

# diabetes

**EDITOR IN CHIEF**

K. Sreekumaran Nair, MD, PhD

**ASSOCIATE EDITORS**

E. Dale Abel, MD, PhD  
 Sharon G. Adler, MD  
 Peter J. Dyck, MD  
 Thomas W. Gardner, MD, MS  
 Kathryn M. Haskins, PhD  
 Gökhan Hotamisligil, MD, PhD

Michael D. Jensen, MD, PhD  
 Anna Krook, PhD  
 Lawrence J. Mandarino, PhD  
 Braxton Mitchell, PhD  
 Jeffrey E. Pessin, PhD  
 James R. Sowers, MD

Lori Sussel, PhD  
 Adrian Vella, MD, FRCP  
 Nick Wareham, MBBS, PhD, FRCP, FFPHM

**SCIENTIFIC EDITOR**  
 Helaine E. Resnick, PhD, MPH

**CONSULTING EDITORS**

Nada A. Abumrad, PhD  
 Rocco Barazzoni, MD, PhD  
 Per-Olof Berggren, PhD  
 Dwaipayan Bharadwaj, PhD, FNASc  
 Anil Bushan, PhD  
 Andrew A. Butler, PhD  
 Wenhong Cao, MD  
 Andre Carpentier, MD, FRCP  
 Deborah J. Clegg, RD, PhD  
 Claudio Cobelli, PhD  
 Anne Cooke, DPhil, FMedSci  
 Gregory Cooney, PhD  
 John A. Corbett, PhD  
 Christian Dina, PhD  
 Daniel J. Drucker, MD  
 Gian Paolo Fadini, MD, PhD  
 Mark Febbraio, PhD  
 Simon J. Fisher, MD, PhD  
 Alessia Fornoni, MD, PhD  
 Toshiro Fujita, MD  
 Maureen Gannon, PhD  
 Victor Alan Gault, PhD  
 Richard E. Gilbert, MBBS, PhD, FRCPC  
 Benjamin Glaser, MD

Laurie J. Goodyear, PhD  
 Struan F.A. Grant, PhD  
 Eric Hajduch, PhD  
 Christian Herder, PhD, MSc  
 Michael Horowitz, MBBS, PhD, FRACP  
 Patrick B. Iynedjian, MD  
 Anton M. Jetten, PhD  
 Weiping Jia, MD, PhD  
 James D. Johnson, PhD  
 Fredrik Karpe, PhD, FRCP  
 Thomas W.H. Kay, MBBS, PhD, FRACP, FRCPA  
 Mark T. Kearney, MD, FRCP  
 Jack W. Kent, PhD  
 Jae Bum Kim, PhD  
 Jason K. Kim, PhD  
 Amira Klip, PhD  
 Yogish C. Kudva, MD  
 Tony K.T. Lam, PhD  
 Ian R. Lanza, PhD  
 Chih-Hao Lee, PhD  
 Carey N. Lumeng, MD, PhD  
 Jian-Xing Ma, MD, PhD  
 Patrick E. MacDonald, PhD

L. Charles Murtaugh, PhD  
 Nicholas Musi, MD  
 Rama Natarajan, PhD, FAHA, FASN  
 P. Darrell Neuffer, PhD  
 Toni Ilana Pollin, PhD  
 Inga Prokopenko, MSC, PhD  
 Jerry Radziuk, PhD, MD, CM  
 Jun Ren, MD, PhD, FAHA  
 Erik A. Richter, MD, DMSci  
 Michael Roden, MD  
 Mario J.A. Saad, MD, PhD  
 Gary J. Schwartz, PhD  
 Bart Staels, PhD  
 John M. Stafford, MD, PhD  
 Naftali Stern, MD  
 Scott A. Summers, PhD  
 Gary Sweeney, PhD  
 Farook Thameem, PhD  
 Matthias Tschoep, MD  
 Antonio Vidal-Puig, MD, PhD  
 Jianping Weng, MD, PhD  
 Adam Whaley-Connell, DO, MSPH  
 Qinglin Yang, MD, PhD  
 Jianping Ye, MD

**AMERICAN DIABETES ASSOCIATION OFFICERS**

**CHAIR OF THE BOARD**  
 Dwight Holing

**PRESIDENT, MEDICINE & SCIENCE**  
 Elizabeth R. Seaquist, MD

**PRESIDENT, HEALTH CARE & EDUCATION**  
 Marjorie Cypress, PhD, RN, CNP, CDE

**SECRETARY/TREASURER**  
 Robert J. Singley, MBA

**CHAIR OF THE BOARD-ELECT**  
 Janel L. Wright, JD

**PRESIDENT-ELECT, MEDICINE & SCIENCE**  
 Samuel Dagogo-Jack, MD, FRCP

**PRESIDENT-ELECT, HEALTH CARE & EDUCATION**  
 David G. Marrero, PhD

**SECRETARY/TREASURER-ELECT**  
 Richard Farber, MBA

**VICE CHAIR OF THE BOARD**  
 Robin J. Richardson

**VICE PRESIDENT, MEDICINE & SCIENCE**  
 Desmond Schatz, MD

**VICE PRESIDENT, HEALTH CARE & EDUCATION**  
 Margaret Powers, PhD, RD, CDE

**VICE SECRETARY/TREASURER**  
 Lorrie Welker Liang

**CHIEF EXECUTIVE OFFICER**  
 Larry Hausner, MBA

**CHIEF SCIENTIFIC & MEDICAL OFFICER**  
 Robert E. Ratner, MD, FACP, FACE



*The mission of the American Diabetes Association is to prevent and cure diabetes and to improve the lives of all people affected by diabetes.*

# diabetes

## Mission Statement for *Diabetes*

*Diabetes* publishes original research about the physiology and pathophysiology of diabetes mellitus. Submitted manuscripts can report any aspect of laboratory, animal, or human research. Emphasis is on investigative reports focusing on areas such as the pathogenesis of diabetes and its complications, normal and pathological pancreatic islet function and intermediary metabolism, pharmacological mechanisms of drug and hormone action, and biochemical and molecular aspects of normal and abnormal biological processes. Studies in the areas of diabetes education or the application of accepted therapeutic and diagnostic approaches to patients with diabetes are not published. More information about the journal can be found online at [diabetes.diabetesjournals.org](http://diabetes.diabetesjournals.org).

**SUBMISSIONS:** *Diabetes* (print ISSN 0012-1797, online ISSN 1939-327X) is owned, controlled, and published monthly by the American Diabetes Association, Inc., 1701 North Beauregard St., Alexandria, VA 22311. *Diabetes* is a registered trademark of the American Diabetes Association.

**PERMISSIONS:** Copyright © 2014 by the American Diabetes Association, Inc. All rights reserved. Printed in the USA. Requests for permission to reuse content should be sent to Copyright Clearance Center at [www.copyright.com](http://www.copyright.com) or 222 Rosewood Dr., Danvers, MA 01923; phone: (978) 750-8400; fax: (978) 646-8600. Requests for permission to translate should be sent to Permissions Editor, American Diabetes Association, at [permissions@diabetes.org](mailto:permissions@diabetes.org).

The American Diabetes Association reserves the right to reject any advertisement for any reason, which need not be disclosed to the party submitting the advertisement.

Commercial reprint orders should be directed to Sheridan Content Services, (800) 635-7181, ext. 8065.

**SUBSCRIPTIONS:** Single issues of *Diabetes* can be ordered by calling toll-free (800) 232-3472, 8:30 A.M. to 5:00 P.M. EST, Monday through Friday. Outside the United States, call (703) 549-1500. Rates: \$75 in the United States, \$95 in Canada and Mexico, and \$125 for all other countries.

*Diabetes* is available online at [diabetes.diabetesjournals.org](http://diabetes.diabetesjournals.org). Please call the numbers listed above, e-mail [membership@diabetes.org](mailto:membership@diabetes.org), or visit the online journal for more information about submitting manuscripts, publication charges, ordering reprints, subscribing to the journal, becoming an ADA member, advertising, permission to reuse content, and the journal's publication policies.

Periodicals postage paid at Alexandria, VA, and additional mailing offices.

PRINT ISSN 0012-1797  
ONLINE ISSN 1939-327X  
PRINTED IN THE USA

**POSTMASTER:** Send address changes to *Diabetes*, American Diabetes Association, Inc., Journal Subscriptions, 1701 North Beauregard St., Alexandria, VA 22311. Claims for missing issues should be made within 6 months of publication. The publisher expects to supply missing issues free of charge only when losses have been sustained in transit and when the reserve stock permits.

---

## AMERICAN DIABETES ASSOCIATION PERSONNEL AND CONTACTS

**EDITORIAL OFFICE DIRECTOR**  
Lyn Reynolds

**PEER REVIEW MANAGER**  
Jane Castner

**EDITORIAL ASSISTANT**  
Rita Summers

**EDITORIAL OFFICE SECRETARIES**  
Raquel Castillo  
Joan Garrett

**MANAGING DIRECTOR,  
SCHOLARLY JOURNAL PUBLISHING**  
Christian S. Kohler

**DIRECTOR, SCHOLARLY JOURNAL PUBLISHING**  
Heather L. Norton

**EDITORIAL MANAGERS**  
Nancy C. Baldino  
Valentina Such

**PRODUCTION MANAGER**  
Amy S. Gavin

**TECHNICAL EDITOR**  
Oedipa Rice

**VICE PRESIDENT, MEMBERSHIP  
& DIRECT RESPONSE MARKETING**  
Richard Erb

**VICE PRESIDENT, CORPORATE ALLIANCES**  
Nancy Stinson Harris

**ADVERTISING MANAGER**  
Julie DeVoss Graff  
[jdevoss@diabetes.org](mailto:jdevoss@diabetes.org)  
(703) 299-5511

**MANAGER, MEMBERSHIP/  
SUBSCRIPTION SERVICES**  
Donald Crowl

**ASSOCIATE DIRECTOR, FULFILLMENT**  
Caryn Cochran

**ADVERTISING REPRESENTATIVES**  
TMG Custom Media  
Nancy Greenwald  
[ngreenwald@adamediasales.com](mailto:ngreenwald@adamediasales.com)  
(646) 783-3786

The Jackson-Gaeta Group, Inc.  
B. Joseph Jackson  
[bartjack@aol.com](mailto:bartjack@aol.com)  
Paul Nalbandian  
[pnalbandian4ada@aol.com](mailto:pnalbandian4ada@aol.com)  
(973) 403-7677