Contributors

N. Franklin Adkinson, Jr., MD
Professor of Medicine and Senior Laboratory Investigator, Johns Hopkins University School of Medicine, Baltimore, Maryland
β-Lactam Allergy

David M. Allen, MD
Partner, ID Specialists, Dallas, Texas
Acinetobacter Species

Ban Mishu Allos, MD
Assistant Professor of Medicine and Preventive Medicine, Vanderbilt University School of Medicine, Nashville, Tennessee
Campylobacter jejuni and Related Species

Guy W. Amsden, PharmD
Director, Department of Pharmaceutical Care Services, Bassett Healthcare, Cooperstown, New York
Pharmacokinetics and Pharmacodynamics of Anti-infective Agents; Tables of Antimicrobial Agent Pharmacology

David A. Anderson, PhD
Associate Professor, Deputy Director, and National Health and Medical Research Council Senior Research Fellow, Macfarlane Burnet Institute for Medical Research and Public Health, Melbourne, Victoria, Australia
Hepatitis E Virus

David R. Andes, MD
Associate Professor, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin
Cephalosporins

Fred Y. Aoki, MD
Professor, Departments of Medicine, Medical Microbiology, Pharmacology, and Therapeutics, University of Manitoba Faculty of Medicine; Health Sciences Centre, Winnipeg, Manitoba, Canada
Antiviral Drugs (Other than Antiretrovirals)

Petra M. Apfalter, MD, DTMH
Associate Professor, Medical University of Vienna, Vienna; Attending Physician, Elisabethinen Hospital Linz, Linz, Austria
Chlamydia pneumoniae

Michael A. Apicella, MD
Professor and Head, Department of Microbiology, University of Iowa Carver College of Medicine, Iowa City, Iowa
Neisseria meningitidis

Cesar A. Arias, MD, MSc, PhD
Assistant Professor of Medicine, University of Texas Medical School at Houston, Houston, Texas; Director, Molecular Genetics and Antimicrobial Resistance Unit, Universidad El Bosque, Bogota, Colombia
Enterococcus Species, Streptococcus bovis Group, and Leuconostoc Species

Michael H. Augenbraun, MD
Professor of Medicine, State University of New York Downstate College of Medicine; Director, Sexually Transmitted Diseases Clinic, Kings County Hospital Center, Brooklyn, New York
Genital Skin and Mucous Membrane Lesions

Dimitri T. Azar, MD
Professor of Ophthalmology, University of Illinois College of Medicine at Chicago; Professor and Head, Department of Ophthalmology and Visual Sciences, University of Illinois at Chicago Medical Center, Chicago, Illinois
Microbial Conjunctivitis; Microbial Keratitis

Larry M. Baddour, MD
Professor of Medicine, Mayo Clinic College of Medicine; Consultant, Infectious Diseases, Mayo Clinic, Rochester, Minnesota
Prosthetic Valve Endocarditis; Infections of Nonvalvular Cardiovascular Devices

Lindsey R. Baden, MD
Assistant Professor of Medicine, Harvard Medical School; Associate Physician, Director of Clinical Research (Division of Infectious Diseases), and Director of Transplant Infectious Diseases, Brigham and Women's Hospital; Director of Infectious Diseases, Dana-Farber Cancer Institute, Boston, Massachusetts
Vaccines for Human Immunodeficiency Virus-1 Infection

Carol J. Baker, MD
Professor of Pediatrics, Molecular Virology, and Microbiology, Department of Pediatrics, Section of Infectious Diseases, Baylor College of Medicine; Attending Physician, Texas Children's Hospital, Houston, Texas
Streptococcus agalactiae (Group B Streptococcus)

Ronald C. Ballard, PhD
Branch Chief, Laboratory Reference and Research Branch, Division of Sexually Transmitted Diseases Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia
Klebsiella granulomatis (Donovanosis, Granuloma Inguinale)

Charles H. Ballow, PharmD
Director, Buffalo Clinical Research Center, Buffalo, New York
Pharmacokinetics and Pharmacodynamics of Anti-infective Agents

Scott D. Barnes, MD
Chief, Warfighter Refractive Eye Surgery Clinic, Womack Army Medical Center, Fort Bragg, North Carolina
Microbial Conjunctivitis; Microbial Keratitis

Miriam J. Baron, MD
Assistant Professor, Department of Medicine, Harvard Medical School; Associate Physician, Brigham and Women's Hospital, Boston, Massachusetts
Pancreatic Infection

Dan H. Barouch, MD, PhD
Associate Professor of Medicine, Harvard Medical School; Chief, Division of Vaccine Research, and Staff Physician, Beth Israel Deaconess Medical Center; Associate Physician, Brigham and Women's Hospital, Boston, Massachusetts
Vaccines for Human Immunodeficiency Virus-1 Infection; Adenoviruses

Alan Barrett, PhD
Professor, Department of Pathology, University of Texas Medical Branch, Galveston, Texas
Flaviviruses (Yellow Fever, Dengue, Dengue Hemorrhagic Fever, Japanese Encephalitis, West Nile Encephalitis, St. Louis Encephalitis, Tick-Borne Encephalitis)
Contributors

Sarice L. Bassin, MD
Assistant Professor of Neurology, Northwestern University Feinberg School of Medicine; Fellowship Director, Neurocritical Care, Northwestern Memorial Hospital, McGaw Medical Center, Chicago, Illinois
Rhabdoviruses

Byron E. Batteiger, MD
Professor, Department of Medicine, Division of Infectious Diseases, and Department of Microbiology and Immunology, Indiana University School of Medicine, Indianapolis, Indiana
Introduction to Chlamydia and Chlamydophila; Chlamydia trachomatis (Trachoma, Perinatal Infections, Lymphogranuloma Venereum, and Other Genital Infections)

Stephen G. Baum, MD
Professor of Medicine and Professor of Microbiology and Immunology, Albert Einstein College of Medicine of Yeshiva University; Attending Physician, North Bronx Healthcare Network, Bronx, New York
Mumps Virus; Introduction to Mycoplasma and Ureaplasma; Mycoplasma pneuniae and Atypical Pneumonia

Arnold S. Bayer, MD
Professor of Medicine, Department of Internal Medicine, David Geffen School of Medicine at UCLA, Los Angeles; Associate Chief, Adult Infectious Diseases, Department of Internal Medicine, Harbor-UCLA Medical Center; Senior Investigator, St. John’s Cardiovascular Research Center, Los Angeles Biomedical Research Institute, Torrance, California
Endocarditis and Intravascular Infections

J. David Beckham, MD
Assistant Professor of Medicine, Division of Infectious Diseases, University of Colorado Denver School of Medicine; Assistant Professor of Medicine, University of Colorado Hospital, Aurora, Colorado
Encephalitis

Susan E. Beekmann, RN, MPH
University of Iowa Carver College of Medicine, Iowa City, Iowa
Infections Caused by Percutaneous Intravascular Devices

Beth P. Bell, MD, MPH
Associate Director for Epidemiologic Science, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia
Hepatitis A Virus

John E. Bennett, MD
Adjunct Professor of Medicine, Uniformed Services University of the Health Sciences F. Edward Hébert School of Medicine, Bethesda, Maryland
Chronic Meningitis; Introduction to Mycoses

Elie F. Berbari, MD
Associate Professor, Division of Infectious Diseases, Mayo Clinic College of Medicine; Attending Physician, Mayo Clinic, Rochester, Minnesota
Osteomyelitis

Jonathan D. Berman, MD, PhD
Senior Vice President for Clinical Affairs, Fast-Track Drugs and Biologics, LLC, North Potomac, Maryland
Alternative Medicines for Infectious Diseases

Joseph S. Bertino, Jr., PharmD
Associate Professor of Pharmacology, Columbia University College of Physicians and Surgeons, New York; Bertino Consulting, Schenectady, New York
Pharmacokinetics and Pharmacodynamics of Anti-infective Agents

Holly H. Birdsall, MD, PhD
Professor of Otolaryngology and Immunology, Baylor College of Medicine; Associate Chief of Staff for Research, Michael E. DeBakey Veterans Affairs Medical Center, Houston, Texas
Antibodies

Alan L. Bisno, MD
Professor Emeritus, Department of Medicine, University of Miami Miller School of Medicine; Staff Physician, Miami Veterans Affairs Medical Center, Miami, Florida
Classification of Streptococci; Streptococcus pyogenes; Nonsuppurative Poststreptococcal Sequelae: Rheumatic Fever and Glomerulonephritis

Hope H. Biswas, ScM
Staff Scientist, Blood Systems Research Institute, San Francisco, California
Human T-Cell Lymphotropic Virus Types I and II

Brian G. Blackburn, MD
Clinical Assistant Professor and Co-Director of Clinical Services, Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine; Attending Physician, Department of Internal Medicine, Division of Infectious Diseases and Geographic Medicine, Stanford Hospital and Clinics, Stanford, California
Free-Living Amoeba

Martin J. Blaser, MD
Frederick H. King Professor of Internal Medicine; Chair, Department of Medicine; and Professor of Microbiology, New York University School of Medicine; Chief, Medical Services, Bellevue Hospital Center; Chief, Medical Services, New York University Langone Medical Center; Staff Physician, Department of Medical Services, New York Harbor Veterans Affairs Medical Center, New York, New York
Introduction to Bacteria and Bacterial Diseases; Campylobacter jejuni and Related Species; Helicobacter pylori and Other Gastric Helicobacter Species

David L. Blazes, MD, MPH
Chief, Global Emerging Infections System Operations, Armed Forces Health Surveillance Center, Silver Spring, Maryland
Outbreak Investigation

Thomas P. Bleck, MD
Assistant Dean and Professor of Neurological Sciences, Neurosurgery, Medicine, and Anesthesiology, Rush Medical College of Rush University; Associate Chief Medical Officer (Critical Care), Rush University Medical Center, Chicago, Illinois
Rhabdoviruses; Clostridium tetani (Tetanus); Clostridium botulinum (Botulism); Botulinum Toxin as a Biological Weapon

Nicole M. A. Blijlevens, MD, PhD
Consultant and Lecturer, Department of Haematology, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands
Infections in the Immunocompromised Host: General Principles
Contributors

Stanley W. Chapman, MD
Professor of Medicine and Associate Professor of Microbiology, University of Mississippi School of Medicine; Division of Infectious Diseases, University of Mississippi Medical Center, Jackson, Mississippi

James D. Chappell, MD, PhD
Assistant Professor of Pathology and Pediatrics, Vanderbilt University School of Medicine; Director, Clinical Diagnostic Virology Laboratory, Vanderbilt University Medical Center, Nashville, Tennessee
Introduction to Viruses and Viral Diseases

Sharon C-A. Chen, PhD, MB BS
Clinical Senior Lecturer, University of Sydney Faculty of Medicine, Sydney; Senior Staff Specialist, Centre for Infectious Diseases and Microbiology, Westmead Hospital, Westmead, New South Wales, Australia
Nocardia Species

Sanjiv Chopra, MD
Professor of Medicine, Harvard Medical School; Senior Consultant in Hepatology, Beth Israel Deaconess Medical Center, Boston, Massachusetts
Acute Viral Hepatitis

Anthony W. Chow, MD
Professor Emeritus, Department of Medicine, Division of Infectious Diseases, University of British Columbia Faculty of Medicine; Honorary Staff, Department of Medicine, Division of Infectious Disease, Vancouver Hospital Health Sciences Center, Vancouver, British Columbia, Canada
Infections of the Oral Cavity, Neck, and Head

Alexandra Chroneou, MD
University of Athens Medical School; Attending Physician, Sotiria Hospital for Chest Diseases, Athens, Greece
Nosocomial Pneumonia

Nicholas P. Cianciotto, PhD
Professor of Microbiology-Immunology, Northwestern University Feinberg School of Medicine, Chicago, Illinois
Legionella

Rebecca A. Clark, MD, PhD
Professor of Medicine, Louisiana State University Health Sciences Center; Clinical Medical Director, HIV Outpatient Program, Interim LSU Public Hospital, New Orleans, Louisiana
Human Immunodeficiency Virus Infection in Women

Robert A. Clark, MD
Professor of Medicine and Associate Chair for Research, Assistant Vice President for Clinical Research, and Director of the Institute for Integration of Medicine and Science, University of Texas Health Science Center at San Antonio; Staff Physician, University Health System and South Texas Veterans Health Care System, San Antonio, Texas
Granulocytic Phagocytes

Jeffrey I. Cohen, MD
Chief, Medical Virology Section, Laboratory of Clinical Infectious Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland
Introduction to Herpesviridae; Human Herpesvirus Types 6 and 7; Herpes B Virus

Myron S. Cohen, MD
Professor of Medicine, University of North Carolina at Chapel Hill School of Medicine; Chief, Division of Infectious Diseases, University of North Carolina Health Care, Chapel Hill, North Carolina
The Acutely Ill Patient with Fever and Rash

Ronit Cohen-Poradosu, MD
Research Associate, Channing Laboratory, Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts
Anaerobic Infections: General Concepts

Susan E. Cohn, MD, MPH
Professor of Medicine, Division of Infectious Diseases, University of Rochester School of Medicine and Dentistry; Attending Physician, Strong Memorial Hospital, Rochester, New York
Human Immunodeficiency Virus Infection in Women

Mark Connors, MD
Chief, HIV-Specific Immunity Section, Laboratory of Immunoregulation, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland
The Immunology of Human Immunodeficiency Virus Infection

Joanne Cono, MD, ScM
Senior Advisor for Science and Global Health, Office of the Director, Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia
Smallpox as an Agent of Bioterrorism

Lawrence Corey, MD
Head, Virology Division, and Professor of Medicine and Laboratory Medicine, University of Washington School of Medicine; Senior Vice President and Co-Director, Vaccine and Infectious Disease Institute, and Head, Program in Infectious Disease, Fred Hutchinson Cancer Research Center, Seattle, Washington
Herpes Simplex Virus

Patricia A. Cornett, MD
Health Science Clinical Professor, University of California, San Francisco, School of Medicine; Chief, Hematology/Oncology, San Francisco Veterans Affairs Medical Center, San Francisco, California
Malignant Diseases in Human Immunodeficiency Virus Infection

Heather L. Cox, PharmD
Assistant Professor of Medicine and Infectious Diseases, Department of Internal Medicine, University of Virginia School of Medicine; Clinical Specialist, Infectious Diseases, Department of Pharmacy Services, University of Virginia Health System, Charlottesville, Virginia
Linezolid and Other Oxazolidinones

William A. Craig, MD
Professor of Medicine, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin
Cephalosporins

Donald E. Craven, MD
Professor of Medicine, Tufts University School of Medicine, Boston; Chairman, Department of Infectious Diseases, Lahey Clinic Medical Center, Burlington, Massachusetts
Nosocomial Pneumonia

Kent B. Croxley, MD
Professor of Medicine, University of Minnesota Medical School; Associate Chief of Staff for Education, Minneapolis Veterans Affairs Medical Center, Minneapolis, Minnesota
Infections in the Elderly
John A. Crump, MB ChB, DTM&H
Associate Professor of Medicine, Division of Infectious Diseases and International Health, Duke University School of Medicine; Director, Duke Tanzania Operations, Duke Global Health Institute, Durham, North Carolina
Enteric Fever and Other Causes of Abdominal Symptoms with Fever

Clyde S. Crumpacker II, MD
Professor of Medicine, Harvard Medical School; Attending Physician, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Boston, Massachusetts
Cytomegalovirus

James W. Curran, MD, MPH
Dean and Professor of Epidemiology, Rollins School of Public Health, Emory University; Co-Director, Emory Center for AIDS Research, Atlanta, Georgia
Epidemiology and Prevention of Acquired Immunodeficiency Syndrome and Human Immunodeficiency Virus Infection

Bart J. Currie, FRACP, DTM&H
Professor in Medicine, Tropical and Emerging Infectious Diseases Division, Menzies School of Health Research and Northern Territory Clinical School; Infectious Diseases Physician, Royal Darwin Hospital, Darwin, Northern Territory, Australia
Burkholderia pseudomallei and Burkholderia mallei: Melioidosis and Glanders

Michael P. Curry, MD
Assistant Professor of Medicine, Harvard Medical School; Medical Director, Liver Transplantation, Beth Israel Deaconess Medical Center, Boston, Massachusetts
Acute Viral Hepatitis

Inger K. Damon, MD, PhD
Adjunct Clinical Faculty, Department of Medicine, Emory University School of Medicine; Chief, Poxvirus and Rabies Branch, Centers for Disease Control and Prevention, Atlanta, Georgia
Orthopoxviruses: Vaccinia (Smallpox Vaccine), Variola (Smallpox), Monkeypox, and Cowpox; Other Poxviruses That Infect Humans: Parapoxviruses, Molluscum Contagiosum, and Yatapoxviruses; Smallpox as an Agent of Bioterrorism

Rabih O. Darouiche, MD
Professor of Medicine and Physical Medicine and Rehabilitation and Director, Center for Prostheses Infection, Baylor College of Medicine; Veterans Affairs Distinguished Service Professor, Michael E. DeBakey Veterans Affairs Medical Center, Houston, Texas
Infections in Patients with Spinal Cord Injury

Robert L. DeBiasi, MD
Associate Professor of Pediatrics, George Washington University School of Medicine and Health Sciences; Attending Physician, Division of Pediatric Infectious Diseases, Children’s National Medical Center, Washington, DC
Orthoreoviruses and Orbiviruses; Coltiviruses and Seadornaviruses

George S. Deepe, Jr., MD
Morgan Professor of Medicine, University of Cincinnati College of Medicine; Professor, Division of Infectious Diseases, University Hospital and Veterans Affairs Cincinnati Medical Center, Cincinnati, Ohio
Histoplasma capsulatum

Carlos del Rio, MD
Professor and Chair, Hubert Department of Global Health, Rollins School of Public Health, Emory University; Co-Director, Emory Center for AIDS Research, Atlanta, Georgia
Epidemiology and Prevention of Acquired Immunodeficiency Syndrome and Human Immunodeficiency Virus Infection

Gregory P. DeMuri, MD
Associate Professor, University of Wisconsin School of Medicine and Public Health; Attending Physician, American Family Children’s Hospital, Madison, Wisconsin
Sinusitis

David T. Dennis, MD, MPH
Faculty Affiliate, Department of Microbiology, Immunology, and Pathology, Colorado State University College of Veterinary Medicine and Biomedical Sciences, Fort Collins, Colorado; Medical Epidemiologist, Division of Influenza, Centers for Disease Control and Prevention, Atlanta, Georgia
Yersinia Species, Including Plague

Peter Densen, MD
Executive Dean, University of Iowa Carver College of Medicine, Iowa City, Iowa
Complement

Ben E. De Pauw, MD, PhD
Professor, Blood Transfusion and Transplantation Immunology, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands
Infections in the Immunocompromised Host: General Principles

Terence S. Dermody, MD
Dorothy Overall Wells Professor of Pediatrics and Professor of Microbiology and Immunology, Vanderbilt University School of Medicine; Director, Division of Pediatric Infectious Diseases, Monroe Carell Jr. Children's Hospital at Vanderbilt, Nashville, Tennessee
Introduction to Viruses and Viral Diseases

Robin Dewar, PhD
Principal Scientist, SAIC–Frederick, National Cancer Institute–Frederick, Frederick, Maryland
Diagnosis of Human Immunodeficiency Virus Infection

James H. Diaz, MD, MPH and TM, PhD
Professor of Public Health and Preventive Medicine and Head, Environmental and Occupational Health Sciences, School of Public Health; Professor of Anesthesiology, School of Medicine, Louisiana State University Health Sciences Center, New Orleans, Louisiana
Introduction to Ectoparasitic Diseases; Lice (Pediculosis); Scabies; Myiasis and Tungiasis; Mites, Including Chiggers; Ticks, Including Tick Paralysis

Carl W. Dieffenbach, PhD
Director, Division of AIDS, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland
Innate (General or Nonspecific) Host Defense Mechanisms

Jules L. Dienstag, MD
Carl W. Walter Professor of Medicine and Dean for Medical Education, Harvard Medical School; Attending Physician, Massachusetts General Hospital, Boston, Massachusetts
Chronic Viral Hepatitis
Contributors

Raphael Dolin, MD
Maxwell Finland Professor of Medicine (Microbiology and Molecular Genetics), Harvard Medical School; Attending Physician, Beth Israel Deaconess Medical Center and Brigham and Women’s Hospital, Boston, Massachusetts
Antiviral Drugs (Other than Antiretrovirals); Vaccines for Human Immunodeficiency Virus-1 Infection; Zoonotic Paramyxoviruses: Nipah, Hendra, and Menangle Viruses; Noroviruses and Other Caliciviruses; Astroviruses and Picobirnaviruses

Scott H. Donaldson, MD
Associate Professor of Medicine, Division of Pulmonary and Critical Care Medicine, University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, North Carolina
Cystic Fibrosis

J. Stephen Dumler, MD
Professor of Medicine and Surgery and Chief, Transplant Infectious Diseases, Vanderbilt University School of Medicine, Nashville, Tennessee
Risk Factors and Approaches to Infections in Transplant Recipients; Infections in Solid Organ Transplant Recipients

Herbert L. DuPont, MD
Professor of Epidemiology and Director, Center for Infectious Diseases, University of Texas School of Public Health; Vice Chairman, Department of Medicine, Baylor College of Medicine; Chief, Internal Medicine Service, St. Luke’s Episcopal Hospital, Houston, Texas
Shigella Species (Bacillary Dysentery)

David T. Durack, MB, DPhil
Consulting Professor of Medicine, Duke University School of Medicine, Durham, North Carolina; Senior Vice President, Beckton, Dickinson and Company, Franklin Lakes, New Jersey
Fever of Unknown Origin; Prevention of Infective Endocarditis

Marlene L. Durand, MD
Assistant Professor, Harvard Medical School; Director, Infectious Disease Service, Massachusetts Eye and Ear Infirmary; Physician, Infectious Disease Unit, Massachusetts General Hospital, Boston, Massachusetts
Endophthalmitis; Infectious Causes of Uveitis; Periocular Infections

Michael S. Donnenberg, MD
Professor of Medicine and Professor of Microbiology and Immunology, University of Maryland School of Medicine, Baltimore, Maryland
Enterobacteriaceae

Michael B. Edmond, MD, MPH, MPA
Professor of Internal Medicine, Epidemiology, and Community Health and Chair, Division of Infectious Diseases, Virginia Commonwealth University School of Medicine; Hospital Epidemiologist, Virginia Commonwealth University Medical Center, Richmond, Virginia
Organization for Infection Control; Isolation

James M. Drake, MB BCh, MSc
Professor of Surgery, University of Toronto Faculty of Medicine; Neurosurgeon in Chief and Harold Hoffman Shopper’s Drug Mart Chair in Pediatric Neurosurgery, Division of Neurosurgery, Hospital for Sick Children, Toronto, Ontario, Canada
Cerebrospinal Fluid Shunt Infections

Morven S. Edwards, MD
Professor of Pediatrics, Section of Infectious Diseases, Baylor College of Medicine; Attending Physician, Texas Children’s Hospital, Houston, Texas
Streptococcus agalactiae (Group B Streptococcus)

J. Peter Donnelly, PhD
Coordinator of Studies in Supportive Care, Department of Haematology, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands
Infections in the Immunocompromised Host: General Principles

Michael B. Eliopoulos, MD
Professor of Medicine, Harvard Medical School; Staff Physician, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Boston, Massachusetts
Principles of Anti-infective Therapy

George M. Engleberg, MD
Professor of Medicine, Harvard Medical School; Staff Physician, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Boston, Massachusetts
Chronic Fatigue Syndrome

N. Cary Engleberg, MD
Professor, Department of Microbiology and Immunology, University of Michigan Medical School, Ann Arbor, Michigan
Mycobacterium leprae

J. Stephen Dumler, MD
Professor of Medicine and Surgery and Chief, Transplant Infectious Diseases, Vanderbilt University School of Medicine, Nashville, Tennessee
Risk Factors and Approaches to Infections in Transplant Recipients; Infections in Solid Organ Transplant Recipients

J. Peter Donnelly, PhD
Coordinator of Studies in Supportive Care, Department of Haematology, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands
Infections in the Immunocompromised Host: General Principles

Michael B. Edmond, MD, MPH, MPA
Professor of Internal Medicine, Epidemiology, and Community Health and Chair, Division of Infectious Diseases, Virginia Commonwealth University School of Medicine; Hospital Epidemiologist, Virginia Commonwealth University Medical Center, Richmond, Virginia
Organization for Infection Control; Isolation

John E. Edwards, Jr., MD
Professor of Medicine, David Geffen School of Medicine at UCLA, Los Angeles; Chief, Division of Infectious Diseases, Harbor-UCLA Medical Center, Torrance, California
Candida Species

Marlene L. Durand, MD
Assistant Professor, Harvard Medical School; Director, Infectious Disease Service, Massachusetts Eye and Ear Infirmary; Physician, Infectious Disease Unit, Massachusetts General Hospital, Boston, Massachusetts
Endophthalmitis; Infectious Causes of Uveitis; Periocular Infections

Paul H. Edelstein, MD
Professor of Pathology and Laboratory Medicine, University of Pennsylvania School of Medicine; Director of Clinical Microbiology, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania
Legionella

Philip R. Dormitzer, MD, PhD
Senior Director and Senior Project Leader, Viral Vaccine Research, Novartis Vaccines and Diagnostics, Cambridge, Massachusetts
Rotaviruses

Guy R. Donowitz, MD
Edward W. Hook Professor of Medicine and Infectious Diseases, University of Virginia School of Medicine; Vice-Chair for Education, Department of Medicine, University of Virginia Health System, Charlottesville, Virginia
Linezolid and Other Oxazolidinones; Acute Pneumonia

James M. Drake, MB BCh, MSc
Professor of Surgery, University of Toronto Faculty of Medicine; Neurosurgeon in Chief and Harold Hoffman Shopper’s Drug Mart Chair in Pediatric Neurosurgery, Division of Neurosurgery, Hospital for Sick Children, Toronto, Ontario, Canada
Cerebrospinal Fluid Shunt Infections

Morven S. Edwards, MD
Professor of Pediatrics, Section of Infectious Diseases, Baylor College of Medicine; Attending Physician, Texas Children’s Hospital, Houston, Texas
Streptococcus agalactiae (Group B Streptococcus)

J. Stephen Dumler, MD
Professor of Medicine and Surgery and Chief, Transplant Infectious Diseases, Vanderbilt University School of Medicine, Nashville, Tennessee
Risk Factors and Approaches to Infections in Transplant Recipients; Infections in Solid Organ Transplant Recipients

Herbert L. DuPont, MD
Professor of Epidemiology and Director, Center for Infectious Diseases, University of Texas School of Public Health; Vice Chairman, Department of Medicine, Baylor College of Medicine; Chief, Internal Medicine Service, St. Luke’s Episcopal Hospital, Houston, Texas
Shigella Species (Bacillary Dysentery)

David T. Durack, MB, DPhil
Consulting Professor of Medicine, Duke University School of Medicine, Durham, North Carolina; Senior Vice President, Beckton, Dickinson and Company, Franklin Lakes, New Jersey
Fever of Unknown Origin; Prevention of Infective Endocarditis

Marlene L. Durand, MD
Assistant Professor, Harvard Medical School; Director, Infectious Disease Service, Massachusetts Eye and Ear Infirmary; Physician, Infectious Disease Unit, Massachusetts General Hospital, Boston, Massachusetts
Endophthalmitis; Infectious Causes of Uveitis; Periocular Infections

Paul H. Edelstein, MD
Professor of Pathology and Laboratory Medicine, University of Pennsylvania School of Medicine; Director of Clinical Microbiology, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania
Legionella

Michael B. Edmond, MD, MPH, MPA
Professor of Internal Medicine, Epidemiology, and Community Health and Chair, Division of Infectious Diseases, Virginia Commonwealth University School of Medicine; Hospital Epidemiologist, Virginia Commonwealth University Medical Center, Richmond, Virginia
Organization for Infection Control; Isolation

John E. Edwards, Jr., MD
Professor of Medicine, David Geffen School of Medicine at UCLA, Los Angeles; Chief, Division of Infectious Diseases, Harbor-UCLA Medical Center, Torrance, California
Candida Species

Morven S. Edwards, MD
Professor of Pediatrics, Section of Infectious Diseases, Baylor College of Medicine; Attending Physician, Texas Children’s Hospital, Houston, Texas
Streptococcus agalactiae (Group B Streptococcus)

J. Stephen Dumler, MD
Professor of Medicine and Surgery and Chief, Transplant Infectious Diseases, Vanderbilt University School of Medicine, Nashville, Tennessee
Risk Factors and Approaches to Infections in Transplant Recipients; Infections in Solid Organ Transplant Recipients

Herbert L. DuPont, MD
Professor of Epidemiology and Director, Center for Infectious Diseases, University of Texas School of Public Health; Vice Chairman, Department of Medicine, Baylor College of Medicine; Chief, Internal Medicine Service, St. Luke’s Episcopal Hospital, Houston, Texas
Shigella Species (Bacillary Dysentery)

David T. Durack, MB, DPhil
Consulting Professor of Medicine, Duke University School of Medicine, Durham, North Carolina; Senior Vice President, Beckton, Dickinson and Company, Franklin Lakes, New Jersey
Fever of Unknown Origin; Prevention of Infective Endocarditis

Marlene L. Durand, MD
Assistant Professor, Harvard Medical School; Director, Infectious Disease Service, Massachusetts Eye and Ear Infirmary; Physician, Infectious Disease Unit, Massachusetts General Hospital, Boston, Massachusetts
Endophthalmitis; Infectious Causes of Uveitis; Periocular Infections

Paul H. Edelstein, MD
Professor of Pathology and Laboratory Medicine, University of Pennsylvania School of Medicine; Director of Clinical Microbiology, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania
Legionella

Michael B. Edmond, MD, MPH, MPA
Professor of Internal Medicine, Epidemiology, and Community Health and Chair, Division of Infectious Diseases, Virginia Commonwealth University School of Medicine; Hospital Epidemiologist, Virginia Commonwealth University Medical Center, Richmond, Virginia
Organization for Infection Control; Isolation

John E. Edwards, Jr., MD
Professor of Medicine, David Geffen School of Medicine at UCLA, Los Angeles; Chief, Division of Infectious Diseases, Harbor-UCLA Medical Center, Torrance, California
Candida Species

Morven S. Edwards, MD
Professor of Pediatrics, Section of Infectious Diseases, Baylor College of Medicine; Attending Physician, Texas Children’s Hospital, Houston, Texas
Streptococcus agalactiae (Group B Streptococcus)
Christopher D. Huston, MD
Assistant Professor, Division of Infectious Diseases, University of Vermont College of Medicine; Attending Physician, Fletcher Allen Health Care, Burlington, Vermont
Microbial Adherence

Noreen A. Hynes, MD, MPH, DTM&H
Associate Professor of Medicine, Johns Hopkins University School of Medicine; Associate Professor of Public Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland
Bioterrorism: An Overview; Plague as a Bioterrorism Weapon

Jonathan R. Iredell, MB BS, PhD
Associate Professor, University of Sydney Faculty of Medicine, Sydney; Senior Staff Specialist, Centre for Infectious Diseases and Microbiology, Westmead Hospital, Westmead, New South Wales, Australia
Nocardia Species

J. Michael Janda, PhD
Chief, Microbial Diseases Laboratory, Center for Infectious Disease, Division of Communicable Disease Control, California Department of Public Health, Richmond, California
Capnocytophaga

Eric C. Johannsen, MD
Assistant Professor of Medicine, Harvard Medical School; Associate Physician, Division of Infectious Diseases, Brigham and Women’s Hospital, Boston, Massachusetts
Epstein-Barr Virus (Infectious Mononucleosis, Epstein-Barr Virus–Associated Malignant Diseases, and Other Diseases)

Warren D. Johnson, Jr., MD
B. H. Kean Professor of Tropical Medicine and Director, Center for Global Health, Weill Cornell Medical College; Attending Physician, New York–Presbyterian Hospital and Weill Cornell Medical Center, New York, New York
Borrelia Species (Relapsing Fever)

Angela D. M. Kashuba, PharmD
Associate Professor, Eshelman School of Pharmacy; Director, Clinical Pharmacology and Analytical Chemistry Core, Center for AIDS Research, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina
Pharmacokinetics and Pharmacodynamics of Anti-infective Agents

Dennis L. Kasper, MD
Professor of Microbiology and Molecular Genetics, Harvard Medical School; William Ellery Channing Professor of Medicine, Brigham and Women’s Hospital, Boston, Massachusetts
Anaerobic Infections: General Concepts

Donald Kaye, MD
Professor of Medicine, Drexel University College of Medicine, Philadelphia, Pennsylvania
Polymyxins (Polymyxin B and Colistin); Urinary Tract Infections

Keith S. Kaye, MD, MPH
Professor of Medicine, Wayne State University School of Medicine; Corporate Director, Hospital Epidemiology and Antimicrobial Stewardship, Detroit Medical Center, Detroit, Michigan
Polymyxins (Polymyxin B and Colistin)

Kenneth M. Kaye, MD
Associate Professor, Department of Medicine, Harvard Medical School; Attending Physician, Division of Infectious Diseases, Brigham and Women’s Hospital, Boston, Massachusetts
Epstein-Barr Virus (Infectious Mononucleosis, Epstein-Barr Virus–Associated Malignant Diseases, and Other Diseases); Kaposi’s Sarcoma–Associated Herpesvirus (Human Herpesvirus Type 8)

James W. Kazura, MD
Professor of International Health, Medicine, and Pathology, Case Western Reserve University School of Medicine; Attending Physician, University Hospitals Case Medical Center, Cleveland, Ohio
Tissue Nematodes, Including Trichinellosis, Dracunculiasis, and the Filariases

George E. Kenny, PhD
Professor Emeritus, Department of Global Health, University of Washington School of Public Health, Seattle, Washington
Genital Mycoplasmas: Mycoplasma genitalium, Mycoplasma hominis, and Ureaplasma Species

Jay S. Keystone, MD, MSc
Professor of Medicine, University of Toronto Faculty of Medicine; Tropical Disease Unit, Toronto General Hospital; Medisys Travel Health, Toronto, Ontario, Canada
Cyclospora cayetanensis, Isospora belli, Sarcocystis Species, Balantidium coli, and Blastocystis hominis

Rima F. Khabbaz, MD
Director, National Center for Preparedness, Detection, and Control of Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia
Emerging and Reemerging Infectious Disease Threats

Charles H. King, MD, MS
Professor of International Health, Case Western Reserve University School of Medicine, Cleveland, Ohio
Cestodes (Tapeworms)

Louis V. Kirchhoff, MD, MPH
Professor, Departments of Internal Medicine (Infectious Diseases) and Epidemiology, University of Iowa Carver College of Medicine; Staff Physician, Medical Service, Department of Veterans Affairs Medical Center, Iowa City, Iowa
Trypanosoma Species (America Trypanosomiasis, Chagas’ Disease): Biology of Trypanosomes; Agents of African Trypanosomiasis (Sleeping Sickness)

Jerome O. Klein, MD
Professor of Pediatrics, Boston University School of Medicine; Consultant in Pediatrics, Maxwell Finland Laboratory for Infectious Diseases, Boston Medical Center, Boston, Massachusetts
Otitis Externa, Otitis Media, and Mastoiditis

Bettina M. Knoll, MD, PhD
Infectious Diseases Fellow, Mayo Clinic, Rochester, Minnesota
Prosthetic Valve Endocarditis

Kirk U. Knowlton, MD
Professor of Medicine and Chief, Division of Cardiology, University of California, San Diego, School of Medicine, La Jolla, California
Myocarditis and Pericarditis

Stephan A. Kohlhoff, MD
Assistant Professor of Pediatrics and Medicine, State University of New York Downstate College of Medicine; Co-Director, Division of Pediatric Infectious Diseases, State University of New York Downstate Medical Center, Brooklyn, New York
Chlamydia (Chlamydia pneumoniae)

Eija Könönen, PPS, PhD
Professor, Institute of Dentistry, University of Turku, Turku; Department of Infectious Disease Surveillance and Control, National Institute for Health and Welfare, Helsinki, Finland
Anaerobic Gram-Positive Nonsporulating Bacilli
Emerging and Reemerging Infectious Disease Threats

Transplantation-Transmitted Infections

Nosocomial Hepatitis and Other Transfusion- and Transplantation-Transmitted Infections

Hepatitis B Virus and Hepatitis Delta Virus

Balantidium coli, C. parvum, C. rodentium, C. hominis, and Other Helminthic Species, C. cayetanensis, Isospora belli, Sarcocystis Species, Blastocystis hominis, and Other Protozoa

Polyomaviruses: Progressive Multifocal Leukoencephalopathy

Zoonoses

Free-Living Amebas

Phyllis Kozarsky, MD

Professor of Medicine/Infectious Diseases and Co-Director, Travel and Tropical Medicine, Emory University School of Medicine; Expert Consultant, Division of Global Migration and Quarantine, Centers for Disease Control and Prevention, Atlanta, Georgia

Cyclospora cayetanensis, Isospora belli, Sarcocystis Species, Balantidium coli, and Blastocystis hominis

Margaret James Koziel, MD

Associate Professor of Medicine, Harvard Medical School; Attending Physician, Beth Israel Deaconess Medical Center, Boston, Massachusetts

Hepatitis B Virus and Hepatitis Delta Virus

John N. Krieger, MD

Professor of Urology, University of Washington School of Medicine; Chief of Urology, Veterans Affairs Puget Sound Health Care System; Attending Urologist, University of Washington Medical Center, Harborview Medical Center, and Seattle Children's Hospital, Seattle, Washington

Prostatitis, Epididymitis, and Orchitis

Matthew J. Kuehnert, MD

Director, Office of Blood, Organ, and Other Tissue Safety, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia

Nosocomial Hepatitis and Other Transfusion- and Transplantation-Transmitted Infections

James W. LeDuc, PhD

Professor, University of Texas Medical Branch School of Medicine; Deputy Director, Galveston National Laboratory, University of Texas Medical Branch, Galveston, Texas

Emerging and Reemerging Infectious Disease Threats

Laura M. Lee, BSN, RN

Special Assistant to the Deputy Director for Clinical Care, Clinical Center, National Institutes of Health, Bethesda, Maryland

Hospital Preparedness for Emerging and Highly Contagious Infectious Diseases: Getting Ready for the Next Epidemic or Pandemic

James E. Leggett, MD

Associate Professor of Medicine, Oregon Health & Science University School of Medicine; Assistant Director, Medical Education, Providence Portland Medical Center, Portland, Oregon

Aminoglycosides

Andres G. Lescano, PhD

Director, Public Health Training, Naval Medical Research Center Detachment, Lima, Peru

Outbreak Investigation

Paul N. Levett, PhD

Assistant Clinical Director, Saskatchewan Disease Control Laboratory, Regina, Saskatchewan, Canada

Leptospira Species (Leptospirosis)

Donald P. Levine, MD

Professor of Medicine, Wayne State University School of Medicine; Vice-Chief of Medicine, Detroit Receiving Hospital, Detroit, Michigan

Infections in Injection Drug Users

Matthew E. Levison, MD

Professor of Public Health, Drexel University School of Public Health; Adjunct Professor of Medicine, Drexel University College of Medicine, Philadelphia, Pennsylvania

Peritonitis and Intraperitoneal Abscesses

Russell E. Lewis, PharmD

Associate Professor, University of Houston College of Pharmacy; Adjunct Assistant Professor, University of Texas M. D. Anderson Cancer Center, Houston, Texas

Agents of Mucormycosis and Entomophthoramycosis

W. Conrad Liles, MD, PhD

Vice-Chair and Professor of Medicine and Canada Research Chair in Infectious Diseases and Inflammation, University of Toronto Faculty of Medicine; Director, Division of Infectious Diseases; Senior Scientist, McLaughlin-Rotman Centre for Global Health; and Senior Scientist, Toronto General Research Institute, University Health Network, Toronto, Ontario, Canada

Immunomodulators

Aldo A. M. Lima, MD, PhD

Professor, Federal University of Ceará School of Medicine, Fortaleza, Ceará, Brazil

Inflammatory Enteritides

Nathan Litman, MD

Professor of Pediatrics, Albert Einstein College of Medicine of Yeshiva University; Director of Pediatrics and Pediatric Infectious Diseases, Children's Hospital at Montefiore, Bronx, New York

Mumps Virus

Bennett Lorber, MD

Thomas M. Durant Professor of Medicine and Professor of Microbiology and Immunology, Temple University School of Medicine, Philadelphia, Pennsylvania

Bacterial Lung Abscess; Listeria monocytogenes
Barbara E. Murray, MD  
J. Ralph Meadows Professor of Medicine and Director, Division of Infectious Diseases, University of Texas Medical School at Houston, Houston, Texas  
- Glycopeptides (Vancomycin and Teicoplanin), Streptogramins (Quinupristin-Dalfopristin), and Lipopeptides (Daptomycin);  
- Enterococcus Species, Streptococcus bovis Group, and Leuconostoc Species

Clinton K. Murray, MD  
Associate Professor, Uniformed Services University of the Health Sciences, Bethesda, Maryland; Clinical Associate Professor, University of Texas Health Science Center at San Antonio; Program Director, Infectious Disease Fellowships, San Antonio Uniformed Services Health Education Consortium, San Antonio, Texas

Patrick R. Murray, PhD  
Chief, Microbiology Service, Clinical Center, National Institutes of Health, Bethesda, Maryland  
The Clinician and the Microbiology Laboratory

Daniel M. Mushker, MD  
Professor of Medicine, Baylor College of Medicine; Chief, Infectious Disease, Michael E. DeBakey Veterans Affairs Medical Center, Houston, Texas  
- Streptococcus pneumoniae

Esteban C. Nannini, MD  
Assistant Professor, Division of Infectious Diseases, Facultad de Ciencias Médicas, Universidad Nacional de Rosario; Attending Physician, Sanatorio Parque, Rosario, Argentina  
- Glycopeptides (Vancomycin and Teicoplanin), Streptogramins (Quinupristin-Dalfopristin), and Lipopeptides (Daptomycin)

Theodore E. Nash, MD  
Head, Gastrointestinal Parasites Section, Laboratory of Parasitic Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland  
- Giardia lamblia; Visceral Larva Migrans and Other Unusual Helminth Infections

William M. Nauseef, MD  
Professor of Medicine and of Microbiology, Department of Medicine, University of Iowa Carver College of Medicine; Attending Physician, Iowa City Veterans Affairs Medical Center, Iowa City, Iowa  
- Granulocytic Phagocytes

Marguerite A. Neill, MD  
Associate Professor of Medicine, Warren Alpert Medical School of Brown University, Providence; Attending Physician, Division of Infectious Disease, Memorial Hospital of Rhode Island, Pawtucket, Rhode Island  
- Other Pathogenic Vibrios

Judith A. O'Donnell, MD  
Professor of Clinical Medicine, Division of Infectious Diseases, University of Pennsylvania School of Medicine; Hospital Epidemiologist and Director, Department of Infection Prevention and Control, Penn Presbyterian Medical Center, Philadelphia, Pennsylvania  
- Topical Antibacterials

Christopher A. Ohl, MD  
Associate Professor of Medicine, Wake Forest University School of Medicine; Medical Director, Center for Antimicrobial Utilization, Stewardship, and Epidemiology, Wake Forest University Baptist Medical Center, Winston-Salem, North Carolina  
- Infectious Arthritis of Native Joints

Pablo C. Okhuysen, MD  
Professor of Medicine, Division of Infectious Diseases, University of Texas Medical School at Houston; Medical Staff, Memorial Hermann Hospital–Texas Medical Center; Medical Staff, Lyndon B. Johnson General Hospital, Houston, Texas  
- Sporothrix schenckii

Andrew B. Onderdonk, PhD  
Professor of Pathology, Harvard Medical School; Director, Clinical Microbiology, Brigham and Women's Hospital, Boston, Massachusetts  
- Gas Gangrene and Other Clostridium-Associated Diseases; Bacteroides, Prevotella, Porphyromonas, and Fusobacterium Species (and Other Medically Important Anaerobic Gram-Negative Bacilli)

Steven M. Opal, MD  
Professor of Medicine, Warren Alpert Medical School of Brown University, Providence; Chief, Division of Infectious Diseases, Memorial Hospital of Rhode Island, Pawtucket, Rhode Island  
- Molecular Mechanisms of Antibiotic Resistance in Bacteria

Walter A. Orenstein, MD  
Deputy Director for Vaccine-Preventable Diseases, Integrated Health Solutions Development, Global Health Program, Bill and Melinda Gates Foundation, Seattle, Washington  
- Immunization

Douglas R. Osman, MD, MPH  
Associate Professor, Division of Infectious Diseases, Mayo Clinic College of Medicine; Consultant, Mayo Clinic, Rochester, Minnesota  
- Osteomyelitis

Michael T. Osterholm, PhD, MPH  
Professor, Division of Environmental Health Sciences, University of Minnesota School of Public Health; Adjunct Professor, University of Minnesota Medical School, Minneapolis, Minnesota  
- Epidemiologic Principles

Stephen M. Ostroff, MD  
Director, Bureau of Epidemiology, and Acting Physician General, Pennsylvania Department of Health, Harrisburg, Pennsylvania  
- Emerging and Reemerging Infectious Disease Threats

Michael N. Oxman, MD  
Professor of Medicine and Pathology, University of California, San Diego, School of Medicine, La Jolla; Staff Physician (Infectious Diseases), Veterans Affairs San Diego Healthcare System, San Diego, California  
- Myocarditis and Pericarditis

Andrea V. Page, MD  
Clinician-Scientist Training Program, Department of Medicine, University of Toronto Faculty of Medicine; Clinical Associate, Divisions of Internal Medicine and Infectious Diseases, University Health Network, Toronto, Ontario, Canada  
- Immunomodulators

Tara N. Palmore, MD  
Deputy Hospital Epidemiologist, Clinical Center, National Institutes of Health, Bethesda, Maryland  
- Nosocomial Herpesvirus Infections

Eric G. Pamer, MD  
Professor of Medicine, Weill Cornell Medical College; Chief, Infectious Diseases, Memorial Hospital, Memorial Sloan-Kettering Cancer Center, New York, New York  
- Cell-Mediated Defense against Infection
Contributors

Peter G. Pappas, MD
Professor of Medicine and Tinsley Harrison Clinical Scholar, University of Alabama at Birmingham School of Medicine, Birmingham, Alabama
Chronic Pneumonia

Mark S. Pasternack, MD
Associate Professor of Pediatrics, Harvard Medical School; Chief, Pediatric Infectious Disease Unit, Massachusetts General Hospital, Boston, Massachusetts
Cellulitis, Necrotizing Fasciitis, and Subcutaneous Tissue Infections; Myositis and Myonecrosis; Lymphadenitis and Lymphangitis

Thomas F. Patterson, MD
Chief, Division of Infectious Diseases; Professor of Medicine; and Director, San Antonio Center for Medical Mycology, University of Texas Health Science Center at San Antonio; Attending Physician, South Texas Veterans Health Care System, San Antonio, Texas Aspergillus Species

Deborah Pavan-Langston, MD
Professor of Ophthalmology, Harvard Medical School; Attending Physician, Massachusetts Eye and Ear Infirmary, Boston, Massachusetts
Microbial Conjunctivitis; Microbial Keratitis

David A. Pegues, MD
Professor of Clinical Medicine, David Geffen School of Medicine at UCLA; Hospital Epidemiologist and Attending Physician, Ronald Reagan UCLA Medical Center, Los Angeles, California Salmonella Species, Including Salmonella Typhi

Robert L. Penn, MD
Professor of Medicine, Louisiana State University Health Sciences Center in Shreveport School of Medicine; Chief, Section of Infectious Diseases, Louisiana State Health Sciences Center–University Hospital, Shreveport, Louisiana Francisella tularensis (Tularemia); Francisella tularensis (Tularemia) as an Agent of Bioterrorism

John R. Perfect, MD
Professor of Medicine, Duke University School of Medicine and Duke University Medical Center, Durham, North Carolina Cryptococcus neoformans

Stanley Perlman, MD, PhD
Professor of Microbiology and Pediatrics, University of Iowa Carver College of Medicine, Iowa City, Iowa
Coronaviruses, Including Severe Acute Respiratory Syndrome (SARS)–Associated Coronavirus

C. J. Peters, MD
Professor, Department of Microbiology and Immunology; Professor, Department of Pathology; and John Sealy Distinguished University Chair in Tropical and Emerging Virology, University of Texas Medical Branch, Galveston; Adjunct Graduate Faculty, Texas A&M University, College Station, Texas Marburg and Ebola Virus Hemorrhagic Fevers; California Encephalitis, Hantavirus Pulmonary Syndrome, and Bunyavirus Hemorrhagic Fevers; Lymphocytic Choriomeningitis Virus, Lassa Virus, and the South American Hemorrhagic Fevers; Viral Hemorrhagic Fevers as Agents of Bioterrorism

Phillip K. Peterson, MD
Professor of Medicine; Director, Division of Infectious Diseases and International Medicine; and Co-Director, Center for Infectious Diseases and Microbiology Translational Research, University of Minnesota Medical School, Minneapolis, Minnesota Infections in the Elderly

William A. Petri, Jr., MD, PhD
Wade Hampton Frost Professor of Epidemiology; Professor of Medicine, Microbiology, and Pathology; and Chief, Division of Infectious Diseases and International Health, University of Virginia School of Medicine; Attending Physician, University of Virginia Health System, Charlottesville, Virginia Microbial Adherence; Introduction to Protozoal Diseases; Entamoeba Species, Including Amebiasis

Cathy A. Petti, MD
Associate Professor of Pathology and Medicine, University of Utah School of Medicine, Salt Lake City, Utah Streptococcus anginosus Group

Larry K. Pickering, MD
Professor of Pediatrics, Emory University School of Medicine; Executive Secretary, Advisory Committee on Immunization Practices (ACIP), and Senior Adviser to the Director, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia Immunization

Gerald B. Pier, PhD
Professor of Medicine (Microbiology and Molecular Genetics), Harvard Medical School; Microbiologist, Brigham and Women's Hospital, Boston, Massachusetts Pseudomonas aeruginosa

Satish K. Pillai, MD
Instructor in Medicine, Harvard Medical School; Staff Physician, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Boston, Massachusetts Principles of Anti-infective Therapy

Peter Piot, MD, PhD
Professor of Global Health and Director, Institute for Global Health, Imperial College London, London, United Kingdom Global Perspectives on Human Immunodeficiency Virus Infection and Acquired Immunodeficiency Syndrome

Susan F. Plaeger, PhD
Director, Basic Sciences Program, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland Innate (General or Nonspecific) Host Defense Mechanisms

Ronald E. Polk, PharmD
Professor of Pharmacy and Medicine, Virginia Commonwealth University School of Pharmacy, Richmond, Virginia Antimicrobial Stewardship

Aurora Pop-Vicas, MD
Assistant Professor of Medicine, Warren Alpert Medical School of Brown University, Providence; Infectious Disease Physician, Memorial Hospital of Rhode Island, Pawtucket, Rhode Island Molecular Mechanisms of Antibiotic Resistance in Bacteria

John H. Powers, MD
Assistant Clinical Professor of Medicine, George Washington University School of Medicine, Washington, DC; Assistant Clinical Professor of Medicine, University of Maryland School of Medicine, Baltimore; Senior Medical Scientist, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland Interpreting the Results of Clinical Trials of Antimicrobial Agents
Contributors

Kathryn L. Ruoff, PhD
Associate Professor, Dartmouth Medical School, Hanover; Associate Director, Clinical Microbiology Laboratory, Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire
Classification of Streptococci

Mark E. Rupp, MD
Professor, Department of Internal Medicine, Division of Infectious Diseases, University of Nebraska Medical Center College of Medicine; Director, Department of Healthcare Epidemiology, Nebraska Medical Center, Omaha, Nebraska
Mediastinitis; Staphylococcus epidermidis and Other Coagulase-Negative Staphylococci

Charles E. Rupprecht, VMD, PhD
Section Lead, Rabies, Centers for Disease Control and Prevention, Atlanta, Georgia
Rhabdoviruses

Thomas A. Russo, MD
Professor of Medicine and Microbiology, Division of Infectious Diseases, State University of New York at Buffalo School of Medicine and Biomedical Sciences; Staff Physician, Veterans Affairs Western New York Health Care System, Buffalo, New York
Agents of Actinomycosis

William A. Rutala, PhD, MPH
Professor of Medicine and Director, Statewide Program in Infection Control and Epidemiology, University of North Carolina at Chapel Hill School of Medicine; Director, Hospital Epidemiology, Occupational Health and Safety Program, University of North Carolina Health Care System, Chapel Hill, North Carolina
The Acutely Ill Patient with Fever and Rash; Disinfection, Sterilization, and Control of Hospital Waste

Mirella Salvatore, MD
Assistant Professor, Department of Public Health, and Assistant Professor, Department of Medicine/Infectious Diseases, Weill Cornell Medical College; Assistant Attending Physician, New York–Presbyterian Hospital, New York, New York
Tetracyclines and Chloramphenicol; Metronidazole

Frank T. Saulsbury
Professor, Department of Pediatrics, Division of Immunology and Rheumatology, University of Virginia School of Medicine, Charlottesville, Virginia
Kawasaki Syndrome

Maria C. Savoia, MD
Vice Dean for Medical Education and Professor of Medicine, University of California, San Diego, School of Medicine, La Jolla, California
Myocarditis and Pericarditis

Paul E. Sax, MD
Associate Professor of Medicine, Harvard Medical School; Clinical Director, Division of Infectious Diseases and Human Immunodeficiency Virus Program, Brigham and Women’s Hospital, Boston, Massachusetts
Pulmonary Manifestations of Human Immunodeficiency Virus Infection

W. Michael Scheld, MD
Gerald L. Mandell–Bayer Professor of Infectious Diseases and Professor of Medicine, University of Virginia School of Medicine; Clinical Professor of Neurosurgery and Director, Pfizer Initiative in International Health, University of Virginia Health System, Charlottesville, Virginia
Endocarditis and Intravascular Infections; Acute Meningitis

Joshua T. Schiffer, MD, MS
Senior Fellow, University of Washington School of Medicine and Fred Hutchinson Cancer Research Center, Seattle, Washington
Herpes Simplex Virus

David Schlossberg, MD
Professor of Medicine, Temple University School of Medicine; Adjunct Professor of Medicine, University of Pennsylvania School of Medicine; Medical Director, Tuberculosis Control Program, Philadelphia Department of Public Health, Philadelphia, Pennsylvania
Chlamydia (Chlamydia) psittaci (Psittacosis)

Thomas Schneider, MD, PhD
Professor of Infectious Diseases, Charité University Hospital, Benjamin Franklin Campus, Berlin, Germany
Whipple’s Disease

Jane R. Schwebke, MD
Professor of Medicine, University of Alabama at Birmingham School of Medicine, Birmingham, Alabama
Trichomonas vaginalis

Cynthia L. Sears, MD
Professor of Medicine, Divisions of Infectious Diseases and Gastroenterology, Johns Hopkins University School of Medicine, Baltimore, Maryland
Prebiotics, Probiotics, and Synbiotics

Carlos Seas, MD
Associate Professor of Medicine and Principal Investigator, Alexander von Humboldt Tropical Medicine Institute, Cayetano Heredia University; Attending Physician, National Hospital Cayetano Heredia, Lima, Peru
Vibrio cholerae

Kent A. Sepkowitz, MD
Professor of Medicine, Weill Cornell Medical College; Vice-Chairman of Medicine and Director, Hospital Infection Control, Memorial Sloan-Kettering Cancer Center, New York, New York
Nosocomial Hepatitis and Other Transfusion- and Transplantation-Transmitted Infections

Edward J. Septimus, MD
Affiliate Professor and Distinguished Senior Fellow, School of Public Policy, George Mason University, Fairfax, Virginia; Medical Director, Infection Prevention, HCA Healthcare System, Nashville, Tennessee
Pleural Effusion and Empyema

George K. Siberry, MD, MPH
Medical Officer, Pediatric, Adolescent, and Maternal Acquired Immunodeficiency Syndrome Branch, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, Maryland
Pediatric Human Immunodeficiency Virus Infection

Costi D. Sifri, MD
Assistant Professor of Medicine, Division of Infectious Diseases and International Health, University of Virginia School of Medicine; Attending Physician, Department of Medicine, University of Virginia Health System, Charlottesville, Virginia
Infections of the Liver and Biliary System; Appendicitis; Diverticulitis and Typhilitis

Nina Singh, MD
Associate Professor of Medicine, University of Pittsburgh School of Medicine; Chief, Transplant Infectious Diseases, Veterans Affairs Pittsburgh Healthcare System, Pittsburgh, Pennsylvania
Infections in Solid Organ Transplant Recipients
Contributors

Upinder Singh, MD
Assistant Professor, Department of Internal Medicine, Division of Infectious Diseases, Stanford University School of Medicine, Stanford, California
Free-Living Amebas

Scott W. Sinner, MD
Clinical Assistant Professor of Medicine, University of Medicine and Dentistry of New Jersey–Robert Wood Johnson Medical School, New Brunswick; Physician in Private Practice, Hillsborough, New Jersey
Viridans Streptococci, Groups C and G Streptococci, and Gemella Species

Sumathi Sivapalasingam, MD
Assistant Professor, Department of Medicine, Division of Infectious Diseases and Immunology, New York University School of Medicine, New York, New York
Macrolides, Clindamycin, and Ketolides

Leonard N. Slater, MD
Professor of Medicine, Division of Infectious Diseases, University of Oklahoma College of Medicine; Chief, Section of Infectious Diseases, and Chairman, Infection Control Committee, Oklahoma City Veterans Affairs Medical Center; Medical Director, Employee Health Service, Oklahoma University Medical Center, Oklahoma City, Oklahoma
Bartonella, Including Cat-Scratch Disease

A. George Smulian, MB BCh
Associate Professor, University of Cincinnati College of Medicine; Chief, Infectious Disease Section, Veterans Affairs Cincinnati Medical Center, Cincinnati, Ohio
Pneumocystis Species

Jack D. Sobel, MD
Professor of Medicine, Wayne State University School of Medicine; Chief, Division of Infectious Diseases, Detroit Medical Center, Detroit, Michigan
Urinary Tract Infections

Samir V. Sodha, MD, MPH
Medical Epidemiologist, Enteric Diseases Epidemiology Branch, Division of Foodborne, Bacterial, and Mycotic Diseases, National Center for Zoonotic, Vectorborne, and Enteric Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia
Foodborne Disease

M. Rizwan Sohail, MD
Assistant Professor of Medicine, Mayo Clinic College of Medicine; Consultant, Infectious Diseases, Mayo Clinic, Rochester, Minnesota
Infections of Nonvalvular Cardiovascular Devices

Tom Solomon, BM, BCh, PhD, DTM&H
Head, Brain Infections Group, and Chair, Division of Neurological Science, University of Liverpool Faculty of Medicine, Liverpool, United Kingdom
Flaviviruses (Yellow Fever, Dengue, Dengue Hemorrhagic Fever, Japanese Encephalitis, West Nile Encephalitis, St. Louis Encephalitis, Tick-Borne Encephalitis)

Yuli Song, PhD
Senior Scientist, Procter and Gamble Healthcare Research, Mason, Ohio
Anaerobic Cocci

David E. Soper, MD
Professor, Departments of Obstetrics and Gynecology, Division of Infectious Diseases, Department of Medicine, Medical University of South Carolina, Charleston, South Carolina
Infections of the Female Pelvis

Tania C. Sorrell, MB BS, MD
Professor of Clinical Infectious Diseases and Director, Centre for Infectious Diseases and Microbiology, University of Sydney Faculty of Medicine, Sydney; Director of Infectious Diseases, Sydney West Area Health Service, Westmead Hospital, Westmead, New South Wales, Australia
Nocardia Species

P. Frederick Sparling, MD
Professor of Medicine, Microbiology and Immunology, University of North Carolina School of Medicine, Chapel Hill, North Carolina
Neisseria gonorrhoeae

Walter E. Stamm, MD
Professor of Medicine, Division of Allergy and Infectious Diseases, University of Washington School of Medicine, Seattle, Washington
Introduction to Chlamydia and Chlamydophila; Chlamydia trachomatis (Trachoma, Perinatal Infections, Lymphogranuloma Venereum, and Other Genital Infections)

James M. Steckelberg, MD
Professor, Division of Infectious Diseases, Mayo Clinic College of Medicine; Consultant, Mayo Clinic, Rochester, Minnesota
Osteomyelitis

Allen C. Steere, MD
Professor of Medicine, Harvard Medical School; Director of Clinical and Translational Research, Department of Rheumatology, Massachusetts General Hospital, Boston, Massachusetts
Borrelia burgdorferi (Lyme Disease, Lyme Borreliosis)

Neal H. Steigbigel, MD
Professor of Medicine, Division of Infectious Diseases and Immunology, New York University School of Medicine; Staff Physician, Medical Service, Infectious Diseases Section, New York Veterans Affairs Medical Center, New York, New York
Macrolides, Clindamycin, and Ketolides

James P. Steinberg, MD
Professor of Medicine, Division of Infectious Diseases, Emory University School of Medicine; Chief Medical Officer, Emory University Hospital Midtown, Atlanta, Georgia
Other Gram-Negative and Gram-Variable Bacilli

Theodore S. Steiner, MD
Associate Professor of Medicine, University of British Columbia Faculty of Medicine, Vancouver, British Columbia, Canada
Principles and Syndromes of Enteric Infection

Timothy R. Sterling, MD
Professor of Medicine, Division of Infectious Diseases, Vanderbilt University School of Medicine; Nashville Metro Public Health Department Tuberculosis Clinic, Nashville, Tennessee
General Clinical Manifestations of Human Immunodeficiency Virus Infection (Including the Acute Retroviral Syndrome and Oral, Cutaneous, Renal, Ocular, Metabolic, and Cardiac Diseases); Mycobacterium tuberculosis

### Contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Department/Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>David A. Stevens, MD</td>
<td>Professor of Medicine, Stanford University School of Medicine, Stanford</td>
<td>Chief, Division of Infectious Diseases, Department of Medicine, and Hospital Epidemiologist, Santa Clara Valley Medical Center; President and Principal Investigator, Infectious Disease Research Laboratory, California Institute for Medical Research, San Jose, California</td>
</tr>
<tr>
<td>Dennis L. Stevens, PhD, MD</td>
<td>Professor of Medicine, University of Washington School of Medicine, Seattle, Washington; Chief, Infectious Diseases, Boise Veterans Affairs Medical Center, Boise, Idaho</td>
<td></td>
</tr>
<tr>
<td>Jacob Strahilevitz, MD</td>
<td>Senior Lecturer in Clinical Microbiology, Hebrew University; Staff Physician, Department of Clinical Microbiology and Infectious Diseases, Hadassah Medical Center, Jerusalem, Israel</td>
<td></td>
</tr>
<tr>
<td>Charles W. Stratton IV, MD</td>
<td>Associate Professor of Pathology and Medicine, Vanderbilt University School of Medicine; Director, Clinical Microbiology Laboratory, Vanderbilt University Medical Center, Nashville, Tennessee</td>
<td></td>
</tr>
<tr>
<td>Anthony F. Suffredini, MD</td>
<td>Senior Investigator, Critical Care Medicine Department, Clinical Center, National Institutes of Health, Bethesda, Maryland</td>
<td></td>
</tr>
<tr>
<td>Kathryn N. Suh, MD</td>
<td>Assistant Professor of Medicine and Pediatrics, University of Ottawa Faculty of Medicine; Attending Physician, Division of Infectious Diseases, Ottawa Hospital, Ottawa, Ontario, Canada</td>
<td></td>
</tr>
<tr>
<td>Mark S. Sulkowski, MD</td>
<td>Associate Professor of Medicine and Medical Director, Viral Hepatitis Center, Johns Hopkins University School of Medicine, Baltimore; Johns Hopkins Rockland Physicians Practice and Research Group at Greenspring Station, Lutherville, Maryland</td>
<td></td>
</tr>
<tr>
<td>Donna C. Sullivan, PhD</td>
<td>Professor of Medicine and Associate Professor of Microbiology, University of Mississippi School of Medicine; Division of Infectious Diseases, University of Mississippi Medical Center, Jackson, Mississippi</td>
<td></td>
</tr>
<tr>
<td>Morton N. Swartz, MD</td>
<td>Professor of Medicine, Harvard Medical School; Associate Firm Chief, Massachusetts General Hospital, Boston, Massachusetts</td>
<td></td>
</tr>
<tr>
<td>Thomas R. Talbot, MD, MPH</td>
<td>Assistant Professor of Medicine and Preventive Medicine, Vanderbilt University School of Medicine; Chief Hospital Epidemiologist, Vanderbilt Medical Center, Nashville, Tennessee</td>
<td>Surgical Site Infections and Antimicrobial Prophylaxis</td>
</tr>
<tr>
<td>C. Sabrina Tan, MD</td>
<td>Instructor in Medicine, Harvard Medical School; Staff Physician, Beth Israel Deaconess Medical Center, Boston, Massachusetts</td>
<td>JC, BK, and Other Polyomaviruses: Progressive Multifocal Leukoencephalopathy</td>
</tr>
<tr>
<td>Nathan M. Thielman, MD, MPH</td>
<td>Associate Professor of Medicine, Division of Infectious Diseases and International Health, Duke University School of Medicine; Director, Duke Global Health Residency Program, Duke University Medical Center, Durham, North Carolina</td>
<td>Antibiotic-Associated Colitis; Enteric Fever and Other Causes of Abdominal Symptoms with Fever</td>
</tr>
<tr>
<td>Chloé Lynn Thio, MD</td>
<td>Associate Professor of Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland</td>
<td></td>
</tr>
<tr>
<td>David L. Thomas, MD, MPH</td>
<td>Professor of Medicine and Chief, Infectious Diseases, Johns Hopkins University School of Medicine, Baltimore, Maryland</td>
<td>Hepatitis B Virus and Hepatitis Delta Virus</td>
</tr>
<tr>
<td>Lora D. Thomas, MD, MPH</td>
<td>Assistant Professor of Medicine, Vanderbilt University School of Medicine; Chief, Division of Infectious Diseases, Nashville Veterans Affairs Medical Center, Nashville, Tennessee</td>
<td>Risk Factors and Approaches to Infections in Transplant Recipients</td>
</tr>
<tr>
<td>Anna R. Thorner, MD</td>
<td>Instructor, Department of Medicine, Harvard Medical School; Associate Physician, Division of Infectious Diseases, Brigham and Women's Hospital, Boston, Massachusetts</td>
<td>Zoonotic Paramyxoviruses: Nipah, Hendra, and Menangle Viruses</td>
</tr>
<tr>
<td>Alan D. Tice, MD</td>
<td>Assistant Professor, John A. Burns School of Medicine, University of Hawai at Manoa, Honolulu, Hawaii</td>
<td>Outpatient Parenteral Antimicrobial Therapy</td>
</tr>
<tr>
<td>Angela María Tobón, MD</td>
<td>Director, Chronic Infectious Diseases Unit, Corporación para Investigaciones Biológicas, Medellin, Colombia</td>
<td>Paracoccidioides brasiliensis</td>
</tr>
<tr>
<td>Edmund C. Tramont, MD</td>
<td>Associate Director, Special Projects, Division of Clinical Research, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland</td>
<td>Innate (General or Nonspecific) Host Defense Mechanisms; Treponema pallidum (Syphilis)</td>
</tr>
<tr>
<td>John J. Treanor, MD</td>
<td>Professor of Medicine, Microbiology, and Immunology, University of Rochester School of Medicine and Dentistry; Attending Physician, Strong Memorial Hospital; Chief, Division of Infectious Diseases, Department of Medicine, University of Rochester Medical Center, Rochester, New York</td>
<td>Influenza Viruses, Including Avian Influenza and Swine Influenza; Noroviruses and Other Caliciviruses; Astroviruses and Picobirnaviruses</td>
</tr>
<tr>
<td>Athé M. N. Tsibris, MD</td>
<td>Instructor in Medicine, Harvard Medical School; Clinical Assistant in Medicine, Massachusetts General Hospital, Boston, Massachusetts</td>
<td>Antiretroviral Therapy for Human Immunodeficiency Virus Infection</td>
</tr>
</tbody>
</table>

Arnold N. Weinberg, MD
Professor of Medicine, Harvard Medical School; Attending Physician, Infectious Disease Unit, Massachusetts General Hospital, Boston, Massachusetts
Zoonoses

Geoffrey A. Weinberg, MD
Professor of Pediatrics, University of Rochester School of Medicine and Dentistry; Director, Pediatric Human Immunodeficiency Virus Program, Golisano Children's Hospital, University of Rochester Medical Center, Rochester, New York
Pediatric Human Immunodeficiency Virus Infection

Gail G. Weinmann, MD
Deputy Director, Division of Lung Diseases, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, Maryland
Chronic Obstructive Pulmonary Disease and Acute Exacerbations

Daniel J. Weisdorf, MD
Professor of Medicine, Division of Hematology, Oncology, and Transplantation, and Director, Adult Blood and Marrow Transplant Program, University of Minnesota Medical School, Minneapolis, Minnesota
Infections in Recipients of Hematopoietic Cell Transplantation

Louis M. Weiss, MD, MPH
Professor of Pathology, Division of Parasitology and Tropical Medicine, and Professor of Medicine, Division of Infectious Diseases, Albert Einstein College of Medicine of Yeshiva University; Attending Physician, Weiler Hospital–Montefiore Medical Center and Jacobi Medical Center, Bronx, New York
Microsporidiosis

Michael E. Weiss, MD
Clinical Professor of Medicine, University of Washington School of Medicine, Seattle, Washington
β-Lactam Allergy

David F. Welch, PhD
Associate Clinical Professor of Pathology, University of Texas Southwestern Medical School; President, Medical Microbiology Consulting, LLC, Dallas, Texas
Bartonella, Including Cat-Scratch Disease

Thomas E. Wellem, MD, PhD
Chief, Laboratory of Malaria and Vector Research, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland
Plasmodium Species (Malaria)

Richard P. Wenzel, MD, MSc
William Branch Porter Professor and Chair, Department of Internal Medicine, Virginia Commonwealth University School of Medicine, Richmond, Virginia
Organization for Infection Control; Isolation

Melinda Wharton, MD, MPH
Deputy Director, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia
Immunization

A. Clinton White, Jr., MD
Paul R. Stalnaker, MD, Distinguished Professor of Internal Medicine and Director, Infectious Disease Division, Department of Internal Medicine, University of Texas Medical Branch, Galveston, Texas
Cryptosporidium Species

Richard J. Whitley, MD
Distinguished Professor of Pediatrics and Professor of Microbiology, Medicine, and Neurosurgery, University of Alabama at Birmingham School of Medicine; Loeb Eminent Scholar Chair in Pediatrics; Vice Chairman, Department of Pediatrics; and Co-Director, Division of Infectious Diseases, University of Birmingham at Alabama Health System, Birmingham, Alabama
Varicella-Zoster Virus

Kenneth H. Wilson, MD
Professor of Medicine, Division of Infectious Diseases and International Health, Duke University School of Medicine; Attending Physician, Durham Veterans Affairs Medical Center, Durham, North Carolina
Antibiotic-Associated Colitis

Walter R. Wilson, MD
Professor of Medicine and Assistant Professor of Microbiology, Mayo Clinic College of Medicine; Consultant, Infectious Diseases, Mayo Clinic, Rochester, Minnesota
Prosthetic Valve Endocarditis; Infections of Nonvalvular Cardiovascular Devices

Frank G. Witebsky, MD
Assistant Chief, Microbiology Service, Department of Laboratory Medicine, National Institutes of Health Clinical Center, National Institutes of Health, Bethesda, Maryland
The Clinician and the Microbiology Laboratory

Matthew C. Wolfgang, PhD
Assistant Professor, Department of Microbiology and Immunology, University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, North Carolina
Cystic Fibrosis

Peter F. Wright, MD
Professor of Pediatrics, Dartmouth Medical School, Hanover, New Hampshire
Parainfluenza Viruses

Edward J. Young, MD
Professor of Medicine, Molecular Virology, and Microbiology, Baylor College of Medicine; Chief, Infection Control, Michael E. DeBakey Veterans Affairs Medical Center, Houston, Texas
Brucella Species

Jo-Anne H. Young, MD
Associate Professor of Medicine, Division of Infectious Disease, and Director, Transplant Infectious Disease Program, University of Minnesota Medical School, Minneapolis, Minnesota
Infections in Recipients of Hematopoietic Cell Transplantation

Jie Lin Zhang, MD
Assistant Professor of Medicine, Harvard Medical School; Attending Physician, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Boston, Massachusetts
Cytomegalovirus

Stephan H. Zinner, MD
Charles S. Davidson Professor of Medicine, Harvard Medical School, Boston; Chair, Department of Medicine, Mount Auburn Hospital, Cambridge, Massachusetts
Sulfonamides and Trimethoprim

John J. Zurlo, MD
Professor of Medicine, Penn State University College of Medicine, Milton S. Hershey Medical Center, Hershey, Pennsylvania
Pasteurella Species
Infectious diseases traverse the usual boundaries established by medical specialists. All organ systems may be involved, and all physicians caring for patients may have to deal with infected patients. The format of this book was chosen with the intent that it would contain the necessary information to aid the practitioner in the understanding, diagnosis, and treatment of infectious diseases. Thus, internists, family or general practitioners, pediatricians, surgeons, obstetrician-gynecologists, urologists, residents and fellows in training, medical students, hospital infection control personnel, and clinical microbiologists should find the book a valuable reference.

In planning this book, the editors considered several different patterns of organization. The system adopted allows the reader to approach an infected patient three different ways: (a) by major clinical syndrome, (b) by specific etiologic organisms, and (c) by host characteristics for patients who are compromised.

Principles and Practice of Infectious Diseases consists of four major parts. The book may be perused as whole, or individual chapters may be examined when the reader is concerned with a specific problem. Part I covers the basic principles necessary for a clear understanding of the concepts of diagnosis and management of infectious disease. Chapters dealing with microbial virulence factors, host defense mechanisms, the epidemiology of infectious diseases, and the clinician and microbiology laboratory are included. In addition, there is a comprehensive discussion of anti-infective chemotherapy.

Part II considers major clinical syndromes. The syndromes are described, followed by a discussion of the potential etiologic agents, evaluation of differential diagnostic possibilities, and an outline of presumptive therapy. All major infectious diseases are discussed in this part of the book.

Part III describes all important pathogenic microbes for man and the diseases they cause. The pathogen is classified and described, the epidemiology is discussed, clinical manifestations are listed, and specific information on therapy and prevention is presented. The most comprehensive discussion of a disease entity can be found by reading about both the etiologic agent and the clinical syndrome. Thus, a comprehensive treatment of pneumococcal pneumonia could be found in reading the appropriate sections of the chapters on acute pneumonia and Streptococcus pneumoniae. We attempted to make the chapters dealing with etiologic agents and those dealing with syndromes complete. Therefore some repetition was unavoidable.

The final section, Part IV, covers special problems in infectious diseases including nosocomial infections, infections in impaired hosts, immunizations, and protection of travelers.

The editors are grateful to our expert contributors. These physicians are the world’s leaders in their fields, and they diligently prepared carefully written, well-referenced “state of the art” chapters. Our secretaries were skillful and meticulous in their attention to the complexities of assembling Principles and Practice of Infectious Diseases. John de Carville, executive editor of John Wiley & Sons, encouraged, cajoled, and advised us from the formative steps all the way through to completion. Lastly, and perhaps most important, we are grateful to our wives and children for putting up with interminable editorial work and meetings.

Gerald L. Mandell, MD
R. Gordon Douglas, Jr., MD
John E. Bennett, MD
It is interesting to compare the first edition with the new, seventh edition of *Principles and Practice of Infectious Diseases*. Since 1979, when the first edition was published, there have been scores of new antimicrobial agents and newly recognized diseases and pathogens, such as Legionnaires’ disease, Lyme disease, Kaposi’s sarcoma, human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS), multidrug-resistant tuberculosis, *Clostridium difficile* colitis, progressive multifocal leukoencephalopathy, severe acute respiratory syndrome (SARS), and the new H1N1 flu, to mention just a few. A comparison with the sixth edition, published in 2004, reveals a further increase in our knowledge of newly recognized diseases, microbes, and therapeutic agents. The developments in basic sciences have been astounding, with advances in genomics leading to rapid diagnoses and breakthrough therapies.

*Principles and Practice of Infectious Diseases* differs from other sources of information, such as many web-based resources, in that it is carefully edited and the content put into perspective by infectious diseases experts. The new edition combines the knowledge and experience of the world’s authorities with the careful review of all chapters by all three editors.

This edition has been planned and designed for physicians (infectious diseases specialists, internists, family practitioners, travel medicine specialists, HIV/AIDS researchers), pharmacologists, public health experts, microbiologists, and basic scientists. Readers consulting the volumes can quickly find key clinical information to help in diagnosing and treating their patients. The text contains up-to-date information and includes numerous 2009 references. New chapters have been added, and all other chapters have been revised extensively, with tables, figures, and references updated.

Among the 330 chapters is excellent coverage of such topics as microbial pathogenesis, infections in cancer patients, emerging infections, new antimicrobial agents, antibiotic resistance, travel medicine, vaccines, infections related to exotic pets, and important aspects of agents of bioterrorism.

The online version of the book contains fully searchable text on the dedicated Expert Consult website. It will also allow us to present new developments in the field and advances in therapy via regular content updates. The website contains other added-value features such as a downloadable image library and drug database.

We could not have edited this book without the assistance and stoic patience of our wives, Judy Mandell, Shirley Bennett, and Kelly Dolin, who endured the many long hours their husbands spent at home, uncommunicative, laboring over yet another edition of this treatise. Our thanks also go to Janet Morgan for her invaluable assistance to Dr. Dolin.

Gerald L. Mandell, MD
John E. Bennett, MD
Raphael Dolin, MD
This page intentionally left blank
PART I  Basic Principles in the Diagnosis and Management of Infectious Diseases

SECTION A  MICROBIAL PATHOGENESIS

1  A Molecular Perspective of Microbial Pathogenicity  3
   DAVID A. RELMAN  |  STANLEY FALKOW

2  Microbial Adherence  15
   WILLIAM A. PETRI, JR.  |  BARBARA J. MANN  |  CHRISTOPHER D. HUSTON

3  Toxins  27
   ERIK L. HENWELL  |  MOLLY A. HUGHES

SECTION B  HOST DEFENSE MECHANISMS

4  Innate (General or Nonspecific) Host Defense Mechanisms  37
   CARL W. DIEFFENBACH  |  EDMUND C. TRAMONT  |  SUSAN F. PLAEGER

5  Human Genetics and Infection  49
   ADRIAN V. S. HILL

6  Antibodies  59
   HOLLY H. BIRDSALL

7  Complement  77
   PETER DENSEN

8  Granulocytic Phagocytes  99
   WILLIAM M. NAUSEEF  |  ROBERT A. CLARK

9  Cell-Mediated Defense against Infection  129
   MICHAEL S. GLICKMAN  |  ERIC G. PAMER

10  Nutrition, Immunity, and Infection  151
    CARYN GEE MORSE  |  KEVIN P. HIGH

11  Prebiotics, Probiotics, and Synbiotics  161
    SHERVIN RABIZADEH  |  MARK A. MILLER  |  CYNTHIA L. SEARS

12  Evaluation of the Patient with Suspected Immunodeficiency  167
    STEVEN M. HOLLAND  |  JOHN I. GALLIN

SECTION C  EPIDEMIOLOGY OF INFECTIOUS DISEASES

13  Epidemiologic Principles  179
    MICHAEL T. OSTERHOLM  |  CRAIG W. HEDBERG

14  Outbreak Investigation  193
    ANDRES G. LESCANO  |  JOEL M. MONTGOMERY  |  DAVID L. BLAZES

15  Emerging and Reemerging Infectious Disease Threats  199
    RIMA F. KHABBAZ  |  STEPHEN M. OSTROFF  |  JAMES W. LEDUC  |  ROBIN MOSELEY  |  JAMES M. HUGHES

16  Hospital Preparedness for Emerging and Highly Contagious Infectious Diseases: Getting Ready for the Next Epidemic or Pandemic  221
    LAURA M. LEE  |  DAVID K. HENDERSON

SECTION D  CLINICAL MICROBIOLOGY

17  The Clinician and the Microbiology Laboratory  233
    PATRICK R. MURRAY  |  FRANK G. WITEBSKY

SECTION E  ANTI-INFECTIVE THERAPY

18  Principles of Anti-infective Therapy  267
    SATISH K. PILLAI  |  GEORGE M. ELIOPOULOS  |  ROBERT C. MOELLERING, JR.

19  Molecular Mechanisms of Antibiotic Resistance in Bacteria  279
    STEVEN M. OPAL  |  AURORA POP-VICAS

20  Pharmacokinetics and Pharmacodynamics of Anti-infective Agents  297
    GUY W. AMSDEN  |  CHARLES H. BALLOW  |  JOSEPH S. BERTINO, JR.  |  ANGELA D. M. KASHUBA

21  Penicillins and β-Lactam Inhibitors  309
    HENRY F. CHAMBERS

22  Cephalosporins  323
    DAVID R. ANDES  |  WILLIAM A. CRAIG

23  Carbapenems and Monobactams  341
    HENRY F. CHAMBERS

24  β-Lactam Allergy  347
    MICHAEL E. WEISS  |  N. FRANKLIN ADKINSON, JR.

25  Fusidic Acid  355
    LIONEL A. MANDELL

26  Aminoglycosides  359
    DAVID N. GILBERT  |  JAMES E. LEGGETT

27  Tetracyclines and Chloramphenicol  385
    MIRELLA SALVATORE  |  JAMES M. HUGHES

28  Rifamycins  403
    DAVID P. CALFEE

29  Metronidazole  419
    MIRELLA SALVATORE  |  BURT R. MEYERS

30  Macrolides, Clindamycin, and Ketolides  427
    SUMATHI SIVAPALASINGAM  |  NEAL H. STEIGBIGEL
SECTION E
SEPSIS

70 Sepsis, Severe Sepsis, and Septic Shock 987
ROBERT S. MUNFORD | ANTHONY F. SUFFREDINI

SECTION F
INTRA-ABDOMINAL INFECTION

71 Peritonitis and Intraperitoneal Abscesses 1011
MATTHEW E. LEVISON | LARRY M. BUSH

72 Infections of the Liver and Biliary System 1035
COSTI D. SIFRI | LAWRENCE C. MADOFF

73 Pancreatic Infection 1045
MIRIAM J. BARON | LAWRENCE C. MADOFF

74 Splenic Abscess 1055
LAWRENCE C. MADOFF

75 Appendicitis 1059
COSTI D. SIFRI | LAWRENCE C. MADOFF

76 Diverticulitis and Typhilitis 1063
COSTI D. SIFRI | LAWRENCE C. MADOFF

SECTION G
CARDIOVASCULAR INFECTIONS

77 Endocarditis and Intravascular Infections 1067
VANCE G. FOWLER, JR. | W. MICHAEL SCHELD | ARNOLD S. BAYER

78 Prosthetic Valve Endocarditis 1113
BETTINA M. KNOLL | LARRY M. BADDOUR | WALTER R. WILSON

79 Infections of Nonvalvular Cardiovascular Devices 1127
M. RIZWAN SOHAIL | WALTER R. WILSON | LARRY M. BADDOUR

80 Prevention of Infective Endocarditis 1143
DAVID T. DURACK

81 Myocarditis and Pericarditis 1153
KIRK U. KNOWLTON | MARIA C. SAVOIA | MICHAEL N. OXMAN

82 Mediastinitis 1173
TREVOR C. VAN SCHOONEVELD | MARK E. RUPP

SECTION H
CENTRAL NERVOUS SYSTEM INFECTIONS

83 Approach to the Patient with Central Nervous System Infection 1183
ALLAN R. TUNKEL

84 Acute Meningitis 1189
ALLAN R. TUNKEL | DIEDERIK VAN DE BEEK | W. MICHAEL SCHELD

85 Cerebrospinal Fluid Shunt Infections 1231
ALLAN R. TUNKEL | JAMES M. DRAKE

86 Chronic Meningitis 1237
JOHN E. BENNETT

87 Encephalitis 1243
J. DAVID BECKHAM | KENNETH L. TYLER

88 Brain Abscess 1265
ALLAN R. TUNKEL

89 Subdural Empyema, Epidural Abscess, and Suppurative Intracranial Thrombophlebitis 1279
ALLAN R. TUNKEL

SECTION I
SKIN AND SOFT TISSUE INFECTIONS

90 Cellulitis, Necrotizing Fasciitis, and Subcutaneous Tissue Infections 1289
MARK S. PASTERNACK | MORTON N. SWARTZ

91 Myositis and Myonecrosis 1313
MARK S. PASTERNACK | MORTON N. SWARTZ

92 Lymphadenitis and Lymphangitis 1323
MARK S. PASTERNACK | MORTON N. SWARTZ

SECTION J
GASTROINTESTINAL INFECTIONS AND FOOD POISONING

93 Principles and Syndromes of Enteric Infection 1335
THEODORE S. STEINER | RICHARD L. GUERRANT

94 Esophagitis 1353
PAUL S. GRAMAN

95 Nausea, Vomiting, and Noninflammatory Diarrhea 1359
DAVID A. BOBAK | RICHARD L. GUERRANT

96 Antibiotic-Associated Colitis 1375
NATHAN M. THEILMAN | KENNETH H. WILSON

97 Inflammatory Enteritides 1389
ALDO A. M. LIMA | RICHARD L. GUERRANT

98 Enteric Fever and Other Causes of Abdominal Symptoms with Fever 1399
NATHAN M. THEILMAN | JOHN A. CRUMP | RICHARD L. GUERRANT

99 Foodborne Disease 1413
SAMIR V. SODHA | PATRICIA M. GRIFFIN | JAMES M. HUGHES

100 Tropical Sprue: Enteropathy 1429
CHRISTINE A. WANKE

101 Whipple's Disease 1435
THOMAS MARTH | THOMAS SCHNEIDER

SECTION K
BONE AND JOINT INFECTIONS

102 Infectious Arthritis of Native Joints 1443
CHRISTOPHER A. OHL

103 Osteomyelitis 1457
ELIE F. BERBARI | JAMES M. STECKELBERG | DOUGLAS R. OSMON

104 Infections with Prostheses in Bones and Joints 1469
BARRY D. BRAUSE

SECTION L
DISEASES OF THE REPRODUCTIVE ORGANS AND SEXUALLY TRANSMITTED DISEASES

105 Genital Skin and Mucous Membrane Lesions 1475
MICHAEL H. AUGENBRAUN
106 Urethritis  1485
WILLIAM M. MCCORMACK

107 Vulvovaginitis and Cervicitis  1495
WILLIAM M. MCCORMACK

108 Infections of the Female Pelvis  1511
DAVID E. SOPER

109 Prostatitis, Epididymitis, and Orchitis  1521
JOHN N. KRIEGER

SECTION M
EYE INFECTIONS

110 Microbial Conjunctivitis  1529
SCOTT D. BARNES  |  DEBORAH PAVAN-LANGSTON  |  DIMITRI T. AZAR

111 Microbial Keratitis  1539
SCOTT D. BARNES  |  DEBORAH PAVAN-LANGSTON  |  DIMITRI T. AZAR

112 Endophthalmitis  1553
MARLENE L. DURAND

113 Infectious Causes of Uveitis  1561
MARLENE L. DURAND

114 Periocular Infections  1569
MARLENE L. DURAND

SECTION N
HEPATITIS

115 Acute Viral Hepatitis  1577
MICHAEL P. CURRY  |  SANJIV CHOPRA

116 Chronic Viral Hepatitis  1593
JULES L. DIENSTAG

SECTION O
ACQUIRED IMMUNODEFICIENCY SYNDROME

117 Global Perspectives on Human Immunodeficiency Virus Infection and Acquired Immunodeficiency Syndrome  1619
PETER PIOT  |  MICHEL CARAEL

118 Epidemiology and Prevention of Acquired Immunodeficiency Syndrome and Human Immunodeficiency Virus Infection  1635
CARLOS DEL RIO  |  JAMES W. CURRAN

119 Diagnosis of Human Immunodeficiency Virus Infection  1663
ROBIN DEWAR  |  DEBORAH GOLDSTEIN  |  FRANK MALDARELLI

120 The Immunology of Human Immunodeficiency Virus Infection  1687
SUSAN MOIR  |  MARK CONNORS  |  ANTHONY S. FAUCI

121 General Clinical Manifestations of Human Immunodeficiency Virus Infection (Including the Acute Retroviral Syndrome and Oral, Cutaneous, Renal, Ocular, Metabolic, and Cardiac Diseases)  1705
TIMOTHY R. STERLING  |  RICHARD E. CHAISSON

122 Pulmonary Manifestations of Human Immunodeficiency Virus Infection  1727
PAUL E. SAX

123 Gastrointestinal and Hepatobiliary Manifestations of Human Immunodeficiency Virus Infection  1737
MARK S. SULKOWSKI

124 Neurologic Diseases Caused by Human Immunodeficiency Virus Type 1 and Opportunistic Infections  1745
IGOR J. KORALNIK

125 Malignant Diseases in Human Immunodeficiency Virus Infection  1765
PATRICIA A. CORNETT  |  PAUL A. VOLBERDING

126 Human Immunodeficiency Virus Infection in Women  1781
SUSAN E. COHN  |  REBECCA A. CLARK

127 Pediatric Human Immunodeficiency Virus Infection  1809
GEOFFREY A. WEINBERG  |  GEORGE K. SIBERRY

128 Antiretroviral Therapy for Human Immunodeficiency Virus Infection  1833
ATHE M. N. TSIBRIS  |  MARTIN S. HIRSCH

129 Management of Opportunistic Infections Associated with Human Immunodeficiency Virus Infection  1855
HENRY MASUR

130 Vaccines for Human Immunodeficiency Virus-1 Infection  1887
DAN H. BAROUCH  |  LINDSEY R. BADEN  |  RAPHAEL DOLIN

SECTION P
MISCELLANEOUS SYNDROMES

131 Chronic Fatigue Syndrome  1897
N. CARY ENGLEBERG

Index  i
## Infectious Diseases and Their Etiologic Agents

### Part III

**Section A**

**Viral Diseases**

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Viruses and Viral Diseases</td>
<td>1907</td>
</tr>
<tr>
<td>James D. ChapPELL</td>
<td></td>
</tr>
<tr>
<td>Orthopoxviruses: Vaccinia (Smallpox Vaccine), Variola (Smallpox), Monkeypox, and Cowpox</td>
<td>1923</td>
</tr>
<tr>
<td>Inger K. DamOn</td>
<td></td>
</tr>
<tr>
<td>Other Poxviruses That Infect Humans: Parapoxviruses, Molluscum Contagiosum, and Yatapoxviruses</td>
<td>1933</td>
</tr>
<tr>
<td>Inger K. DamOn</td>
<td></td>
</tr>
<tr>
<td>Introduction to Herpesviridae</td>
<td>1937</td>
</tr>
<tr>
<td>Jeffrey I. Cohen</td>
<td></td>
</tr>
<tr>
<td>Herpes Simplex Virus</td>
<td>1943</td>
</tr>
<tr>
<td>Joshua T. SchiffEr</td>
<td></td>
</tr>
<tr>
<td>Varicella-Zoster Virus</td>
<td>1963</td>
</tr>
<tr>
<td>Richard J. WhiTeY</td>
<td></td>
</tr>
<tr>
<td>Cytomegalovirus</td>
<td>1971</td>
</tr>
<tr>
<td>Clyde S. CrumPacker II</td>
<td></td>
</tr>
<tr>
<td>Epstein-Barr Virus (Infectious Mononucleosis, Epstein-Barr Virus–Associated Malignant Diseases, and Other Diseases)</td>
<td>1989</td>
</tr>
<tr>
<td>Eric C. JohanniSen</td>
<td></td>
</tr>
<tr>
<td>Human Herpesvirus Types 6 and 7</td>
<td>2011</td>
</tr>
<tr>
<td>Jeffrey I. Cohen</td>
<td></td>
</tr>
<tr>
<td>Kaposi’s Sarcoma–Associated Herpesvirus (Human Herpesvirus Type 8)</td>
<td>2017</td>
</tr>
<tr>
<td>Kenneth M. Kaye</td>
<td></td>
</tr>
<tr>
<td>Herpes B Virus</td>
<td>2023</td>
</tr>
<tr>
<td>Jeffrey I. Cohen</td>
<td></td>
</tr>
<tr>
<td>Adenoviruses</td>
<td>2027</td>
</tr>
<tr>
<td>Elizabeth G. Rhee</td>
<td></td>
</tr>
<tr>
<td>Papillomaviruses</td>
<td>2035</td>
</tr>
<tr>
<td>William Bonnez</td>
<td></td>
</tr>
<tr>
<td>JC, BK, and Other Polyomaviruses: Progressive Multifocal Leukoencephalopathy</td>
<td>2051</td>
</tr>
<tr>
<td>C. Sabrina Tan</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B Virus and Hepatitis Delta Virus</td>
<td>2059</td>
</tr>
<tr>
<td>Margaret James Koziel</td>
<td></td>
</tr>
<tr>
<td>Human Parvoviruses, Including Parvovirus B19 and Human Bocavirus</td>
<td>2087</td>
</tr>
<tr>
<td>Kevin E. Brown</td>
<td></td>
</tr>
<tr>
<td>Orthoreoviruses and Orbiviruses</td>
<td>2097</td>
</tr>
<tr>
<td>Roberta L. DeBiasi</td>
<td></td>
</tr>
<tr>
<td>Coltiviruses and Seadornaviruses</td>
<td>2101</td>
</tr>
<tr>
<td>Roberta L. DeBiasi</td>
<td></td>
</tr>
<tr>
<td>Rotaviruses</td>
<td>2105</td>
</tr>
<tr>
<td>Philip R. DormitzEr</td>
<td></td>
</tr>
<tr>
<td>Alphaviruses</td>
<td>2117</td>
</tr>
<tr>
<td>Lewis Markoff</td>
<td></td>
</tr>
<tr>
<td>Rubella Virus (German Measles)</td>
<td>2127</td>
</tr>
<tr>
<td>Anne A. GershOn</td>
<td></td>
</tr>
<tr>
<td>Flaviviruses (Yellow Fever, Dengue, Dengue Hemorrhagic Fever, Japanese Encephalitis, West Nile Encephalitis, St. Louis Encephalitis, Tick-Borne Encephalitis)</td>
<td>2133</td>
</tr>
<tr>
<td>David W. Vaughn</td>
<td></td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>2157</td>
</tr>
<tr>
<td>Stuart C. Ray</td>
<td></td>
</tr>
<tr>
<td>Coronavirus, Including Severe Acute Respiratory Syndrome (SARS)–Associated Coronavirus</td>
<td>2187</td>
</tr>
<tr>
<td>Kenneth McIntosh</td>
<td></td>
</tr>
<tr>
<td>Parainfluenza Viruses</td>
<td>2195</td>
</tr>
<tr>
<td>Peter F. Wright</td>
<td></td>
</tr>
<tr>
<td>Mumps Virus</td>
<td>2201</td>
</tr>
<tr>
<td>Nathan Utman</td>
<td></td>
</tr>
<tr>
<td>Respiratory Syncytial Virus</td>
<td>2207</td>
</tr>
<tr>
<td>Caroline Breese Hall</td>
<td></td>
</tr>
<tr>
<td>Human Metapneumovirus</td>
<td>2223</td>
</tr>
<tr>
<td>Ann R. Falsey</td>
<td></td>
</tr>
<tr>
<td>Measles Virus (Rubeola)</td>
<td>2229</td>
</tr>
<tr>
<td>Anne A. Gershon</td>
<td></td>
</tr>
<tr>
<td>Zoonotic Paramyxoviruses: Nipah, Hendra, and Menangle Viruses</td>
<td>2237</td>
</tr>
<tr>
<td>Anna R. Thorner</td>
<td></td>
</tr>
<tr>
<td>Vesicular Stomatitis Virus and Related Vesiculoviruses</td>
<td>2245</td>
</tr>
<tr>
<td>Steven M. Fine</td>
<td></td>
</tr>
<tr>
<td>Rhabdoviruses</td>
<td>2249</td>
</tr>
<tr>
<td>Sarice L. Bassin</td>
<td></td>
</tr>
<tr>
<td>Marburg and Ebola Virus Hemorrhagic Fevers</td>
<td>2259</td>
</tr>
<tr>
<td>C. J. Peters</td>
<td></td>
</tr>
<tr>
<td>California Encephalitis, Hantavirus Pulmonary Syndrome, and Bunyavirid Hemorrhagic Fevers</td>
<td>2289</td>
</tr>
<tr>
<td>C. J. Peters</td>
<td></td>
</tr>
<tr>
<td>Influenza Viruses, Including Avian Influenza and Swine Influenza</td>
<td>2265</td>
</tr>
<tr>
<td>John J. Treanor</td>
<td></td>
</tr>
<tr>
<td>California Influenza, Hantavirus Pulmonary Syndrome, and Bunyavirid Hemorrhagic Fevers</td>
<td>2289</td>
</tr>
<tr>
<td>C. J. Peters</td>
<td></td>
</tr>
<tr>
<td>Lymphocytic Choriomeningitis Virus, Lassa Virus, and the South American Hemorrhagic Fevers</td>
<td>2295</td>
</tr>
<tr>
<td>C. J. Peters</td>
<td></td>
</tr>
<tr>
<td>Human T-Cell Lymphotropic Virus Types I and II</td>
<td>2303</td>
</tr>
<tr>
<td>Edward L. Murphy</td>
<td></td>
</tr>
<tr>
<td>Human Immunodeficiency Viruses</td>
<td>2323</td>
</tr>
<tr>
<td>Marvin S. Reitz, Jr.</td>
<td></td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>2157</td>
</tr>
<tr>
<td>Parainfluenza Viruses</td>
<td>2195</td>
</tr>
<tr>
<td>human metapneumovirus</td>
<td>2223</td>
</tr>
<tr>
<td>respiratory syncytial virus</td>
<td>2207</td>
</tr>
<tr>
<td>human parvovirus</td>
<td>2229</td>
</tr>
<tr>
<td>mumps virus</td>
<td>2201</td>
</tr>
<tr>
<td>respiratory syncytial virus</td>
<td>2207</td>
</tr>
<tr>
<td>human metapneumovirus</td>
<td>2223</td>
</tr>
<tr>
<td>human metapneumovirus</td>
<td>2223</td>
</tr>
<tr>
<td>respiratory syncytial virus</td>
<td>2207</td>
</tr>
</tbody>
</table>
SECTION A

INTRODUCTION TO THE ENTEROVIRUSES AND PARECHOVIRES

170 Introduction to the Enteroviruses and Parechoviruses 2337
JOHN F. MODLIN

171 Poliovirus 2345
JOHN F. MODLIN

172 Coxsackieviruses, Echoviruses, Newer Enteroviruses, and Parechoviruses 2353
JOHN F. MODLIN

173 Hepatitis A Virus 2367
ANNEMARIE WASLEY | STEPHEN M. FEINSTONE | BETH P. BELL

174 Rhinovirus 2389
RONALD B. TURNER

175 Noroviruses and Other Caliciviruses 2399
RAPHAEL DOLIN | JOHN J. TREANOR

176 Astroviruses and Picobirnaviruses 2407
RAPHAEL DOLIN | JOHN J. TREANOR

177 Hepatitis E Virus 2411
DAVID A. ANDERSON

SECTION B

PRION DISEASES

178 Prions and Prion Diseases of the Central Nervous System (Transmissible Neurodegenerative Diseases) 2423
PATRICK J. BOSQUE | KENNETH L. TYLER

SECTION C

CHLAMYDIAL DISEASES

179 Introduction to Chlamydia and Chlamydophila 2439
WALTER E. STAMM | BYRON E. BATTEIGER

180 Chlamydia trachomatis (Trachoma, Perinatal Infections, Lymphogranuloma Venereum, and Other Genital Infections) 2443
WALTER E. STAMM | BYRON E. BATTEIGER

181 Chlamydophila (Chlamydia) psittaci (Psittacosis) 2463
DAVID SCHLOSSBERG

182 Chlamydophila (Chlamydia) pneumoniae 2467
MARGARET R. HAMMERSCHLAG | STEPHAN A. KOHLHOFF | PETRA M. APFALTER

SECTION D

MYCOPLASMA DISEASES

183 Introduction to Mycoplasma and Ureaplasma 2477
STEPHEN G. BAUM

184 Mycoplasma pneumoniae and Atypical Pneumonia 2481
STEPHEN G. BAUM

185 Genital Mycoplasmas: Mycoplasma genitalium, Mycoplasma hominis, and Ureaplasma Species 2491
GEORGE E. KENNY

SECTION E

RICKETTOSIOSES, EHRLICHIOSIS, AND ANAPLASMOSIS

186 Introduction to Rickettsioses, Ehrlichioses, and Anaplasmosis 2495
DIDIER RAOULT

187 Rickettsia rickettsii and Other Spotted Fever Group Rickettsiae (Rocky Mountain Spotted Fever and Other Spotted Fevers) 2499
DAVID H. WALKER

188 Rickettsia akari (Rickettsialpox) 2509
DIDIER RAOULT

189 Coxiella burnetii (Q Fever) 2511
THOMAS J. MARRIE | DIDIER RAOULT

190 Rickettsia prowazekii (Epidemic or Louse-Borne Typhus) 2521
DAVID H. WALKER | DIDIER RAOULT

191 Rickettsia typhi (Murine Typhus) 2525
J. STEPHEN DUMLER | DAVID H. WALKER

192 Orientia tsutsugamushi (Scrub Typhus) 2529
DIDIER RAOULT

193 Ehrlichia chaffeensis (Human Monocytotropic Ehrlichiosis), Anaplasma phagocytophilum (Human Granulocytotropic Anaplasmosis), and Other Anaplasmataceae 2531
J. STEPHEN DUMLER | DAVID H. WALKER

SECTION F

BACTERIAL DISEASES

194 Introduction to Bacteria and Bacterial Diseases 2539
MARTIN J. BLASER

195 Staphylococcus aureus (Including Staphylococcal Toxic Shock) 2543
YOK-AI QUE | PHILIPPE MOREILLON

196 Staphylococcus epidermidis and Other Coagulase-Negative Staphylococci 2579
MARK E. RUPP | PAUL D. FEY

197 Classification of Streptococci 2591
KATHRYN L. RUOFF | ALAN L. BISNO

198 Streptococcus pyogenes 2593
ALAN L. BISNO | DENNIS L. STEVENS

199 Nonsuppurative Poststreptococcal Sequelae: Rheumatic Fever and Glomerulonephritis 2611
ALAN L. BISNO

200 Streptococcus pneumoniae 2623
DANIEL M. MUSHER

201 Enterococcus Species, Streptococcus bovis Group, and Leuconostoc Species 2643
CESAR A. ARIAS | BARBARA E. MURRAY

202 Streptococcus agalactiae (Group B Streptococcus) 2655
MORVEN S. EDWARDS | PHILIPPE MOREILLON

203 Viridans Streptococci, Groups C and G Streptococci, and Gemella Species 2667
SCOTT W. SINNER | ALLAN R. TUNKEL
Contents

204 Streptococcus anginosus Group 2681
  CATHY A. PETTI | CHARLES W. STRATTON IV

205 Corynebacterium diphtheriae 2687
  ROB ROY MAcGREGOR

206 Other Coryneform Bacteria and Rhodococci 2695
  DANIEL K. MEYER | ANNETTE C. REBOLI

207 Listeria monocytogenes 2707
  BENNETT LORBER

208 Bacillus anthracis (Anthrax) 2715
  GREGORY J. MARTIN | ARTHUR M. FRIEDLANDER

209 Bacillus Species and Related Genera Other than Bacillus anthracis 2727
  THOMAS FEKETE

210 Erysipelothrix rhusiopathiae 2733
  ANNETTE C. REBOLI

211 Neisseria meningitidis 2737
  MICHAEL A. APCICELLA

212 Neisseria gonorrhoeae 2753
  JEANNE M. MARRAZZO | H. HUNTER HANDSFIELD | P. FREDERICK SPARLING

213 Moraxella catarrhalis, Kingella, and Other Gram-Negative Cocci 2771
  TIMOTHY F. MURPHY

214 Vibrio cholerae 2777
  CARLOS SEAS | EDUARDO GOTUZZO

215 Other Pathogenic Vibrios 2787
  MARGUERITE A. NEILL | CHARLES C. J. CARPENTER

216 Campylobacter jejuni and Related Species 2793
  BAN MISHU ALLOS | MARTIN J. BLASER

217 Helicobacter pylori and Other Gastric Helicobacter Species 2803
  MARTIN J. BLASER

218 Enterobacteriaceae 2815
  MICHAEL S. DONNENBERG

219 Pseudomonas aeruginosa 2835
  GERALD B. PIER | REUBEN RAMPHAL

220 Stenotrophomonas maltophilia and Burkholderia cepacia Complex 2861
  GEORG MASCHMEYER | Ulf GÖBEL

221 Burkholderia pseudomallei and Burkholderia mallei: Melioidosis and Glanders 2869
  BART J. CURRIE

222 Acinetobacter Species 2881
  DAVID M. ALLEN | BARRY J. HARTMAN

223 Salmonella Species, Including Salmonella Typhi 2887
  DAVID A. PEGUES | SAMUEL I. MILLER

224 Shigella Species (Bacillary Dysentery) 2905
  HERBERT L. DUPONT

225 Haemophilus Species (Including H. influenzae and Chancroid) 2911
  TIMOTHY F. MURPHY

226 Brucella Species 2921
  EDWARD J. YOUNG

227 Francisella tularensis (Tularemia) 2927
  ROBERT L. PENN

228 Pasteurella Species 2939
  JOHN J. ZURLO

229 Yersinia Species, Including Plague 2943
  DAVID T. DENNIS | PAUL S. MEAD

230 Bordetella pertussis 2955
  VALERIE WATERS | SCOTT HALPERIN

231 Rat-Bite Fever: Streptobacillus moniliformis and Spirillum minus 2965
  RONALD G. WASHBURN

232 Legionella 2969
  PAUL H. EDELSTEIN | NICHOLAS P. CIANCIOTTO

233 Other Legionella Species 2985
  ROBERT R. MUDER

234 Capnocytophaga 2991
  J. MICHAEL JANDA | MARGOT GRAVES

235 Bartonella, Including Cat-Scratch Disease 2995
  LEONARD N. SLATER | DAVID F. WELCH

236 Klebsiella granulomatis (Donovanosis, Granuloma Inguinale) 3011
  RONALD C. BALLARD

237 Other Gram-Negative and Gram-Variable Bacilli 3015
  JAMES P. STEINBERG | EILEEN M. BURD

238 Treponema pallidum (Syphilis) 3035
  EDMUND C. TRAMONT

239 Endemic Treponematoses 3055
  EDWARD W. HOOK III

240 Leptospira Species (Leptospirosis) 3059
  PAUL N. LEVETT | DAVID A. HAAKE

241 Borrelia Species (Relapsing Fever) 3067
  KYU Y. RHEE | WARREN D. JOHNSON, JR.

242 Borrelia burgdorferi (Lyme Disease, Lyme Borreliosis) 3071
  ALLEN C. STEERE

243 Anaerobic Infections: General Concepts 3083
  RONIT COHEN-PORADOSU | DENNIS L. KASPER

244 Clostridium tetani (Tetanus) 3091
  PAVANI REDDY | THOMAS P. BLECK

245 Clostridium botulinum (Botulism) 3097
  PAVANI REDDY | THOMAS P. BLECK

246 Gas Gangrene and Other Clostridium-Associated Diseases 3103
  ANDREW B. ONDERDONK | WENDY S. GARRETT

247 Bacteroides, Prevotella, Porphyromonas, and Fusobacterium Species (and Other Medically Important Anaerobic Gram-Negative Bacilli) 3111
  WENDY S. GARRETT | ANDREW B. ONDERDONK

248 Anaerobic Coci 3121
  SYDNEY M. FINEGOLD | YULI SONG

249 Anaerobic Gram-Positive Nonsporulating Bacilli 3125
  EJIA KÖNÖNEN
SECTION F
PROTOZOAL DISEASES

272 Introduction to Protozoal Diseases 3409
JONATHAN I. RAVDIN  |  WILLIAM A. PETRI, JR.

273 Entamoeba Species, Including Amebiasis 3411
WILLIAM A. PETRI, JR.  |  RASHIDUL HAQUE

274 Free-Living Amebas 3427
ANITA A. KOSHY  |  BRIAN G. BLACKBURN  |  UPINDER SINGH

275 Plasmodium Species (Malaria) 3437
RICK M. FAIRHURST  |  THOMAS E. WELLEMS

276 Leishmania Species: Visceral (Kala-Azar), Cutaneous, and Mucosal Leishmaniasis 3463
ALAN J. MAGILL

277 Trypanosoma Species (American Trypanosomiasis, Chagas' Disease): Biology of Trypanosomes 3481
LOUIS V. KIRCHHOFF

278 Agents of African Trypanosomiasis (Sleeping Sickness) 3489
LOUIS V. KIRCHHOFF

279 Toxoplasma gondii 3495
JOSE G. MONTOYA  |  JOHN C. BOOTHROYD  |  JOSEPH A. KOVACS

280 Giardia lamblia 3527
DAVID R. HILL  |  THEODORE E. NASH

281 Trichomonas vaginalis 3535
JANE R. SCHWEBKE

282 Babesia Species 3539
JEFFREY A. GELFAND  |  EDOUARD G. VANNIER

283 Cryptosporidium Species 3547
KATHRYN N. SUH  |  PHYLLIS KOZARSKY  |  JAY S. KEYSTONE

SECTION G
MYCOSES

250 Mycobacterium tuberculosis 3129
DANIEL W. FITZGERALD  |  TIMOTHY R. STERLING  |  DAVID W. HAAS

251 Mycobacterium leprae 3165
CYBÈLE R. RENAULT  |  JOEL D. ERNST

252 Mycobacterium avium Complex 3177
FRED M. GORDIN  |  C. ROBERT HORSBURGH, JR.

253 Infections Due to Nontuberculous Mycobacteria Other than Mycobacterium avium-intracellulare 3191
BARBARA A. BROWN-ELLIOTT  |  RICHARD J. WALLACE, JR.

254 Nocardia Species 3199
TANIA C. SORRELL  |  DAVID H. MITCHELL  |  JONATHAN R. IREDELL  |  SHARON C.-A. CHEN

255 Agents of Actinomycosis 3209
THOMAS A. RUSSO

256 Introduction to Mycoses 3221
JOHN E. BENNETT

257 Candida Species 3225
JOHN E. EDWARDS, JR.

258 Aspergillus Species 3241
THOMAS F. PATTERSON

259 Agents of Mucormycosis and Entomophthoramycosis 3257
DIMITRIOS P. KONTOYIANNIS  |  RUSSELL E. LEWIS

260 Sporothrix schenckii 3271
JOHN H. REX  |  PABLO C. OKHUYSEN

261 Agents of Chromoblastomycosis 3277
DUANE R. HOSPENTHAL

262 Agents of Mycetoma 3281
DUANE R. HOSPENTHAL

263 Cryptococcus neoformans 3287
JOHN R. PERFECT

264 Histoplasma capsulatum 3305
GEORGE S. DEEFE, JR.

265 Blastomyces dermatitidis 3319
STANLEY W. CHAPMAN  |  DONNA C. SULLIVAN

266 Cocidioides Species 3333
JOHN N. GALGIANI

267 Dermatophytosis and Other Superficial Mycoses 3345
RODERICK J. HAY

268 Paracoccidioides brasiliensis 3357
ANGELA RESTREPO  |  ANGELA MARÍA TObÓN

269 Uncommon Fungi and Prototheca 3365
DUANE R. HOSPENTHAL

270 Pneumocystis Species 3377
PETER D. WALZER  |  A. GEORGE SMLJAN

271 Microsporidiosis 3391
LOUIS M. WEISS
<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>290</td>
<td>Cestodes (Tapeworms)</td>
<td>3607</td>
<td>CHARLES H. KING</td>
</tr>
<tr>
<td>291</td>
<td>Visceral Larva Migrants and Other Unusual Helminth Infections</td>
<td>3617</td>
<td>THEODORE E. NASH</td>
</tr>
<tr>
<td>292</td>
<td>SECTION K</td>
<td>ECTOPARASITIC DISEASES</td>
<td></td>
</tr>
<tr>
<td>292</td>
<td>Introduction to Ectoparasitic Diseases</td>
<td>3625</td>
<td>JAMES H. DIAZ</td>
</tr>
<tr>
<td>293</td>
<td>Lice (Pediculosis)</td>
<td>3629</td>
<td>JAMES H. DIAZ</td>
</tr>
<tr>
<td>294</td>
<td>Scabies</td>
<td>3633</td>
<td>JAMES H. DIAZ</td>
</tr>
<tr>
<td>295</td>
<td>Myiasis and Tungiasis</td>
<td>3637</td>
<td>JAMES H. DIAZ</td>
</tr>
<tr>
<td>296</td>
<td>Mites, Including Chiggers</td>
<td>3643</td>
<td>JAMES H. DIAZ</td>
</tr>
<tr>
<td>297</td>
<td>Ticks, Including Tick Paralysis</td>
<td>3649</td>
<td>JAMES H. DIAZ</td>
</tr>
<tr>
<td>298</td>
<td>SECTION L</td>
<td>DISEASES OF UNKNOWN ETIOLOGY</td>
<td></td>
</tr>
<tr>
<td>298</td>
<td>Kawasaki Syndrome</td>
<td>3663</td>
<td>FRANK T. SAULSBURY</td>
</tr>
<tr>
<td>300</td>
<td>SECTION A</td>
<td>NOSOCOMIAL INFECTIONS</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>Organization for Infection Control</td>
<td>3669</td>
<td>MICHAEL B. EDMOND</td>
</tr>
<tr>
<td>301</td>
<td>Isolation</td>
<td>3673</td>
<td>MICHAEL B. EDMOND</td>
</tr>
<tr>
<td>301</td>
<td>Disinfection, Sterilization, and Control of Hospital Waste</td>
<td>3677</td>
<td>WILLIAM A. RUTALA</td>
</tr>
<tr>
<td>302</td>
<td>Infections Caused by Percutaneous Intravascular Devices</td>
<td>3697</td>
<td>SUSAN E. BEEKMANN</td>
</tr>
<tr>
<td>303</td>
<td>Nosocomial Pneumonia</td>
<td>3717</td>
<td>DONALD E. CRAVEN</td>
</tr>
<tr>
<td>304</td>
<td>Nosocomial Urinary Tract Infections</td>
<td>3725</td>
<td>THOMAS M. HOOTON</td>
</tr>
<tr>
<td>305</td>
<td>Nosocomial Hepatitis and Other Transfusion- and Transplantation-Transmitted Infections</td>
<td>3739</td>
<td>KENT A. SEPKOWITZ</td>
</tr>
<tr>
<td>306</td>
<td>Human Immunodeficiency Virus in Health Care Settings</td>
<td>3753</td>
<td>DAVID K. HENDERSON</td>
</tr>
<tr>
<td>307</td>
<td>Nosocomial Herpesvirus Infections</td>
<td>3771</td>
<td>TARA N. PALMORE</td>
</tr>
<tr>
<td>308</td>
<td>SECTION B</td>
<td>INFECTIONS IN SPECIAL HOSTS</td>
<td></td>
</tr>
<tr>
<td>308</td>
<td>Infections in the Immunocompromised Host: General Principles</td>
<td>3781</td>
<td>J. PETER DONNELLY</td>
</tr>
<tr>
<td>309</td>
<td>Prophylaxis and Empirical Therapy of Infection in Cancer Patients</td>
<td>3793</td>
<td>CLAUDIO VISCOLI</td>
</tr>
<tr>
<td>310</td>
<td>Risk Factors and Approaches to Infections in Transplant Recipients</td>
<td>3809</td>
<td>J. STEPHEN DUMMER</td>
</tr>
<tr>
<td>311</td>
<td>Infections in Recipients of Hematopoietic Cell Transplantation</td>
<td>3821</td>
<td>JO-ANNE H. YOUNG</td>
</tr>
<tr>
<td>312</td>
<td>Infections in Solid Organ Transplant Recipients</td>
<td>3839</td>
<td>J. STEPHEN DUMMER</td>
</tr>
<tr>
<td>313</td>
<td>Infections in Patients with Spinal Cord Injury</td>
<td>3851</td>
<td>RABIH O. DAROUICHE</td>
</tr>
<tr>
<td>314</td>
<td>Infections in the Elderly</td>
<td>3857</td>
<td>KENT B. CROSSLEY</td>
</tr>
<tr>
<td>315</td>
<td>Infections in Asplenic Patients</td>
<td>3865</td>
<td>LARRY I. LUTWICK</td>
</tr>
<tr>
<td>316</td>
<td>Infections in Injection Drug Users</td>
<td>3875</td>
<td>DONALD P. LEVINE</td>
</tr>
<tr>
<td>317</td>
<td>SECTION C</td>
<td>SURGICAL AND TRAUMA-RELATED INFECTIONS</td>
<td></td>
</tr>
<tr>
<td>317</td>
<td>Surgical Site Infections and Antimicrobial Prophylaxis</td>
<td>3891</td>
<td>THOMAS R. TALBOT</td>
</tr>
<tr>
<td>318</td>
<td>Burns</td>
<td>3905</td>
<td>CLINTON K. MURRAY</td>
</tr>
<tr>
<td>319</td>
<td>Bites</td>
<td>3911</td>
<td>ELLIE J. C. GOLDSTEIN</td>
</tr>
<tr>
<td>320</td>
<td>Immunization</td>
<td>3917</td>
<td>WALTER A. ORENSTEIN</td>
</tr>
<tr>
<td>321</td>
<td>SECTION D</td>
<td>IMMUNIZATIONS</td>
<td></td>
</tr>
<tr>
<td>321</td>
<td>Bioterrorism: An Overview</td>
<td>3951</td>
<td>LUCIANA BORIO</td>
</tr>
<tr>
<td>322</td>
<td>Plague as a Bioterrorism Weapon</td>
<td>3965</td>
<td>LUCIANA BORIO</td>
</tr>
<tr>
<td>323</td>
<td>Francisella tularensis (Tularemia) as an Agent of Bioterrorism</td>
<td>3971</td>
<td>LISA S. HODGES</td>
</tr>
<tr>
<td>324</td>
<td>Smallpox as an Agent of Bioterrorism</td>
<td>3977</td>
<td>LISA D. ROTZ</td>
</tr>
</tbody>
</table>
Anthrax as an Agent of Bioterrorism  3983
GREGORY J. MARTIN | ARTHUR M. FRIEDLANDER

Botulinum Toxin as a Biological Weapon  3993
PAVANI REDDY | THOMAS P. BLECK

Viral Hemorrhagic Fevers as Agents of Bioterrorism  3995
C. J. PETERS

Zoonoses  3999
CAMILLE NELSON KOTTON | ARNOLD N. WEINBERG

PROTECTION OF TRAVELERS

Protection of Travelers  4009
DAVID O. FREEDMAN

Infections in Returning Travelers  4019
DAVID O. FREEDMAN

Index