

INFECTION AND IMMUNITY

VOLUME 78 • JULY 2010 • NUMBER 7

Ferric C. Fang, *Editor in Chief* (2012)
University of Washington School of Medicine

John H. Adams, *Editor* (2014)
University of South Florida

Helene L. Andrews-Polymenis, *Minireview Editor* (2014)
Texas A&M University System Health Science Center

Andreas J. Bäumlner, *Editor* (2012)
University of California at Davis

Steven R. Blanke, *Editor* (2012)
University of Illinois

James B. Bliska, *Editor* (2013)
State University of New York, Stony Brook

Andrew Camilli, *Editor* (2011)
Tufts University School of Medicine

George S. Deepe, Jr., *Editor* (2014)
University of Cincinnati College of Medicine

JoAnne L. Flynn, *Editor* (2014)
University of Pittsburgh School of Medicine

Anthony T. Maurelli, *Minireview Editor* (2014)
Uniformed Services University of the Health Sciences

Beth A. McCormick, *Editor* (2012)
University of Massachusetts Medical School

Richard P. Morrison, *Editor* (2015)
University of Arkansas for Medical Sciences

Shelley M. Payne, *Editor* (2014)
University of Texas at Austin

Joseph F. Urban, Jr., *Editor* (2013)
USDA Agricultural Research Service

Jeffrey N. Weiser, *Editor* (2012)
University of Pennsylvania

EDITORIAL BOARD

David W. K. Acheson (2010)
Luis Actis (2012)
Toni Aebischer (2011)
Darrin R. Akins (2012)
Klaus Aktories (2011)
James Alexander (2010)
Holly Algood (2010)
Craig Altier (2012)
Juan Anguita (2010)
Rui Appelberg (2010)
Judith A. Appleton (2012)
Glen D. Armstrong (2010)
Sandra K. Armstrong (2011)
Ingo Autenrieth (2011)
Abdu F. Azad (2011)
Lauren Bakaletz (2010)
Jimmy D. Ballard (2011)
Jeff Banas (2010)
Joseph Barbieri (2010)
David Beenhouwer (2012)
Samuel M. Behar (2011)
John Belisle (2010)
Jorge A. Benitez (2010)
Elke Bergmann-Leitner (2010)
Luiz E. Bermudez (2012)
Christian Bogdan (2012)
Carolyn H. Bohach (2011)
Gregory Bohach (2010)
Catherine Bosio (2012)
Kenneth L. Bost (2012)
Michael Brennan (2012)
Volker Briken (2012)
David Briles (2012)
Charles Brown (2011)
Jeremy Brown (2011)
Wendy Brown (2010)
Dirk Hans Busch (2012)
Gerald Byrne (2012)
Felipe C. Cabello (2010)
Melissa J. Caimano (2012)
Richard Calderone (2011)
Anthony A. Campagnari (2012)
Michael Cappello (2010)
Nicholas Carbonetti (2011)
James Carroll (2010)
Jean Celli (2012)
Kris Chadee (2011)
Sandra P. Chang (2011)
Bobby Cherayil (2011)
Ambrose Cheung (2011)
Ashok K. Chopra (2012)
Jeffrey D. Cirillo (2010)
Steven Clegg (2011)
Jennifer L. Coburn (2011)
Terry D. Connell (2012)
Paul Converse (2010)
Brad Cookson (2010)
Cynthia Cornelissen (2012)
Peggy Cotter (2012)
Timothy L. Cover (2011)
Christopher W. Cutler (2012)

Steven J. Czinn (2011)
Charles J. Czuprynski (2010)
Andrew Darwin (2012)
Frank DeLeo (2012)
Donald R. Demuth (2012)
Eric Y. Denkers (2011)
Vojo Deretic (2011)
Albert Descoteaux (2012)
Corrella Detweiler (2012)
Dirk A. E. Dobbelaere (2010)
Mark Doherty (2010)
Peter Dube (2011)
Roman Dziarski (2011)
Kathryn A. Eaton (2010)
Sabine Ehrt (2011)
Karen Elkins (2010)
David Elliott (2010)
Masashi Emoto (2010)
Christian Engwerda (2010)
Peter B. Ernst (2011)
Marta Feldmesser (2010)
J. Christopher Fenno (2012)
Paul Fidel (2012)
Ken Fields (2012)
Sarah Fortune (2012)
Timothy Foster (2010)
Dara Frank (2010)
Carl Frasch (2011)
Nancy E. Freitag (2011)
Matthias Frosch (2010)
Francisco Garcia-del Portillo (2011)
Nisha Garg (2010)
Ricardo T. Gazzinelli (2010)
Caroline Genco (2010)
Frances D. Gillin (2010)
Michael Glickman (2010)
Joanna B. Goldberg (2011)
Kenneth J. Goodrum (2010)
Channe Gowda (2012)
Bruce Green (2010)
Marc-Jan Gubbels (2012)
Patricia Guerry-Kopecko (2011)
Paul A. Gulig (2011)
John S. Gunn (2010)
Carlos A. Guzman (2012)
Ted Hackstadt (2011)
Constantine G. Haidaris (2010)
Anders Hakansson (2012)
Eric J. Hansen (2010)
Wolf-Dietrich Hardt (2010)
Robert Douglas Hardy (2012)
Nicola Harris (2011)
Eric Harvill (2011)
David Hasty (2010)
Alan R. Hauser (2010)
Jürgen Heesemann (2010)
Robert Heinzen (2010)
David Hendrixson (2010)
Michael Hensel (2011)
DeBroski Herbert (2011)
Sarah K. Highlander (2010)

Paul Hoffman (2012)
Eric Houpt (2012)
Gary B. Huffnagle (2011)
Christopher A. Hunter (2010)
Christopher Huston (2010)
Kris Huygen (2012)
Lars Hviid (2012)
Angelo Izzo (2011)
William Jarra (2012)
Ann Jerse (2012)
Bradley D. Jones (2011)
Ann-Beth Jonsson (2012)
Thomas H. Kawula (2010)
Imtiaz Khan (2012)
Samantha King (2012)
Robert Kingsley (2011)
Beth D. Kirkpatrick (2010)
Karl Klose (2011)
Dennis J. Kopecko (2010)
Eric Krukonis (2011)
Nirbhay Kumar (2012)
Sanjai Kumar (2010)
Jonathan Kurtis (2012)
Eric Lafontaine (2010)
Richard J. Lamont (2010)
David E. Lanar (2012)
Chia Y. Lee (2010)
Wayne Lencer (2012)
Stuart Levitz (2011)
David M. Lewinsohn (2011)
Adrian Luty (2010)
David M. Lyerly (2012)
Richard Malley (2011)
Barbara J. Mann (2012)
Richard T. Marconi (2011)
Helene Marquis (2012)
Carl F. Marrs (2011)
Bruce A. McClane (2010)
Larry McDaniel (2012)
John McKinney (2010)
David N. McMurray (2012)
Joan Meccas (2011)
D. Scott Merrell (2011)
Dennis Metzger (2012)
Karen Meysick (2011)
F. Chris Minion (2012)
Tim J. Mitchell (2012)
Hans-Willi Mittrucker (2011)
Harry L. T. Mobley (2010)
Jeremy Mogrige (2010)
Denise Monack (2012)
Steven L. Moseley (2011)
David M. Mosser (2012)
Rodney A. Moxley (2010)
Matthew Mulvey (2011)
Robert S. Munson (2010)
Timothy Murphy (2012)
Moon H. Nahm (2011)
Elizabeth Nardin (2012)
James P. Nataro (2011)
Gerard J. Nau (2011)

Melody Neely (2012)
Frank C. Nichols (2012)
Matthew Nilles (2012)
Karen A. Norris (2010)
Steven J. Norris (2012)
Joshua Nosanchuk (2010)
Bogdan Nowicki (2012)
Edwin V. Oaks (2011)
Tom G. O'Brig (2012)
David O'Callaghan (2010)
Joan C. Olson (2012)
Mary O'Riordan (2012)
Paul Orndorff (2010)
Karen Ottemann (2010)
Michael Otto (2012)
Guy Palmer (2010)
Vijay Pancholi (2012)
David W. Pascual (2011)
Marcela Pasetti (2012)
James C. Paton (2011)
Mario T. Philipp (2010)
Carol Pickett (2011)
Gerald B. Pier (2010)
Liise-anne Pirofski (2012)
Gregory V. Plano (2010)
Manuela Raffatellu (2012)
Lalita Ramakrishnan (2010)
Kyle Ramsey (2012)
Roger G. Rank (2010)
Rino Rappuoli (2011)
Adam Ratner (2012)
Donald Reason (2012)
Jörg Reimann (2010)
Richard F. Rest (2011)
Eleanor Riley (2010)
Daniel Rockey (2010)
Luigina Romani (2011)
Roy Martin Roop II (2011)
Craig R. Roy (2012)
David Sacks (2011)
Nina Salama (2012)
Padmini Salgame (2011)
James Samuel (2010)
Matyas Sandor (2012)
Karla Fullner Satchell (2011)
Charles Scanga (2010)
Frank Scannapieco (2010)
David Schauer (2010)
Dieter M. Schifferli (2011)
Larry S. Schlesinger (2012)
Michael J. Schurr (2010)
Ira Schwartz (2012)
Janakiram Seshu (2012)
William Shafer (2012)
Hai Ning Shi (2012)
Jerry Simecka (2010)
Upinder Singh (2011)
Jon Skare (2011)
Mark Smeltzer (2012)
Stephen Smiley (2011)
Vanessa Sperandio (2012)

Michael N. Starnbach (2011)
Chad Steele (2010)
Steffen Stenger (2012)
Scott Stibitz (2012)
Bradley Gene Stiles (2012)
Susan C. Straley (2010)
Michele Swanson (2012)
W. Edward Swords (2011)
Carol O. Tackett (2010)
Christopher Taylor (2010)
Vernon Tesh (2011)
John G. Tew (2010)

Alfredo G. Torres (2012)
Renee Tsohis (2012)
Elaine Tuomanen (2010)
Joanne Turner (2011)
Rodney K. Tweten (2011)
Jude Uzonna (2012)
Adrianus van der Velden (2012)
Thomas E. Van Dyke (2010)
Wesley C. Van Voorhis (2011)
Michael L. Vasil (2011)
Andrés Vazquez-Torres (2012)
Anna Vecchiarelli (2012)

Joseph M. Vinetz (2010)
Joseph Vogel (2012)
Janis Weis (2012)
Alison Weiss (2011)
Rodney A. Welch (2011)
Michael R. Wessels (2010)
Lee M. Wetzler (2012)
A. Clinton White, Jr. (2012)
Brenda A. Wilson (2012)
Mary Wilson (2010)
Nathalie Winter (2012)

David Wood (2012)
Hui Wu (2012)
Thomas A. Wynn (2010)
George S. Yap (2012)
Hongwei Yu (2010)
Thomas C. Zahrt (2010)
Oscar Zaragoza (2011)
Guangming Zhong (2011)
Richard Zuerner (2010)
Arturo Zychlinsky (2011)

Thomas E. Shenk, *Chairman, Publications Board* Barbara M. Goldman, *Director, Journals*
Diane Smith, *Production Editor* Stefanie Kowalski, *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 online and from the Journals Department. *Infection and Immunity* is published monthly, one volume per year. Nonmember print subscription prices (per year) are: \$972, U.S.; \$1,041, Canada (plus 5% GST, or 13% HST where applicable); \$1,054, Europe; \$1,081, Latin America; \$1,084, rest of world. Member print subscription prices (per year) are: \$138, U.S.; \$237, Canada (plus 5% GST, or 13% HST where applicable); \$220, Europe; \$247, Latin America; \$250, rest of world. Single copies are: \$100, nonmember; \$50, member (Canadians add 5% GST, or 13% 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.

Made in the United States of America. Printed on acid-free paper. doi:10.1128/IAI.78.7.2010 CODEN: INFIBR

Copyright © 2010, American Society for Microbiology. All Rights Reserved.

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.