

MOLECULAR CANCER RESEARCH

Defining the Molecular Basis of Malignancy and Progression

AN OFFICIAL JOURNAL OF THE **AACR** American Association
for Cancer Research



Editor-in-Chief

Karen E. Knudsen

Deputy Editors

William C. Hahn
Steffi Oesterreich

Senior Editors

Lawrence H. Boise
Robert Bristow
Jason S. Carroll
Jose R. Conejo-Garcia
Yves A. DeClerck
Francesca Demichelis
J. Alan Diehl
Heide L. Ford
W. Lee Kraus
Massimo Loda
James J. Manfredi
Elaine R. Mardis
Steven B. McMahon
Mark A. Rubin
Toshiyasu Taniguchi
Scott A. Tomlins
Jean Y.J. Wang
Ashani T. Weeraratna

Editorial Staff

Associate Editor

Lucas J. Brand

Associate Managing Editor

Jen Zimmerman

Editorial Associate

Karen Quann

Special Content Manager

Chris Vesci

Senior Production Editor

Gregory Cosby

Editorial Board

Andrew E. Aplin
Steven E. Artandi
Rene Bernards
Carlos Caldas
George A. Calin
Charles E. Chalfant
Junjie Chen
Edwin Cheung
Scott D. Cramer
James A. DeCaprio
James V. DeGregori
Dolores Di Vizio
Yali Dou
Giulio F. Draetta
Donald L. Durden
Martin Eilers
Christine M. Eischen
Alessandro Fatatis
Felix Y. Feng
Gen-Sheng Feng
Michelangelo Fiorentino
Elsa R. Flores
Christopher A. French
Serge Y. Fuchs
Frank B. Furnari
Todd R. Golub
Joe W. Gray
H. Leighton Grimes

Thomas Helleday
Elizabeth P. Henske
Mien-Chie Hung
Jos Jonkers
Sumin Kang
Scott H. Kaufmann
Khandan Keyomarsi
Joseph L. Kissil
Ralf Kittler
Steven J. Kridel
Natasha Kyprianou
Xiaole Shirley Liu
Gregory D. Longmore
David Macpherson
Christopher A. Maher
Maureen E. Murphy
Senthil K. Muthuswamy
Michael Ohh
Joseph T. Opferman
Renata Pasqualini
Charles W.M. Roberts
Ze'ev Ronai
Martine F. Roussel
Kevin Ryan
William P. Schieman
Sabina Signoretti
Chi Wai Eric So
Makoto Mark Taketo
Andrew Thorburn
Axel Ullrich
Sooryanarayana Varambally
Karen H. Vousden
Geoffrey M. Wahl
Qianben Wang
Stephen J. Weiss
Xiaolu Yang

Editorial Office: *Molecular Cancer Research* [ISSN: 1541-7786 (Print); 1557-3125 (Online)] is published monthly, one volume per year, by the American Association for Cancer Research, Inc., 615 Chestnut Street, 17th Floor, Philadelphia, PA 19106-4404. Periodicals postage paid at Philadelphia, PA, and additional mailing offices. POSTMASTER: Send address changes to *Molecular Cancer Research*, Member Services, AACR, 615 Chestnut Street, 17th Floor, Philadelphia, PA 19106-4404 or E-mail: membership@aacr.org. Copyright 2020 by the American Association for Cancer Research, Inc. © The paper used in this publication meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).

MOLECULAR CANCER RESEARCH

Publishing Information

AN OFFICIAL JOURNAL OF THE **AACR** American Association for Cancer Research

AACR Officers

Elaine R. Mardis, President
 Antoni Ribas, President-Elect
 Elizabeth M. Jaffee,
 Past President
 William N. Hait, Treasurer
 Margaret Foti, Chief Executive Officer

Publications Committee

Victor E. Velculescu, Chairperson
 Dafna Bar-Sagi
 Mary Helen Barcellos-Hoff
 Michael E. Berens
 John D. Carpten
 Maura L. Gillison
 Rakesh K. Jain
 Pasi A. Jänne
 Gerrit A. Meijer
 Gordon B. Mills
 Steffi Oesterreich
 William Pao
 Gloria M. Petersen
 David R. Piwnica-Worms
 Charles W.M. Roberts
 Alice T. Shaw
 Lillian L. Siu
 Saraswati V. Sukumar
 Toshikazu Ushijima

Publishing Staff

Publisher

Christine Battle

Director, Journal

Operations and Systems

Daniel S. Evanko

Director, Journal

Sales and Marketing

Nicola L. Hill

Director, Digital Publishing

Mark Jacobson

Associate Director, Production

Charlene Squibb

Assistant Director, Production

David Livewell

Assistant Director, Journal Marketing

Joanna Arnold

Assistant Director, Institutional Sales & Outreach

Karola Rac

Marketing and Creative Services

Senior Director

Paul Driscoll

Design Staff

Susan Moore

Scope

Molecular Cancer Research publishes articles describing novel basic cancer research discoveries of broad interest to the field. Studies must be of demonstrated significance, and the Journal prioritizes analyses performed at the molecular and cellular level that reveal novel mechanistic insight into pathways and processes linked to cancer risk, development, and/or progression. Areas of emphasis include all cancer-associated pathways (including cell-cycle regulation; cell death; chromatin regulation; DNA damage and repair; gene and RNA regulation; genomics; metabolism; oncogenes and tumor suppressors; signal transduction; and tumor microenvironment), in addition to studies describing new molecular mechanisms and interactions that support cancer phenotypes.

Molecular Cancer Research is abstracted and/or indexed in Current Contents/Clinical Medicine, MEDLINE, Science Citation Index, Scopus, and Web of Science.

Submission of Manuscripts

Online manuscript submission is welcomed at <http://mcr.msubmit.net>. Before submitting a manuscript, please read the Instructions for Authors, which is available from the Journal's home page at <http://mcr.aacrjournals.org>.

Publication Charges

Beginning with manuscripts submitted January 1, 2016 or after, articles will be published with the understanding that the author(s) will pay both a publication fee plus a color figure handling fee. Please see the Instructions for Authors, which are available from the Journal's home page at <http://mcr.aacrjournals.org>.

Subscription Information

Nonmember Individuals

Subscriptions include print version with online access. Contacts listed below are for nonmember individual subscriptions.

USA and Rest of World (excluding Japan)

American Association for Cancer Research, 615 Chestnut Street, Philadelphia, PA 19106; 1-855-744-4667; pubsales@aacr.org

Japan

e-support@maruzen.co.jp;
journal@kinokuniya.co.jp; usaco@usaco.co.jp

International print subscriptions include cost of surface mail. Expedited mailing is available. Contact the American Association for Cancer Research for rates.

Site Licenses

For information about institutional site licenses, contact pubsales@aacr.org.

AACR Members

AACR members may opt to receive either a print subscription with online access to content or an online only subscription. Contact membership@aacr.org or visit the membership page at www.aacr.org for more information.

Single Issue Sales

Subject to their availability, single or back issues may be purchased for \$60 (U.S.) or \$65 (outside the U.S.) each. The cost must be prepaid. Contact pubsales@aacr.org.

Claims

One-time claims for missing issues made within 120 days of the issue's publication will be honored, subject to availability. No credit or refund will be given if an issue is out of print at the time of claim.

AACR Members

membership@aacr.org

Nonmembers and Institutions

pubsales@aacr.org

Advertising Information

For information about advertising in ACR journals, contact Pharmaceutical Media Inc., 30 East 33rd St., 4th Floor, New York, NY 10016; 212-904-0360; Dsimone@pminy.com.

Copyright and Permissions

Content printed in or disseminated by *Molecular Cancer Research* is protected by copyright.

Authors who wish to publish material in *Molecular Cancer Research* must formally transfer copyright to the AACR. All authors must sign copyright transfer forms before the AACR can proceed with publication.

To read the complete AACR Copyright and Permissions Policy, visit <http://aacrjournals.org/content/authors/copyright-permissions-and-access>.