

INFECTION AND IMMUNITY

VOLUME 69 • MARCH 2001 • NUMBER 3

Alison D. O'Brien, *Editor in Chief* (2004)
Uniformed Services University of the Health Sciences

Joseph T. Barbieri, *Editor* (2001)
Medical College of Wisconsin

Drusilla L. Burns, *Editor* (2002)
U.S. Food and Drug Administration

John D. Clements, *Editor* (2004)
Tulane Medical Center

Victor J. DiRita, *Editor* (2004)
University of Michigan Medical School

B. Brett Finlay, *Editor* (2005)
University of British Columbia

Stefan H. E. Kaufmann, *Editor* (2004)
Max Planck Institute for Infection Biology

Thomas R. Kozel, *Editor* (2005)
University of Nevada

John M. Mansfield, *Editor* (2003)
University of Wisconsin

Robert N. Moore, *Editor* (2001)
University of Tennessee

William A. Petri, Jr., *Editor* (2004)
University of Virginia School of Medicine

Daniel A. Portnoy, *Minireview Editor* (2004)
University of California, Berkeley

Elaine I. Tuomanen, *Editor* (2002)
St. Jude Children's Research Hospital

EDITORIAL BOARD

David W. K. Acheson (2001)
John H. Adams (2002)
Leslie G. Adams (2002)
Julia W. Albright (2001)
Judith E. Allen (2002)
Norma W. Andrews (2002)
B. J. Appelmek (2002)
Judith A. Appleton (2003)
Glen D. Armstrong (2001)
Sandra K. Armstrong (2002)
Abdu F. Azad (2002)
Pamela J. Baker (2003)
Alan G. Barbour (2001)
Scott Barnum (2001)
Robert E. Baughn (2002)
Andreas J. Bäumler (2002)
Patrik Bavoil (2002)
Blaine L. Beaman (2003)
Jeffrey M. Becker (2001)
Jorge L. Benach (2001)
William Benjamin (2001)
Luiz E. Bermudez (2003)
William Bishai (2003)
Samuel J. Black (2003)
Martin J. Blaser (2001)
James B. Bliska (2002)
Ian Blomfield (2002)
Philip N. Bochsler (2001)
Christian Bogdan (2003)
Gregory A. Bochach (2002)
Subbarao Bondada (2002)
Dov L. Boros (2002)
Kenneth L. Bost (2003)
Prosper N. Boyaka (2002)
Robert R. Brubaker (2002)
Donald E. Burgess (2001)
Jerry M. Buysse (2003)
Gerald Byrne (2003)
Joseph V. Califano (2003)
Anthony A. Campagnari (2003)
Arturo Casadevall (2002)
Kris Chadee (2002)
W. LaJean Chaffin (2003)
John Chan (2003)
Sandra P. Chang (2002)
Ambrose Cheung (2002)
Nicholas P. Cianciotto (2002)
Josephine Clark-Curtiss (2002)
P. Patrick Cleary (2002)
Steven Clegg (2002)
R. John Collier (2003)
Frank M. Collins (2001)
Helen Collins (2003)
Terry D. Connell (2003)
Cynthia Cornelissen (2003)
Peggy Cotter (2003)

Timothy L. Cover (2002)
Christopher W. Cutler (2003)
Jim E. Cutler (2002)
Cecil Czerkinsky (2001)
Steven J. Czinn (2002)
Charles J. Czuprynski (2001)
Toni Darville (2001)
Sabine Daugelat (2003)
Patrick De Baetselier (2001)
George S. Deepe, Jr. (2001)
Eric Y. Denkers (2002)
Vojo Deretic (2003)
Aravinda de Silva (2002)
Dirk A. E. Dobbelaere (2001)
Judith E. Domer (2001)
Roman Dziarski (2002)
Kathryn Edwards (2001)
Stefan Ehlers (2003)
Toby K. Eisenstein (2002)
Joanne Engel (2003)
N. Cary Engleberg (2001)
Peter B. Ernst (2002)
Ferric C. Fang (2002)
Jay P. Farrell (2002)
Paul Fidel (2003)
Barry Fields (2002)
Scott G. Filler (2003)
Fred D. Finkelman (2003)
Joanne L. Flynn (2002)
Dara W. Frank (2003)
Caroline Attardo Genco (2002)
Frances D. Gillin (2001)
Mae F. Go (2002)
Werner Goebel (2001)
Joanna B. Goldberg (2002)
William E. Goldman (2001)
Kenneth J. Goodrum (2001)
David P. Greenberg (2001)
Brian Greenwood (2002)
Patricia Guerry-Kopecko (2002)
Paul A. Gulig (2002)
Carlos A. Guzman (2003)
Jörg Hacker (2001)
Constantine G. Haidaris (2001)
Thomas L. Hale (2002)
Shigeyuki Hamada (2002)
Thomas A. Hamilton (2003)
Emanuela Handman (2003)
Philip C. Hanna (2002)
Eric J. Hansen (2001)
David L. Hasty (2003)
Edward A. Havell (2002)
Richard F. Hector (2001)
Jürgen Heesemann (2001)
Fred Heffron (2002)
Jürgen Hess (2001)

Erik Hewlett (2002)
Sarah K. Highlander (2001)
Harry R. Hill (2002)
Christopher A. Hunter (2001)
Kris Huygen (2003)
Lars Hviid (2003)
Ralph R. Isberg (2002)
Matt Jackson (2001)
Ann Jerse (2003)
Bradley D. Jones (2003)
Dieter Kabelitz (2001)
James B. Kaper (2003)
Lloyd H. Kasper (2003)
Thomas H. Kawula (2001)
Theo N. Kirkland (2001)
Hiroshi Kiyono (2001)
Thomas R. Klei (2002)
Bruce S. Klein (2002)
Toshihiko Koga (2001)
Dennis J. Kopecko (2001)
Malak Kotb (2003)
Howard K. Kuramitsu (2002)
Agnes F. Labigne (2001)
David E. Lanar (2003)
Jean Langhorne (2002)
Catherine Anne Lee (2002)
David Leiby (2001)
John M. Leong (2003)
Stuart Levitz (2002)
Oliver Liesenfeld (2003)
James W. Lillard (2002)
Hank A. Lockman (2003)
Douglas Lowrie (2002)
David M. Lyster (2003)
Paul T. Magee (2003)
Alan H. Magill (2003)
Richard M. Maizels (2003)
Stanley R. Maloy (2002)
Barbara J. Mann (2003)
Mariarosaria Marinaro (2002)
Carl F. Marrs (2002)
Kouji Matsushima (2001)
Anthony Maurelli (2002)
Bruce A. McClane (2001)
Dennis W. McGeer (2002)
David N. McMurray (2003)
John Mekalanos (2001)
Eleanor S. Metcalf (2001)
Thomas F. Meyer (2001)
Martin Mielke (2001)
Virginia L. Miller (2002)
F. Chris Minion (2003)
Hans-Willi Mitrucker (2003)
Harry L. T. Mobley (2001)
Robert L. Modlin (2001)
J. Glenn Morris, Jr. (2002)

Richard P. Morrison (2002)
Steven L. Moseley (2002)
David M. Mosser (2003)
Rodney Moxley (2001)
Robert S. Munson (2001)
Juneann W. Murphy (2002)
Peter J. Murray (2002)
Daniel M. Musher (2001)
Moon H. Nahm (2002)
Elizabeth Nardin (2003)
James P. Nataro (2002)
John Nedrud (2002)
Chris Newbold (2002)
Thalia I. Nicas (2001)
Michael V. Norgard (2003)
Karen A. Norris (2001)
Steven J. Norris (2003)
Robert North (2001)
Bogdan Nowicki (2001)
Edwin V. Oaks (2002)
Tom G. Obrig (2003)
Joan C. Olson (2003)
Ian M. Orme (2002)
Eric Oswald (2001)
Michael J. Parmely (2001)
David W. Pascual (2002)
James C. Paton (2002)
Edward J. Pearce (2001)
Miercio E. A. Pereira (2002)
Robert D. Perry (2001)
Kenneth M. Peterson (2002)
Mario T. Philipp (2001)
Carol Pickett (2002)
Gerald B. Pier (2001)
Christopher V. Plowe (2003)
Matthew Pollack (2002)
Reuven Porat (2001)
Steven J. Projan (2002)
Justin D. Radolf (2002)
Roger G. Rank (2001)
Rino Rappuoli (2002)
Jane A. Raulston (2002)
Steven G. Reed (2002)
Jörg Reimann (2001)
Richard F. Rest (2002)
Judith C. Rhodes (2001)
Ernst T. Rietschel (2001)
Eleanor M. Riley (2002)
James K. Roche (2003)
Luigina Romani (2002)
Roy Martin Roop II (2002)
Roy R. B. Russell (2001)
David Sacks (2002)
James Samuel (2001)
Matyas Sandor (2003)
Ulrich E. Schaible (2003)

David Schauer (2001)
Dieter M. Schifferli (2002)
Larry S. Schlesinger (2003)
Michael Schmitt (2003)
Louis Schofield (2003)
Lisa Rae Schopf (2002)
June R. Scott (2002)
Alan Sher (2001)
Carol Sibley (2003)
Richard Silverstein (2001)
Pamela Long Claus Small (2002)
Stanley M. Spinola (2002)
Samuel L. Stanley, Jr. (2003)
Steffen Stenger (2003)
Jeremy M. Sternberg (2002)
Joseph W. St. Geme (2002)
Scott Stibitz (2003)
Susan C. Straley (2001)
Paul Sullam (2002)
Michele Swanson (2003)
Joseph Sypek (2003)
Carol O. Tacket (2001)
Rick L. Tarleton (2003)
Vernon Tesh (2002)
John G. Tew (2001)
Cynthia M. Theodos (2002)
James Travis (2003)
Rodney K. Tweten (2002)
Joseph F. Urban, Jr. (2002)
Ivo van de Rijn (2002)
Thomas E. Van Dyke (2001)
Frederik W. van Ginkel (2002)
Wesley C. Van Voorhis (2002)
Michael L. Vasil (2002)
Malabi M. Venkatesan (2003)
Leigh R. Washburn (2001)
Jeffrey N. Weiser (2003)
Alison Weiss (2002)
Rodney A. Welch (2002)
Thomas E. Welles (2003)
Susan E. H. West (2001)
Lee M. Wetzler (2003)
A. Clinton White, Jr. (2003)
Theodore C. White (2003)
Brenda A. Wilson (2003)
Mary E. Wilson (2002)
Herbert L. Winkler (2001)
Kim S. Wise (2001)
Jon Woods (2002)
John H. Wyckoff III (2003)
Thomas A. Wynn (2001)
George S. Yap (2003)
Arturo Zychlinsky (2002)

Samuel Kaplan, *Chairman, Publications Board*
Diane Smith, *Production Editor*

Linda M. Illig, *Director, Journals*
Anastacia Thomasian, *Assistant Production Editor*

Infection and Immunity (ISSN 0019-9567), a publication of the American Society for Microbiology (ASM), 1752 N St., N.W., Washington, DC 20036-2904, is devoted to the advancement and dissemination of fundamental knowledge concerning infections caused by pathogenic bacteria, fungi, and parasites. Instructions to authors are published in the January issue each year; reprints are available from the editors and the Journals Department. *Infection and Immunity* is published monthly, one volume per year. Nonmember print subscription prices (per year) are: \$575, U.S.; \$610, Canada (plus 7% GST, or 7% GST + 8% HST where applicable); \$650, Europe; \$659, Latin America; \$677, rest of world. Member print subscription prices (per year) are: \$70, U.S.; \$103, Canada (plus 7% GST, or 7% GST + 8% HST where applicable); \$140, Europe; \$150, Latin America; \$168, rest of world. Single copies are: \$50, nonmember; \$20, member (Canadians add 7% GST, or 7% GST + 8% HST where applicable). For prices of electronic versions, contact the Subscriptions Unit, ASM. Correspondence relating to subscriptions, defective copies, missing issues, and availability of back issues should be directed to the Subscriptions Unit, ASM; correspondence relating to reprint orders should be directed to the Reprint Order Unit, ASM; and correspondence relating to disposition of submitted manuscripts, proofs, and general editorial matters should be directed to the Journals Department, American Society for Microbiology, 1752 N St., N.W., Washington, DC 20036-2904. Phone: (202) 737-3600.

Claims for missing issues from residents of the United States, Canada, and Mexico must be submitted within 3 months after publication of the issues; residents of all other countries must submit claims within 6 months of publication of the issues. Claims for issues missing because of failure to report an address change or for issues "missing from files" will not be allowed.

Periodicals postage paid at Washington, DC 20036, and at additional mailing offices.

POSTMASTER: Send address changes to *Infection and Immunity*, ASM, 1752 N St., N.W., Washington, DC 20036-2904.

Copyright © 2001, American Society for Microbiology. All Rights Reserved.

Made in the United States of America. Printed on acid-free paper. DOI: 10.1128/IAI.69.3.2001 CODEN: INFIBR

The code at the top of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal use or for personal use of specific clients. This consent is given on the condition, however, that the copier pay the stated per-copy fee through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, for copying beyond that permitted by Sections 107 and 108 of the U.S. Copyright Law. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.