

# The Journal of Pharmacology and Experimental Therapeutics

A Publication of the American Society for Pharmacology and Experimental Therapeutics

**Rick G. Schnellmann, Editor**

**Craig C. Beeson, Assistant Editor**

Darrel R. Abernethy  
Jerry J. Buccafusco  
Philip S. Burton  
David B. Bylund  
Mitchell P. Fink

Ronald N. Hines  
Myron K. Jacobson  
Michael F. Jarvis  
Norbert E. Kaminski  
Daniel R. Knapp

## ASSOCIATE EDITORS

Lawrence H. Lash  
Roberto Levi  
Alan J. Lewis  
Louis M. Luttrell  
David S. Miller

Richard A. Morrisett  
Michael J. O'Neill  
Robert B. Raffa  
Robert A. Roth

David A. Taylor  
Kenneth D. Tew  
Stephanie W. Watts  
Alice M. Young

## EDITORIAL ADVISORY BOARD

Geoffrey W. Abbott  
Thomas J. Abbruscato  
Edson X. Albuquerque  
Rodrigo Andrade  
Thomas M. Argentieri  
Leslie R. Ballou  
William A. Banks  
Jack Bergman  
Daniel C. Bertrand  
Italo Biaggioni  
C. Paul Bianchi  
Floyd E. Bloom  
Jean-Marie Boeynaems  
Franco Borsini  
John Charpie  
Du-Shieng Chien  
Marlene L. Cohen  
Lucio G. Costa  
Brian M. Cox  
Bryan F. Cox  
Jacqueline N. Crawley  
Bruce N. Cronstein  
Pamela L. Crowell  
M. Imad Damaj  
Thomas P. Davis  
William C. deGroat

Gary E. DeLander  
Frederick J. Ehler  
John L. Evenden  
Steven J. Feinmark  
John W. Ferkany  
Giora Z. Feuerstein  
Stephen F. Flaim  
Anthony W. Fox  
Charles P. France  
Alan Frazer  
Bernard W. Futscher  
James J. Galligan  
Vadivel Ganapathy  
Patricia E. Ganey  
Gerald F. Gebhart  
Richard A. Gillis  
Alan R. Gintzler  
John R. Glowa  
Murali Gopalakrishnan  
Steven M. Grassl  
Garrett J. Gross  
Gary J. Grover  
Perry V. Halushka  
Arthur A. Hancock  
J. Paul Hieble  
K. Roger Hornbrook  
Susanna Hourani  
Leonard L. Howell

Dale G. Hoyt  
Harry Ischiroopoulos  
Edwin K. Jackson  
Kenneth M. Johnson  
William J. Jusko  
Peter W. Kalivas  
Laurence S. Kaminsky  
Jonathan L. Katz  
Mark R. Kelley  
Raouf A. Khalil  
Lewis B. Kinter  
George F. Koob  
Suk-Hee Lee  
Michael S. Levine  
Wolfgang Löscher  
Benedict R. Lucchesi  
Joseph J. Lynch  
Philip R. Mayeux  
Donald E. McMillan  
Mark J. Millan  
Gary W. Miller  
Hasan Mukhtar  
L. Charles Murrin  
Michael Nader  
Stanley Nattel  
Norton H. Neff  
S. Stevens Negus III  
Kim A. Neve

Yasuyuki Nomura  
James S. Norris  
James M. O'Donnell  
Patricio O'Donnell  
Michael F. O'Neill  
K. Sandy Pang  
Achilles J. Pappano  
B. Kevin Park  
Dianne M. Perez  
Michael T. Piascik  
Marina Picciotto  
Russell O. Pieper  
Joseph W. Polli  
John B. Pritchard  
Russell A. Prough  
Raymond M. Quock  
John W. Regan  
J. Larry Renfro  
Bryan L. Roth  
Michael C. Sanguinetti  
Jonathan G. Scammell  
Michal Laniado  
Schwartzman  
Ronald Seifert  
Charles N. Serhan  
David R. Sibley  
Theodore A. Slotkin  
Philip C. Smith

Quentin R. Smith  
Nikolai M. Soldatov  
Edward E. Soltis  
Patricia K. Sonsalla  
Michael D. Southall  
Roger D. Speakman  
Francis G. Spinale  
D.N. Stephens  
John L. Sutko  
Csaba Szabo  
Istvan Szelenyi  
Ronald J. Tallarida  
Milt Teitler  
Paul F. Terranova  
Alvin V. Terry  
Myron L. Toews  
George J. Trachte  
Hiroshi Ueda  
Michael R. Vasko  
Sandra P. Welch  
Daniel Wierda  
Michael Williams  
Raymond J. Winquist  
Jeffrey M. Witkin  
Bryan K. Yamamoto  
Edward J. Zambraski

## BOARD OF PUBLICATIONS TRUSTEES

Brian M. Cox, *Chair*; Darrell R. Abernethy, P. Jeffrey Conn, Lorraine J. Gudas, Eric F. Johnson, John S. Lazo, Edward T. Morgan, Richard R. Neubig, Rick G. Schnellmann, and Darryle D. Schoepf

**ASPET EXECUTIVE OFFICER:** Christine K. Carrico

*Journals Director:* Richard Dodenhoff

*Managing Editor:* Jill Filler

*Senior Editorial Coordinator:* David D. Williams

*Production Coordinator:* Debbie Tsamoudakis

**Journal and ASPET Office:** 9650 Rockville Pike, Bethesda, MD 20814-3995; telephone: 301-634-7060; fax: 301-634-7061; email: info@aspet.org; web site: www.aspet.org.

**Correspondence regarding editorial matters** should be addressed to Dr. Rick G. Schnellmann, Editor, *The Journal of Pharmacology and Experimental Therapeutics*, at the above address.

**Official version:** The online version of *The Journal of Pharmacology and Experimental Therapeutics* contains all of the information and material contained in the print version plus additional material that may not appear in print such as videos and large data sets. The online version may be more current than the print version. Where noted, the online version has been corrected in departure from the print version. The online version of *The Journal of Pharmacology and Experimental Therapeutics* officially published by the American Society for Pharmacology and Experimental Therapeutics is the definitive version and, to the extent any difference exists, will prevail over the print version.

**Instructions to Authors:** See <http://jpet.aspetjournals.org> for the Instructions to Authors and the ASPET Authorship Responsibility, Financial Disclosure, and Copyright Transfer form.

**Correspondence concerning subscriptions:** Nonmember individual and institutional subscriptions: ASPET Subscriptions Dept., Rm. L-2310, 9650 Rockville Pike, Bethesda, MD 20814-3998; telephone: 301-634-7029; fax: 301-634-7099; email: staff@dues.faseb.org. ASPET Members: contact the ASPET office. For European site licenses and consortia, contact: David Charles, Institutional Sales & Licensing, 92 avenue du General de Gaulle, 78600 Maisons-Laffitte, France; telephone: +33-1-39-12-29-29; fax: +33-1-39-12-47-45; email: dlcharles@wanadoo.fr.

**Change of address:** ASPET must be notified 60 days in advance. Journals undeliverable because of incorrect address will be destroyed. Duplicate copies may be obtained, if available, from ASPET at the single copy price. Send address changes to the ASPET office.

**Issue Replacement Policy: Domestic Subscribers**—Claims for nondelivery of issues must be made within three (3) months of issue mail date.

**Foreign Subscribers**—Claims for nondelivery of issues must be made

within six (6) months of issue mail date. **Missing Issues (domestic and foreign)**—ASPET will not honor refunds or replacement requests made outside of the claim time period. Up to two (2) issues will be replaced free of charge per subscription year.

**Reprints of individual articles** are available from the authors and from Infotrieve at [www.infotrieve.com](http://www.infotrieve.com); otherwise call 800-422-4633, fax 310-208-5971, or email [orders@infotrieve.com](mailto:orders@infotrieve.com). Please send as much citation information as possible such as journal title, volume issue, page number, year, authors, article title, etc.

**Reprints in large quantities** for commercial or academic use may be purchased from the publisher. For information and prices, call 301-634-7063.

**Copyright Information:** *The Journal of Pharmacology and Experimental Therapeutics* is copyrighted by The American Society for Pharmacology and Experimental Therapeutics. Photocopying of articles beyond that permitted by Sections 107 and 108 of the U.S. Copyright Law is allowed, provided that the \$20.00-per-copy fee is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. Classroom photocopying is permitted at no fee, provided that students are not charged more than the cost of duplication. This consent does not extend to other kinds of copying. Reproduction of any portion of an article for subsequent republication requires permission of ASPET. Write to the ASPET office at the above address. Requests should include a statement of intended use as well as explicit specifications of the materials to be reproduced.

**Disclaimer:** The statements and opinions contained in the articles of *The Journal of Pharmacology and Experimental Therapeutics* are solely those of the individual authors and contributors and not of The American Society for Pharmacology and Experimental Therapeutics. The appearance of advertisements in the journal is not a warranty, endorsement, or approval of the products of safety. The American Society for Pharmacology and Experimental Therapeutics disclaims responsibility for any injury to persons or property resulting from any ideas of products referred to in the articles or advertisement.