>
<td>274</td>
</tr>
<tr>
<td>12</td>
<td>Molecular Methods for Diagnosis of Infectious Diseases</td>
<td>306</td>
</tr>
<tr>
<td>13</td>
<td>Automated Immunoassay Analyzers</td>
<td>324</td>
</tr>
<tr>
<td>14</td>
<td>Commercial Methods in Clinical Veterinary Microbiology</td>
<td>336</td>
</tr>
<tr>
<td>15</td>
<td>A Comparison of Current Laboratory Information Systems</td>
<td>360</td>
</tr>
<tr>
<td>16</td>
<td>Emerging Infectious Diseases</td>
<td>396</td>
</tr>
<tr>
<td>17</td>
<td>Rapid Systems and Instruments for Antimicrobial Susceptibility Testing of Bacteria</td>
<td>413</td>
</tr>
</tbody>
</table>
Coordinating Authors

STEPHEN D. ALLEN  CHAPTER 4  
Department of Pathology and Laboratory Medicine, Indiana University School of Medicine, Clarian Health Partners, and Methodist-IU-Riley Hospitals, Indianapolis, IN 46228

ALAN T. EVANGELISTA  CHAPTERS 3 AND 17  
Ortho-McNeil Pharmaceutical, Inc., 1000 Route 202, Room 3046, Raritan, NJ 08869, and Department of Pathology and Laboratory Medicine, MCP Hahnemann University, Philadelphia, PA 19129

LYNNE S. GARCIA  CHAPTER 11  
LSG & Associates, 512 12th St., Santa Monica, CA 90402-2908

SHARON L. HANSEN  CHAPTER 1  
11 Ole Grist Run, Milton, DE 19968  
Retired from the Microbiology Branch, Division of Clinical Laboratory Devices, Center for Devices and Radiological Health, Food and Drug Administration

RICHARD L. HODINKA  CHAPTERS 6 AND 13  
Departments of Pediatrics and Pathology and Clinical Virology Laboratory, Children’s Hospital of Philadelphia and University of Pennsylvania School of Medicine, Philadelphia, PA 19104

THOMAS J. INZANA  CHAPTER 14  
Center for Molecular Medicine and Infectious Diseases, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

ROBERT C. JERRIS  CHAPTER 7  
Microbiology, DeKalb Medical Center, Decatur, GA 30033, and Department of Pathology, Emory University School of Medicine, Atlanta, GA 30322

DONALD JUNGKIND  CHAPTER 12  
Departments of Pathology and Microbiology and Clinical Microbiology Laboratories, Thomas Jefferson University, 207 Pavilion Building, 11th and Walnut Sts., Philadelphia, PA 19107-4998

CHARLES T. LADOUlis  CHAPTER 15  
Spartan Consulting Group, Inc., 5 Grand Tour, Locust, NJ 07760-2343, and TNB Laboratories, Inc., 300 Prince Philip Drive, Spencer Hall, Memorial University of Newfoundland, St. John’s, Newfoundland, Canada

MARILYN A. MENEGUS  CHAPTER 5  
Clinical Microbiology Laboratories and Departments of Microbiology and Immunology, Pathology and Laboratory Medicine, and Pediatrics, University of Rochester School of Medicine, Rochester, NY 14642

JAMSHID MOGHADDAS  APPENDIX  
Clinical Microbiology and Immunology Laboratory, Temple University Hospital, Philadelphia, PA 19140

DAVID H. PERSING  CHAPTER 18  
Corixa Corporation, Suite 200, 1124 Columbia St., Seattle, WA 98104

GLENN D. ROBERTS  CHAPTERS 9 AND 10  
Clinical Mycology and Mycobacteriology Laboratories, Division of Clinical Microbiology, Mayo Clinic and Mayo Foundation, 200 First St. SW, Rochester, MN 55905

BYUNGSE SUH  CHAPTER 16  
Section of Infectious Diseases, Temple University Hospital, Philadelphia, PA 19140

KEN B. WAITES  CHAPTER 8  
Department of Pathology, University of Alabama at Birmingham, 619 S. 19th St., WP P230, Birmingham, AL 35233-7331
CHAPTER 2

MELVIN P. WEINSTEIN

University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School and Microbiology Laboratory, Robert Wood Johnson University Hospital, New Brunswick, NJ 08901-0019
Contributors

RAY D. ALLER
Medical Affairs and Informatics, MDS Laboratory Services (US), 5217 Maryland Way, Suite 303, Brentwood, TN 37027

CÉCILE M. BÉBÉAR
Laboratoire de Bactériologie, Université Victor Segalen Bordeaux 2, 33076 Bordeaux, France

CAROLYN M. BLACK
Scientific Resources Program, National Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, GA 30333

PAUL P. BOURBEAU
Division of Laboratory Medicine, Geisinger Medical Center, Danville, PA 17822

CHRISTOPHER L. EMERY
Department of Pathology and Laboratory Medicine, MCP Hahnemann University School of Medicine and Medical College of Pennsylvania-Hahnemann Hospitals, Philadelphia, PA 19102

LESLIE HALL
Clinical Mycology and Mycobacteriology Laboratories, Division of Clinical Microbiology, Mayo Clinic and Mayo Foundation, 200 First St. SW, Rochester, MN 55905

HARALD H. KESSLER
Institute of Hygiene and Molecular Diagnostics Laboratory, Karl-Franzens-Universität Graz, Universitätsplatz 4, A-8010 Graz, Austria

JAY R. KOSTMAN
Presbyterian Medical Center, University of Pennsylvania, Philadelphia, PA 19104

DAVID S. LINDSAY
Center for Molecular Medicine and Infectious Diseases, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

RICHARD MANIGLIA
Presbyterian Medical Center, University of Pennsylvania, Philadelphia, PA 19104

XIANG-JIN MENG
Center for Molecular Medicine and Infectious Diseases, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

KAREN W. POST
Rollins Animal Disease Diagnostic Laboratory, 2101 Blue Ridge Rd., Raleigh, NC 27607

L. BARTH RELLER
Departments of Pathology and Medicine and Clinical Microbiology Laboratory, Duke University Medical Center, Durham, NC 27710

JEAN A. SIDERS
Department of Pathology and Laboratory Medicine, Clarian Health Partners, Methodist-IU-Riley Hospitals, Indianapolis, IN 46228

DEBORAH F. TALKINGTON
Division of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, GA 30333

ALLAN L. TRUANT
Clinical Microbiology, Immunology, and Virology Laboratories and Departments of Pathology and Laboratory Medicine, Microbiology and Immunology, and Internal Medicine, Temple University Hospital and School of Medicine, 2 Park Ave. Pavilion, Broad and Ontario Sts., Philadelphia, PA 19140

DONNA M. WOLK
Molecular Diagnostics Laboratories, Southern Arizona VA Health Care System, Laboratory Services (6-113), 3601 S. 6th Ave., Tucson, AZ 85723
Foreword

Over 3 years ago, I received a phone call from Allan Truant asking me whether I would be willing to write a foreword to a new clinical microbiology book he was editing. I was immediately skeptical; I had not seen a truly “new” book in clinical microbiology during all of the 19 years I have been practicing in this discipline. I grew increasingly skeptical as I listened to Dr. Truant explain what he planned: a comprehensive, scholarly multiauthor look at commercial test systems in clinical microbiology. I did not think that this was possible, but I was wrong.

In this work, Dr. Truant and his coauthors have indeed created something “brand new.” The information provided in this important work simply is not available anywhere else, at least not in as organized and comprehensive a fashion. More importantly, this text will have immense value for practicing clinical microbiologists, especially those faced with making decisions as to what systems should be used in specific laboratory settings.

The text is divided into 18 chapters; 12 address specific functional areas of clinical microbiology (e.g., blood cultures, bacterial identification and susceptibility testing, virology, mycobacteriology, etc.). In addition, there are separate chapters on licensure and regulation of commercial products, veterinary microbiology, laboratory information systems, immunoassay systems, emerging infectious diseases, and the future of technology in clinical microbiology. The text concludes with an appendix containing a comprehensive listing of commercial sources for the systems described.

Most chapters consist of an introductory section, a comprehensive review of salient test systems, including a comparison of performance characteristics, and summary remarks. Dr. Truant relies heavily on practicing clinical microbiologists as authors of this text, and as a result the information presented herein is of real practical utility to laboratory professionals. The text is very well-written, comprehensive, well-organized, and appropriately referenced. One of the major pitfalls of most multiauthored texts is lack of consistency in style, scope, and approach between different chapters and/or sections. These problems have been scrupulously avoided in this manual. As a result of careful editing, there is conspicuous balance and clear continuity across all of the chapters of this text.

One of the principal advantages of writing forewords for books such as this is that one gets to see the information before anyone else does. In my position as the director of a clinical microbiology laboratory in a large academic medical center, I find myself consulting the chapters nearly every day. I have not been disappointed.

Increasingly, clinical microbiology laboratories have become reliant on new technologies in their day-to-day provision of diagnostic services. It is estimated that more technology has been introduced into the clinical microbiology laboratory during the past decade than during the entire century that preceded it. This trend will only continue, if not accelerate. Keeping up with new technologies becomes nearly impossible. In this respect, the Manual of Commercial Methods in Clinical Microbiology will undoubtedly come to occupy a readily accessible and prominent spot on the bookshelves of practicing clinical microbiologists everywhere. This is one of those rare books that is destined for a tattered and worn existence soon after it is published. This reality further ensures that the first edition of the manual must be followed by an updated second edition, and then a third edition, and a fourth . . . .

One final (and perhaps political) comment. Beyond its practical application, reading this text from cover to cover leads to a clear perspective on what a truly enormous impact new technologies have had on the provision of clinical microbiology services over a very short time. Obviously, the same has been true in all areas of health care. What a difference a decade makes. Nonetheless, I suspect that 100 years from now, when future workers in our field peek back through their retroscopes and ask the question, “What was the single most defining element in medicine during the beginning of the new millennium, at least in the United States?” the answer will not be technology advances. It probably will not be managed care either, or, for that matter, novel approaches to diagnosing and treating diseases like diabetes, heart disease, AIDS, and cancer. It will not even be genomics. I strongly suspect the answer will be acceptance of evidence-based medicine as a valid paradigm.

In view of the myriad of technologies that now confront us, we must begin to ask serious questions about their real clinical value, their cost-effectiveness, and how they can benefit us in ways that old approaches could not. The studies need to be systematic, objective, thoughtful,
and comprehensive. And then we must carefully analyze and evaluate the data. It is only then that we can make valid decisions as to the most prudent applications of these new technologies. In this respect, the Manual of Commercial Methods in Clinical Microbiology serves another very useful purpose. It serves as a valuable starting point for the design and implementation of the many investigations that must certainly follow. Dr. Truant and his coauthors have done all of us who practice clinical microbiology a lasting service.

GARY V. DOERN
Preface

The Manual of Commercial Methods in Clinical Microbiology is a natural progression of the texts currently available in the discipline of clinical microbiology. The 3 decades since the first edition of the Manual of Clinical Microbiology (MCM) was published by the American Society for Microbiology have brought tremendous strides in the availability, quality, and clinical usefulness of commercial products in clinical microbiology, particularly bacteriology. In fact, in the first edition of MCM (1970), other than the description of culture media, reagents and stains, one would be hard pressed to find information on commercially available products of any kind. Commercially available microscopes and illuminators (since many light sources were separate from the microscopes at that time) were briefly mentioned, and a commercially available latex particle agglutination test for Coccidioides immitis was reviewed. This serves to emphasize the paucity of commercially available kits which the clinical microbiologist could use for the identification and antimicrobial susceptibility of significant pathogens at that time. In addition, in recent years, the advent of molecular methods in clinical microbiology has revolutionized the evaluation of patients with presumed infectious diseases. We are moving from an era of phenotypic identification of organisms and experiencing a paradigm shift to a true genotypic identification. This has refined and sometimes even changed the taxonomic placement of organisms which were previously categorized primarily by phenotypic characteristics.

We are just beginning to realize the value of our discipline in evaluating patients with infectious diseases and contributing to the use of therapeutic modalities in their treatment and cure. If one measures the discipline of clinical microbiology from the initiation of ASM’s clinical microbiology section (now a division), it is barely middle-aged. As clinical microbiologists, we are only at the beginning of our contributions to infectious diseases and clinical medicine.

Bacteriologists and microbiologists practiced this discipline long before it was known as clinical microbiology. Indeed, Pasteur, Koch, and others used the science of microbiology to help their fellow humans to improve their collective health and quality of life. Some may consider them the first clinical microbiologists. And, although many discussions ensued between those arguing that the discipline should be called clinical microbiology and those arguing that it should be called diagnostic microbiology, the discipline is generally known today as clinical microbiology, since those who practice this specialty perform services which are both diagnostic and consultative. We consult with clinicians (indeed, some people are both microbiologists and clinicians), interpret laboratory results, and work very closely with specialists in infectious diseases and other medical disciplines, infection control practitioners, and many other health care providers.

This reference is not intended to provide an exhaustive review of clinical microbiology procedures. The Manual of Clinical Microbiology, the Manual of Clinical Laboratory Immunology, the Clinical Microbiology Procedures Handbook, Essential Procedures for Clinical Microbiology, and other fine texts provide this resource for those of us practicing clinical microbiology. However, to date, there has been no general resource for all subdisciplines of clinical microbiology to use when evaluating commercial methods, tests or products. Sources such as ASM books, the Cumitech series, periodicals (such as the Journal of Clinical Microbiology), reviews and scientific journal articles, and package inserts, which occasionally contain in-house data from the manufacturer, have been the main resource for those needing specific information on commercial methods and products.

In this book, we attempt to review the commercial tests (both manual and automated) in the discipline of clinical microbiology. Descriptions of their sensitivities and specificities and predictive values from peer-reviewed sources, when available, are included. The authors have attempted to include the most recent peer-reviewed data from respected journals. We also try to predict new tests or methods which may be used in the next several years. Additional information which will be of value is included in chapters devoted to molecular microbiology, information management, emerging infectious diseases, and veterinary clinical microbiology.

This manual, then, can be used as a starting point when one needs to evaluate which test, kit, procedure, or instrument may be considered or chosen for an organism detection, organism identification, or antibiotic susceptibility test. Current pricing information, newly published peer-reviewed product evaluations, new products, and other information will supplement the information provided in this manual.

The authors have attempted not to duplicate recent information, methods, and procedures or product reviews
which are readily available in other references from ASM or other sources. Among the topics which are not reviewed in this text are taxonomy; routine culture information; and general issues such as normal floras, microscopy, laboratory management, infection control, and a comprehensive description of all of the major groups of organisms. Additionally, if substantive product reviews have been included in recent reviews or texts, they are not duplicated in this manual, and the reader is referred to the authoritative reference. This text also does not review the plethora of antibody tests which are covered authoritatively and extensively in the Manual of Clinical Laboratory Immunology. However, there is some unavoidable and necessary overlap of selected information. For example, the topic of collection, storage, and transportation is addressed by some authors if deemed significantly different from previous descriptions or unique to a specific commercial test. The exclusion of antibody tests will not pertain to the chapters on human immunodeficiency virus and mycoplasmas, since many of the significant methods are antibody based. In addition, for hepatitis and rickettsia methods, the reader is referred to the Manual of Clinical Microbiology and the Manual of Clinical Laboratory Immunology for current authoritative reviews.

The contributors to this book consist of a wonderful group of practicing clinical microbiologists, physicians, and scientists with a wealth of experience. I thank all of the authors for their diligence and completeness. I apologize for any unintentional omission of tests or data, and I encourage the reader to contact me or the ASM Press editorial office with any suggestions or corrections for future editions. The authors have done their best to describe the most commonly used products in clinical microbiology. As all clinical microbiologists readily understand, comparisons between products are quite difficult and scientifically challenging. Among these difficulties are changing reagents, pricing, software, hardware, and databases; different groups of products which are evaluated and described in the literature at different times, in different laboratories, or with different reference procedures; new products; and products which have been removed from the marketplace. The contributors have attempted to sort through this maze and have tried to include only the most recent and pertinent references. Of course, each laboratory and director must thoroughly evaluate each method for its usefulness in a specific setting before implementation, keeping in mind the complexity of the method and technical expertise required, review of the test by the Food and Drug Administration, the cost of the method (including reagents, personnel and equipment), and its clinical usefulness.

I hope the information presented in this manual proves useful to clinical microbiologists, pathologists, infectious disease specialists, and other health care providers. And I especially hope that it serves as an incentive for improvement of this reference in future editions and an inspiration for future accomplishments in clinical microbiology and infectious diseases.

ALLAN L. TRUANT
I thank Jeff Holtmeier, director of ASM Press, for his guidance and wisdom. Without his foresight and diligence, this project would not have been possible. Many thanks are also given to Ken April of ASM Press for his persistence and skills in bringing this project to completion. Thanks also are extended to Paul Edelstein, Irv Nachamkin, Nancy Stockbine, Washington Winn, Marianna Wilson, and Helen Buckley for review of selected portions of this manual. I also thank the College of American Pathologists for providing information to the authors of this manual and CAP Today for providing information and data for chapter 15.

I also thank a number of family members, to whom this book is dedicated. I thank my father, the late Joseph Paul Truant, Ph.D. (1923–1988), the founder and coeditor of the first three editions of the Manual of Clinical Microbiology, and the first chairperson of the Clinical Microbiology Section of the American Society for Microbiology. The Clinical Microbiology Section, which later became a division, is now the largest division of ASM. He also served as secretary, vice-chairman, and chairman of the Medical Division of ASM and as an editorial board member for journals published by ASM and the Canadian Society for Microbiology. His selfless dedication and time devoted to ASM and to helping establish, with the collaboration of many others, clinical microbiology as an accepted discipline have paved the way for those of us who practice this specialty and strive to minimize the morbidity and mortality associated with infectious diseases. I also am grateful to my mother, Flora Rina (Lenardon) Truant, who practiced infection control in the home before it was a well-understood principle, who taught her children persistence and determination, and who is the epitome of America’s work ethic and moral strength; my children, Patti, Kathleen, and Steven, who give me an emotional compass and who have loved and supported me throughout this project and well beyond; and my sisters, Linda Ann Thompson and Anita Louise Ryan, and their families for their love and support.

ALLAN L. TRUANT
Important Notice

The authors and editor have taken great care to confirm the accuracy of the information presented in this manual. However, the authors, editor, and publisher make no warranty, expressed or implied, that the information in this book is accurate or appropriate for any particular facility or environment or any individual employee's personal situation, and they are not responsible for any consequences of application of any of the information in this book by any reader. The inclusion of specific products, instruments, reagents, or kits by the contributors of this manual does not represent any endorsement of any such product by the American Society for Microbiology or ASM Press or its contributors or editors, nor does the inclusion or inadvertent exclusion of any product, instrument, reagent, or kit reflect a preference for any product over other similar competitive products. The comments included in this manual are those of the authors and do not necessarily reflect the views of their employers or institutions.

Some of the tests and methods discussed in this manual have Food and Drug Administration (FDA) clearance for selected uses. It is the responsibility of the laboratorian or health care provider to ascertain the FDA status of each product which is considered for use in his or her hospital, setting, or practice.
Index

A.F.B. Adjusting Reagents, 256
A3 medium, 202
A3B medium, 202
A7 agar, 203–204, 210
ATB agar, 204
A8 agar, 203–204, 210, 220
AbboScreen, heartworm test, 353
Abbott Laboratories PCR, 313–314
ABI PRISM 377 DNA sequencer, 442
ABI PRISM 5700 System, 430, 433–435
ABI PRISM 6700 System, 430–431
ABI PRISM 7700 System, 345, 433–435
Absidia corymbifera, 247
AccentLab (laboratory information system), 361–363
Access automated immunoassay system, 326
Access CHLAMYDIA, 140–143, 156, 177
AccuProbe system (culture identification tests), 310–311
bacteria, 311
Campylobacter, 38
fungi, 244
mycobacteria, 267–268, 310
Neisseria gonorrhoeae, 40, 42
AccuSpot HIV-1 & 2, 106
AccuSpot Plus HIV 1 & 2, 106
AccuStrip Strep A (II), 28
Acid-fast staining, mycobacteria, 256–257
Acinetobacter, 414
Actinobacillus, 347–349
Actinobacillus pleuropneumoniae, 348
Actinobaculum suis, 349
Actinomyces, 59, 62, 64
Actinomyces iraadii, 51
Actinomycetes vicosus, 59
Adenocline Type 40/41, 93
Adenolex, 93
Adenovirus, 84, 93, 308, 341
Adenovirus ELA (Biotrin International), 93
Adenovirus IDEA, 93
Advanced EXPERT System, 416
Advia Centaur automated immunoassay system, 326
Aerococcus, 25
Aeromonas hydrophila, 349
Aeromonas salmonicida, 349
Aerospray Slide Stainer 7320 Microbiology Acid-Fast Staining, 257
Aerotolerance test, 59
Affirm VPIII, 301, 311
African horse sickness virus, 342
Agar gel immunodiffusion, viruses, 340–341
AIA 600 II automated immunoassay system, 332
AIA Nex-IA automated immunoassay system, 332
Albicans ID, 234
Albicans-Sure, 234–235
Alcaligenes xylosoxidans, 18
Allosebac, 25
Alpha-Tech AFB Stains and Controls, 257
Alphavirus, 339
Amebae, 275, 351–352
American Society for Testing and Materials, Laboratory Equipment Control Interface Specification, 445
AMPLIFICOR CT, 154–156, 158, 170–176, 178–182, 184, 313
AMPLIFICOR CT/GC, 178, 191–192
AMPLIFICOR CT/NG, 175, 177, 186
AMPLIFICOR CT/NG/IC, 146–151
AMPLIFICOR Cytomegalovirus (CMV), 95
AMPLIFICOR HIV-1 assay, 113
AMPLIFICOR HIV-1 1.5 assay, 312
AMPLIFICOR HIV-1 MONITOR 1.0 assay, 114–115
AMPLIFICOR MTB test, 262–263, 265–266
AMPLIFICOR Neisseria gonorrhoeae, 40, 42, 193
AMPLIFICOR PCR, 312–313
Amplified Chlamydia trachomatis Assay, 146–150, 152, 155, 165–168
Amplifoil Universal Amplification and Detection System, 438
An-IDENT, 61–66, 349
Anaerobic bacteria, 50–83
automated testing procedures, 72–75
clinical considerations, 50–52
future directions in testing, 75–77
identification, 53–54
identification after 4 h of aerobic incubation, 61–69
immunodiagnostic methods, 69–72
incubation, inspection, and subculture of colonies, 53–55
interpretation of identification obtained from kits, 69
introduction, 50–52
MALDI-TOF-MS, 76–78
manual test procedures, 54–69
moderate obligate anaerobes, 50
PCR methods, 75–76
specimen collection, transport, and storage, 52–53
steps in diagnosis of infections, 51–52
strict obligate anaerobes, 50
Anaerobic Culturette, 53
Anaerobic incubation systems, 53–55
Anaerobic Jar (EM Science), 54
Anaerobic Jar Complete (Oxoid), 54
Anaerobic Jar, Complete (Difco), 54
Anaerobic System (Difco), 54
Anaerobic Transport System, 53
Anaerocult A, 54
Fecal specimen, Fecal flotation device (Vedco), 352
Fecal flotation, 351–352
FECA-MIX, 352
FECA-MED, 352
Feca-Dry II, 352
Fusarium solani
FUNGITEST, 247
Fungitec G Test MK, 229
Fungifast Twin, 236, 238, 240
Fungistat Twin, 236, 238, 240
Fungitite G Test MK, 229
FURTHERTEST, 247
Fusarium solani, 247
Fusobacterium, 59, 61–63, 68–69, 71, 75
Fusobacterium necrophorum, 51, 59, 64
Fusobacterium nucleatum, 51, 64
Fusobacterium ulcera, 59
Fusobacterium varium
Gardnerella, 311
Gardnerella vaginalis, 41–43
GasPak 100, 54
GasPak 150, 54
GasPak Plus generator, 54
GasPak Pouch Environmental System, 54
Gastrointestinal viruses, 92–93
Gel-based automation, DNA sequencing, 441–442
GelToaster, 442
Gemmella, 25
Gen-Eri-K, 309
Gen-Probe HIV-1 viral load assay, 114–115
Gen-Probe TMA, 314
GenBio ImmunoWELL ELISA, mycoplasmas, 213
GenBio ImmunoWELL Mycoplasma pneumoniae IgM or IgG, 214–219
Gene Release, 307–308
GeneChip array, 440–441
Geneclean, 308
GeneLibrarian, 442
Genesys Plus (laboratory information system), 369–371
Genesys Pro (laboratory information system), 369–371
GeneTAC 2000 Biochip Analyzer, 441
Genetic Analysis Technology Consortium, 445
Genetic Systems Genie HIV1/HIV2, 106
Genetic Systems HIV-1 Ag EIA, 112
Genetic Systems HIV-1 nLAV, 102
Genetic Systems HIV-1 Western Blot, 110
Genetic Systems HIV-1/HIV-2 Peptide, 102
Genetic Systems HIV-2, 102
Genetic Systems HIV-2 Western Blot, 110
Genital mycoplasmas, 202, 213
Genezyme Combo Rapid Test, 283, 287
Genezyme Contrast Strep A, 28
Genezyme Virotech GmbH Mycoplasma pneumoniae ELISA kit, 213
Geotrichum, 233–234
Geotrichum candidum, 243
Giardia, 300
Giardia, 284, 286–288
Giardia-Cel, 301
Giardia-CELISA, 301
Giardia lamblia, 282–283, 300–301, 351–352
Giemsa stain, C. trachomatis, 132
β-Glucan Limulus test
Aspergillus, 230
C. albicans, 228–229
Glutamate dehydrogenase, latex agglutination test, 70, 74
Gonobio test, 40–41
Gonochek II, 40–41
GonoGen II, 40–41
GonoGen I, 40–41
GonoStat II, 40
Gonozyme, 40–41
Gram-negative bacteria, 31–33
automated systems for identification, 33
manual systems for identification, 33
Gram-positive bacteria, 23–31
Group A Streptococcus Direct test, 29, 310
Haemophilus, 17, 347–348, 421, 423–424
identification, 39–41
Haemophilus aphrophilus, 39, 41
Haemophilus daceyi, 39
Haemophilus haemolyticus, 40
Haemophilus identification test kit, 40
Haemophilus influenzae, 39–41, 311, 422
Haemophilus parahaemolyticus, 40
Haemophilus parainfluenzae, 39–40
Haemophilus paraphrophilus, 39–40
Haemophilus segnis, 40
Haemophilus somnis, 348
Hansenula, 243, 246
Hantaan virus, 404
Mycoplasma penetrans, 202
Mycoplasma prunum, 202
Mycoplasma pneumoniae, 201–203, 210–214, 216, 220, 222
Mycoplasma salivarium, 349
Mycoplasma SPIR, 220–221
Mycoplasma synoviae, 349
Mycoprep Specimen Digestion/Decontamination, 256
Mycoscreen broth/agar, 204
Mycoscreen GU broth system, 203–204
Mycostandard, 247–248
Myctotal, 247–248
Mycotrans, 202
Mycotrim medium, 203
Mycotube, 236, 238
NAC-PAC, 256
NAC-PAC2, 256
Naegleria fowleri, 275
NASBA, see Nucleic acid sequence-based amplification
Negative staining, viruses, 338
Negative-strand RT-PCR, 345
Neisseria, 40–42
Neisseria gonorrhoeae, 40–42, 128, 130–131, 186–193, 311–313, 315–316
culture-based tests, 186–193
direct fluorescent antibody tests, 186, 190
ligase chain reaction assay, 186–193
nucleic acid tests, 42
Neisseria-Kwik test kit, 40–42
Neisseria meningitidis, 40–42
Neisstrip, 40–41
Neonates
chlamydial conjunctivitis, 129
serological testing for human immunodeficiency virus, 110–114
Neopora caninum, 353
Nested PCR methods, 309, 344–345
Newcastle disease virus, 340
N/F System, 32
Nitrate reduction disk test, 59
Nongonococcal urethritis, 129, 201
Novapath HIV-1 Immunoblot, 110
NOVIUS Lab (laboratory information system), 388–391
Nucleic acid(s)
amplification, 309–310
hybridization and detection of amplification products, 309–310
sensitivity, 309–310
extraction, 307–309, 430–431
contamination control, 308–309
sensitivity, 307
sequencing, future directions, 430, 441–443
viral, 343–345
Nucleic acid capture technology, 430
Nucleic acid detection assays
amplified methods, 311–316
commercially available, 310–316
future directions, 429–430
nonamplified methods, 310–311
nucleic acid probe amplification assays, 316
nucleic acid target amplification assays, 312–316
signal amplification assays, 311–312
Nucleic acid probe, C. trachomatis, 145
Nucleic acid sequence-based amplification (NASBA), 315–316
Nucleospin, 308
NuclIScan Reader, 316
NuclISens Extractor, 315, 430
NuclISens HIV-1 QT RNA assay, 114–115
NuclISens RNA Extraction Kit, 308
NuclISens system, 315
O&P examination, see Ova and parasite examination
Omni automated immunoassay system, 328
Omni-SAL, 109
OpenGene System, 116, 442
Operational truth study, 9–9
OptiMAL, 285, 298, 302
OpsLab (laboratory information system), 385–388
OraSure, 107, 109
OraSure HIV-1 Western Blot, 110
Oricul-N system, Candida, 229
Orihobacterium rhinotracheale, 348
OSOM Strep A test, 28
Ova and parasite (O&P) examination, 275, 283–284
Ova Float ZN, 138, 392
OvaSol, 352
Ovine papillomavirus, 343
Ovine progressive pneumonia virus, 340
Ovum flotation, 352
Oxi/Ferm, 347
Oxi/Ferm II, 32
Oxoid Signal Blood Culture System, 12–13
Oxoid Strep Grouping Kit, 27
Oxoid Strep Plus, 27
PACE 2
C. trachomatis, 145, 153, 155–156, 158, 163–164, 176, 179, 181, 184, 310
N. gonorrhoeae, 40, 42, 186–187, 191, 310
Package insert, 5
PANext RNA extraction kit, 308
Para Kit, fecal centrifugation kit, 291
Para-Pak CON-Test fecal concentration system, 290
Para-Pak parasitology products, 279
Para-Pak Ultra, 281
PARA-SED fecal concentration system, 281, 289–290
Paracoccidioides brasiliensis, 244
Parainfluenza virus, 84, 340–341
Paramyxovirus, 341
Parasight-F, 285, 298, 302
Parasites, 274–305
blood collection, 284–285
concentration of fecal specimen, 283–285, 289–292
diagnostic test options, 275
equipment for diagnosis, 276
fresh stool specimen, 276, 278
immunoassay, 282–283, 286
immunodetection, 299–301
microscopy, 275–276
morphology, 274
ovum and parasite examination, 275, 283–284
permanent stained smear, 283–284
preserved stool specimens, 276–285
routine methods, 275
solicitation of product information, 276
sources of commercial reagents and supplies, 295–297
special tests, 275–276
specimen collection, 276
specimens from miscellaneous body sites, 285
stains, 292
STAT category, 274–275
veterinary, 351–353
wet mount, 283
Particulate antigen-antibody tests, mycoplasmas, 212–213, 222
Pasco DMS, 421
Pasco Reader, 421
Pasco Strep Plus panel, 424
Pasco System
antifungal susceptibility testing, 245, 247
antimicrobial susceptibility testing, 421–422
Staphylococcus epidermidis
Staphylococcus cohnii
Staphylococcus capitis
Staphylococcus auricularis
Staphylococcus saprophyticus
Staphylococcus intermedius
Staphylococcus haemolyticus
Staphylococcus aureus

single-vial fecal collection system, 278, 281–282

transport, 280

veterinary, 351–352

Strand displacement amplification test, C. trachomatis, 172

Stratagene, 437–438, 440

Strep A OIA, 29

Strep A OIA Max, 29

Strep Grouping Kit, 27

Streptex, 27

Streptococci, 25, 62, 348

beta-hemolytic, 26–28

group A, 29

pharyngeal, 26–27

group B, 27–28

group C, 348

group G, 348

identification, 26–28

species identification, 28

Streptococcus agalactiae, 311

Streptococcus dysgalactiae, 348

Streptococcus iniae, 396–397

Streptococcus pneumoniae, 17, 311

antimicrobial susceptibility testing, 420–425

urinary antigen, 28

Streptococcus pyogenes, 310–311

Streptococcus suis, 348

Streptococcus uberis, 348

SUDS HIV-1, 106, 108

Sunquest Commercial Lab (laboratory information system), 391–393

Suppliers, commercial, 295–297, 451–465

SureStep Strept A (II), 28

Surround (laboratory information system), 372–374

Susceptibility testing, see Antimicrobial susceptibility testing

Swine encephalomyocarditis virus, 341, 343

Swine influenza virus, 339, 341, 343

Swine vesicular disease virus, 343

SYBR-Green I dye, 431

T. VAG DFA kit, 302

Tania, 302

TaqMan chemistry, 312–313, 433–435

TB Aauramine-Rhodamine Fluorescent Stain, 257

TB Fluorescent Stain Kit, 256–257

TB Kinyoun Carbol Fuchsin Stain, 257

TB Quick Stain Kit, 256–257

TB Stain Kit K, 256–257

TB Stain Kit ZN, 256–257

TB Fluorescent Stain Kit, 256–257

TB Fluorescent Stain Kit, 256–257

TB Kinyoun Carbol Fuchsin Stain, 257

TB Quick Stain Kit, 256–257

TB Stain Kit K, 256–257

TB Stain Kit ZN, 256–257

TB Susceptibility Quad 1-IWP, 269

TB Susceptibility Quad 2-IWP, 269

TB Ziehl-Neelsen Carbol Fuchsin, 257

TechLab CD Tox A/B, 76

TechLab Crypto/Giardia IF Test, 299, 301

TechLab Test

Cryptosporidium, 300

E. histolytica, 300

Giardia, 301

TestPack CHLAMYDIA, 134

TestPack HIV-1/HIV-2 AB, 106

TestPack PLUS STREP A, 29

TestPack PLUS/OBC, 29

TestPack Plus/OBC II, 29

TestPack Rotavirus, 92

TestPack RSV, 89

Thermophilic strand displacement amplification (tSDA) test, 314–315

TIGRIS System, 313–314

TORCH agents, 324

Toxogen, 243

TouchScan SR, 420

Toxin A EIA, 73

Toxin A OIA Max, 29

Toxin Group A, 29

Toxin Group B, 27–28

Toxin Group C, 348

Toxin Group G, 348

Identification, 26–28

Species Identification, 28

Streptococcus agalactiae, 311

Streptococcus dysgalactiae, 348

Streptococcus iniae, 396–397

Streptococcus pneumoniae, 17, 311

Antimicrobial susceptibility testing, 420–425

Urinary antigen, 28

Streptococcus pyogenes, 310–311

Streptococcus suis, 348

Streptococcus uberis, 348

SUDS HIV-1, 106, 108

Sunquest Commercial Lab (laboratory information system), 391–393

Suppliers, commercial, 295–297, 451–465

SureStep Strept A (II), 28

Surround (laboratory information system), 372–374

Susceptibility testing, see Antimicrobial susceptibility testing

Swine encephalomyocarditis virus, 341, 343

Swine influenza virus, 339, 341, 343

Swine vesicular disease virus, 343

SYBR-Green I dye, 431

T. VAG DFA kit, 302

Tania, 302

TaqMan chemistry, 312–313, 433–435

TB Aauramine-Rhodamine Fluorescent Stain, 257

TB Fluorescent Stain Kit, 256–257

TB Kinyoun Carbol Fuchsin Stain, 257

TB Quick Stain Kit, 256–257

TB Stain Kit K, 256–257

TB Stain Kit ZN, 256–257

TB Susceptibility Quad 1-IWP, 269

TB Susceptibility Quad 2-IWP, 269

TB Ziehl-Neelsen Carbol Fuchsin, 257

TechLab CD Tox A/B, 76

TechLab Crypto/Giardia IF Test, 299, 301

TechLab Test

Cryptosporidium, 300

E. histolytica, 300

Giardia, 301

TestPack CHLAMYDIA, 134

TestPack HIV-1/HIV-2 AB, 106

TestPack PLUS STREP A, 29

TestPack PLUS/OBC, 29

TestPack Plus/OBC II, 29

TestPack Rotavirus, 92

TestPack RSV, 89

Thermophilic strand displacement amplification (tSDA) test, 314–315

TIGRIS System, 313–314

TORCH agents, 324

Toxogen, 243

TouchScan SR, 420

Toxin A EIA, 73

Toxin CD Test, 73

Toxin A OIA Max, 29

Toxin Group A, 29

Toxin Group B, 27–28

Toxin Group C, 348

Toxin Group G, 348

Identification, 26–28

Species Identification, 28

Streptococcus agalactiae, 311

Streptococcus dysgalactiae, 348

Streptococcus iniae, 396–397

Streptococcus pneumoniae, 17, 311

Antimicrobial susceptibility testing, 420–425

Urinary antigen, 28

Streptococcus pyogenes, 310–311

Streptococcus suis, 348

Streptococcus uberis, 348

SUDS HIV-1, 106, 108

Sunquest Commercial Lab (laboratory information system), 391–393

Suppliers, commercial, 295–297, 451–465

SureStep Strept A (II), 28

Surround (laboratory information system), 372–374

Susceptibility testing, see Antimicrobial susceptibility testing

Swine encephalomyocarditis virus, 341, 343

Swine influenza virus, 339, 341, 343

Swine vesicular disease virus, 343

SYBR-Green I dye, 431

T. VAG DFA kit, 302

Tania, 302

TaqMan chemistry, 312–313, 433–435

TB Aauramine-Rhodamine Fluorescent Stain, 257

TB Fluorescent Stain Kit, 256–257

TB Kinyoun Carbol Fuchsin Stain, 257

TB Quick Stain Kit, 256–257

TB Stain Kit K, 256–257

TB Stain Kit ZN, 256–257

TB Susceptibility Quad 1-IWP, 269

TB Susceptibility Quad 2-IWP, 269

TB Ziehl-Neelsen Carbol Fuchsin, 257

TechLab CD Tox A/B, 76

TechLab Crypto/Giardia IF Test, 299, 301

TechLab Test

Cryptosporidium, 300

E. histolytica, 300

Giardia, 301

TestPack CHLAMYDIA, 134

TestPack HIV-1/HIV-2 AB, 106

TestPack PLUS STREP A, 29

TestPack PLUS/OBC, 29

TestPack Plus/OBC II, 29

TestPack Rotavirus, 92

TestPack RSV, 89

Thermophilic strand displacement amplification (tSDA) test, 314–315

TIGRIS System, 313–314

TORCH agents, 324

Toxogen, 243

TouchScan SR, 420

Toxin A EIA, 73

Toxin CD Test, 73
INDEX

Vitek 2 ID-GNB card, 32–33
Vitek ANI, 61–67
Vitek EPS, 32
Vitek GNI, 33
Vitek GNI Plus, 32–34
Vitek GPI card, 25–26, 28–30
Vitek GPS-106 card, 425
Vitek gram-positive system, 349
Vitek ID-GPC card, 25–26, 30
Vitek NHI card, 40–42
Vitek System (antimicrobial susceptibility testing), 413–416
Vitek UID, 32
Vitek UID-3, 32
Vitek YBC system, 240–241, 243–244
Vitek Yeast Biochemical Card, 236
VITROS ECi automated immunoassay system, 330
VZV, see Varicella-zoster virus

WAVE DNA fragment analysis system, 443–444
WB003 test, 229–230
WEE-TABS, 57–61

West Nile encephalitis virus, 402–403
Western blot assay
human immunodeficiency virus, 108–111
viruses, 342
Western equine encephalitis virus, 341
Wet mount, parasites, 283
WINLAB (laboratory information system), 372–377
Witness Dirofilaria, 353
Wizard, 308
Wuchereria bancrofti, 302
Wuchereria bancrofti ICT Filariasis, 302

Yeast, commercial kits for identification, 236–241
Yeastlike organisms, 236–241
YeastStar, 238, 240
Yersinia, 34
Yersinia pestis, 78, 435
Yersinia ruckeri, 349
YT Microplate, 243–244

ZStatFlu, 85–87