

American Journal of Physiology- Regulatory, Integrative and Comparative Physiology

Editor: P. B. PERSSON

Associate Editors:

A. W. COWLEY
W. A. CUPPLES
H. EHMKE

J. P. GRANGER
T. E. LOHMEIER
J. B. PRITCHARD

J. B. SCHNERMANN
H. SCHOLZ
O. SKØTT

Consulting Editor: G. F. DiBONA

Medical Consulting Editors:

D. L. ECKBERG

V. K. SOMERS

Special Editor: H. M. STAUSS

Editorial Board:

W. J. ARENDSHORST
M. BAMSHAD
S. M. BARMAN
T. J. BARTNESS
C. BAYLIS
S. L. BEALER
S. BENYAJATI
H.-R. BERTHOUD
P. BIE
V. S. BISHOP
E. H. BLAINE
C. M. BLATTEIS
M. BRANDS
J. P. BRIGGS
D. P. BROOKS
V. L. BROOKS
R. BUSSE
J. G. CANNON
O. A. CARRETERO
M. W. CHAPLEAU
S. CHEMTOB
T. M. COFFMAN
K. P. CONRAD
J. T. CUNNINGHAM
R. A. L. DAMPNEY
R. L. DAVISSON
M. Di RIENZO
J.-L. ELGHOZI
D. H. EVANS
J. FANDREY
S. A. FARBER
M. C. FISHMAN

J. L. GARVIN
M. GASSMANN
P. G. GUYENET
J. E. HALL
R. HARRIS
J. R. HAYWOOD
L. J. HOFFER
N.-H. HOLSTEIN-RATHLOU
J. D. IMIG
D. JACKSON
E. K. JACKSON
B. J. A. JANSSEN
B. L. JENSEN
E. J. JOHNS
A. K. JOHNSON
C. JULIEN
A. JUST
K. KANOSUE
S. J. KAUFMAN
R. A. KHALIL
H. R. KIRCHHEIM
U. C. KOPP
C. M. KOTZ
A. KURTZ
F. LANG
B. E. LEVIN
K. LEY
S. LINDSTEDT
J. N. LORENZ
G. N. LUHESHI
D. S. A. MAJID
S. MALPAS

R. D. MANNING JR.
D. L. MATTSO
R. M. McALLEN
M. J. MCKINLEY
S. W. MIFFLIN
D. S. MILLER
W. K. MILSOM
L. L. MOLDAWER
J.-P. MONTANI
T. H. MORAN
S. F. MORRISON
J. J. MULLINS
B. NAFZ
L. G. NAVAR
S. NIELSEN
H. NISHIMURA
K. R. OLSON
T. L. PALLONE
G. PARATI
A. PATZAK
A. E. G. PERSSON
H. M. PIPER
Q. J. PITTMAN
C. R. PLATA-SALAMAN
U. POHL
D. M. POLLOCK
J. S. POLLOCK
J. F. RECKELHOFF
G. REINHART
J. L. RENFRO
R. RETTIG
L. M. RINAMAN

R. J. ROMAN
F. J. SALAZAR
M. N. SAWKA
E. L. SCHIFFRIN
C. SCHNACKENBERG
J. SCHRADER
G. J. SCHWARTZ
R. J. SEELEY
E. SEELIGER
J. L. SEGAR
J. N. STALLONE
K. STRANGE
E. M. STRICKER
A. F. SVED
D. B. THOMASON
P. THORÉN
K. L. THORNBURG
R. M. TOUYZ
B. N. VAN VLIET
J. G. VERBALIS
R. S. WEISINGER
W. J. WELCH
C. S. WILCOX
L. L. WOODS
S. C. WOOD
J. M. WYSS
R. ZELLER
A.-P. ZOU
I. H. ZUCKER

Publications Committee

D. J. BENOS, *Chair*
P. A. HANSEN
M. A. KNEPPER
H. RAFF
E. D. RANNELS

Ex officio

M. REICH
*Director of Publications
and Executive Editor*
J. A. WILLIAMS, *President*
M. FRANK, *Executive Director*

A. G. TRUDGETT
Editorial Manager
V. MILLION
Journal Supervisor
Z. ERIM
Copy Editor

The *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology* (ISSN-0363-6119) is published monthly (two volumes a year) by the American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814-3991 and online at www.ajpregu.org. *Subscription Prices (post-paid)*: Institutions (print only): \$525.00, US; \$565.00, Canada and Mexico; \$605.00, elsewhere. Institutions (print and online): \$545.00, US; \$585.00, Canada and Mexico; \$625.00, elsewhere. Institutions (online only): \$450.00. Nonmember individual (print only): \$350.00, US; \$390.00, Canada and Mexico; \$430.00, elsewhere. Nonmember individual (print and online): \$365.00, US; \$405.00, Canada and Mexico; \$445.00, elsewhere. Nonmember individual (online only): \$300.00. APS member (print and online): \$135.00, US; \$175.00, Canada and Mexico; \$215.00, elsewhere. Subscrip-

tions from outside the United States are payable in US currency or full equivalent. Japanese yen price is available from our agent: USACO Corporation, 17-12 Higashi-Azabu 2-Chome, Minato-Ku, Tokyo 106-0044, Japan. Subscriptions are accepted on a calendar-year basis only. *Single Copies and Back Issues*: When available, \$60.00 each postpaid. Periodicals postage paid at Bethesda, MD and at additional mailing offices. POSTMASTER: Send address changes to the American Journal of Physiology-Regulatory, Integrative and Comparative Physiology, 9650 Rockville Pike, Bethesda, MD 20814-3991.

Copyright © 2003 by the American Physiological Society. Printed in the United States of America by Cadmus Professional Communications—Ephrata Division, Ephrata, PA 17522. The code at the bottom of the first page of an

article indicates the copyright owner's consent that copies of that article may be made beyond that permitted by sections 107 and 108 of the US Copyright Law—unless the copies are for general distribution, for advertising, for creating new works, or for resale—provided the per-copy fee is paid through the Copyright Clearance Center, Inc., 222 Rosewood Dr., Danvers, MA 01923. 0363-6119/2003 \$5.00.

Change of Address: The Journal must be advised of a change of address at least 6 weeks prior to date of issue, with both the subscriber's old and new address given. Undelivered copies resulting from address change will not be replaced.

Editorial and Business Correspondence: AJP-Regulatory, Integrative and Comparative Physiology, 9650 Rockville Pike, Bethesda, MD 20814-3991.