

# 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

Massimo Loda  
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  
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  
Houjian Cai  
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  
Fengyi Wan  
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](mailto:membership@aacr.org). Copyright 2021 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

Antoni Ribas, President  
David A. Tuveson, President-Elect  
Elaine R. Mardis, Past President  
William N. Hait, Treasurer  
Margaret Foti, Chief Executive Officer

### Publications Committee

Victor E. Velculescu, Chairperson  
Adriana Albini  
Laura Fejerman  
Masanori Hatakeyama  
Catriona H.M. Jamieson  
Jos Jonkers  
Virginia G. Kallamani  
Andrew Kung  
Jonathan D. Licht  
Ira Mellman  
Gordon B. Mills  
Kunle Odunsi  
Kenneth J. Pienta  
Joshua D. Rabinowitz  
Timothy R. Rebbeck  
David L. Rimm  
Mack Roach, III  
Sheila K. Singh  
Sheila A. Stewart  
Miguel A. Villalona-Calero  
Michael B. Yaffe

### 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

#### Director, Editorial

Robert Kruger

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

### Publication Charges

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 Publication Fees and Reprints page which is available at <https://aacrjournals.org/content/authors/publication-fees-and-reprints>.

### Subscription Information

#### Nonmember Individuals

Subscriptions include online access only. 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](mailto:pubsales@aacr.org)

#### Japan

[e-support@maruzen.co.jp](mailto:e-support@maruzen.co.jp);  
[journal@kinokuniya.co.jp](mailto:journal@kinokuniya.co.jp); [usaco@usaco.co.jp](mailto: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](mailto: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](mailto:membership@aacr.org) or visit the membership page at <https://aacr.org> for more information.

#### Single Issue Sales/Claims

Due to the impact of COVID-19, the AACR has discontinued single issue orders and fulfillment of claims through December 31, 2021.

### Advertising Information

For information about advertising in AACR journals, contact The Walchli Tauber Group, Inc., 2225 Old Emmorton Road, Suite 201, Bel Air, MD 21015; 443-512-8899; [maura.paoletti@wt-group.com](mailto:maura.paoletti@wt-group.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 <https://aacrjournals.org/content/authors/copyright-permissions-and-access>.