

# 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

Braxton Mitchell, PhD

Jeffrey E. Pessin, PhD

James R. Sowers, MD

Lori Sussel, PhD

Adrian Vella, MD, FRCP

Nick Wareham, MBBS, PhD, FRCP, FFPHM

Fredric E. Wondisford, MD

**CONSULTING EDITORS**

Steven F. Abcouwer, PhD

Reza Abdi, MD

Nada A. Abumrad, PhD

Gail K. Adler, MD, PhD, FAHA

Rocco Barazzoni, MD, PhD

Timothy J. Bartness, PhD

Dwaipayan Bharadwaj, PhD, FNASc

Andrew A. Butler, PhD

Wenhong Cao, MD

Deborah J. Clegg, RD, PhD

Anne Cooke, DPhil, FMedSci

Gregory Cooney, PhD

Daniel J. Drucker, MD

Josephine M. Egan, MD,

MRCPI, FRCPI

Gian Paolo Fadini, MD, PhD

Brian N. Finck, PhD

Simon J. Fisher, MD, PhD

Alessia Fornoni, MD, PhD

Maureen Gannon, PhD

Richard E. Gilbert, MBBS, PhD, FRCPC

Benjamin Glaser, MD

Laurie J. Goodyear, PhD

Struan F.A. Grant, PhD

Eric Hajdуч, PhD

Christian Herder, PhD, MSc

Pedro L. Herrera, PhD

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

Richard G. Kibbey, MD, PhD

Jae Bum Kim, PhD

Jason K. Kim, PhD

Jeonga Kim, PhD

James L. Kirkland, MD, PhD

Amira Klip, PhD

Ian R. Lanza, PhD

Chih-Hao Lee, PhD

Sheldon E. Litwin, MD

Carey N. Lumeng, MD, PhD

Francis C. Lynn, PhD

Patrick E. MacDonald, PhD

Bettina Mittendorfer, PhD

Viswanathan Mohan, MD, FRCP, PhD, DSc,

FNASc, FASc, FNA, FACP, FACE, FTWAS

Nicolas Musi, MD

Erik Näslund, PhD

Linda R. Peterson, MD

Inga Prokopenko, PhD

Alberto Pugliese, MD

Jerry Radziuk, PhD, MD, CM

Erik A. Richter, MD, DMSci

Michael Roden, MD

Guy A. Rutter, PhD

Alice S. Ryan, PhD

Leslie S. Satin, PhD

Masakazu Shiota, DVM, PhD

Kevin R. Short, PhD

Bart Staels, PhD

John M. Stafford, MD, PhD

Craig S. Stump, MD, PhD, FACE

Scott A. Summers, PhD

Farook Thameem, PhD

Gianna Maria Toffolo, PhD

Michael I. Trenell, PhD

Hubert M. Tse, PhD

Matthias von Herrath, MD

Jianping Ye, MD

Lori M. Zeltser, PhD

**AMERICAN DIABETES ASSOCIATION OFFICERS****CHAIR OF THE BOARD**

Robin J. Richardson

**PRESIDENT, MEDICINE & SCIENCE**

Desmond Schatz, MD

**PRESIDENT, HEALTH CARE & EDUCATION**

Margaret A. Powers, PhD, RD, CDE

**SECRETARY/TREASURER**

Lorrie Welker Liang

**CHAIR OF THE BOARD-ELECT**

David A. DeMarco, PhD

**PRESIDENT-ELECT, MEDICINE & SCIENCE**

Alvin C. Powers, MD

**PRESIDENT-ELECT, HEALTH CARE & EDUCATION**

Brenda Montgomery, RN, MSHS, CDE

**SECRETARY/TREASURER-ELECT**

Umesh Verma

**CHIEF EXECUTIVE OFFICER**

Kevin L. Hagan

**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).

Copyright © 2016 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.

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.

PRINT ISSN 0012-1797

ONLINE ISSN 1939-327X

PRINTED IN THE USA

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

---

## AMERICAN DIABETES ASSOCIATION PERSONNEL AND CONTACTS

**VICE PRESIDENT, PUBLISHER**  
Michael Eisenstein

**ASSOCIATE PUBLISHER,  
SCHOLARLY JOURNALS**  
Christian S. Kohler

**EDITORIAL OFFICE DIRECTOR**  
Lyn Reynolds

**PEER REVIEW MANAGER**  
Jane Castner

**EDITORIAL ASSISTANTS**  
Raquel Castillo-Orozco  
Joan Garrett

**DIRECTOR, SCHOLARLY JOURNALS**  
Heather Norton Blackburn

**CONTENT PRODUCTION MANAGER**  
Kelly Newton

**EDITORIAL CONTENT MANAGER**  
Nancy C. Baldino

**TECHNICAL EDITORS**  
Oedipa Rice  
Theresa Cooper

**ASSOCIATE DIRECTOR, BILLING  
& COLLECTIONS**  
Laurie Ann Hall

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

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

## ADVERTISING SALES

**ASSOCIATE PUBLISHER, ADVERTISING &  
SPONSORSHIPS**  
Clare Liberis  
[cliberis@diabetes.org](mailto:cliberis@diabetes.org)  
(212) 725-4925, ext. 3448

**PHARMACEUTICAL/DEVICE DIGITAL ADVERTISING**  
e-Healthcare Solutions  
John Burke  
Chief Revenue Officer  
[sales@ehsmaail.com](mailto:sales@ehsmaail.com)  
(609) 882-8887, ext. 149

**PHARMACEUTICAL/DEVICE PRINT ADVERTISING**  
The Jackson-Gaeta Group, Inc.  
B. Joseph Jackson  
[joejackson@jacksongaeta.com](mailto:joejackson@jacksongaeta.com)  
Paul Nalbandian  
[paulnalbandian@jacksongaeta.com](mailto:paulnalbandian@jacksongaeta.com)  
Tina Auletta  
[tinaauletta@jacksongaeta.com](mailto:tinaauletta@jacksongaeta.com)  
(973) 403-7677