

# CLINICAL CANCER RESEARCH

The Journal of Clinical and Translational Research

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



## Editor-in-Chief

Keith T. Flaherty

### Executive Editor

Marlowe S. Tessmer

### Scientific Editor

Jacqueline Brosnan-Cashman

### Deputy Editors

Omar Abdel-Wahab  
Jennifer R. Grandis  
Susan G. Hilsenbeck  
Pasi A. Jänne  
Jean-Charles Soria  
Josep Tabernero  
Jedd D. Wolchok

### Senior Editors

Julie E. Bauman  
Andrew S. Chi  
Ezra E.W. Cohen  
Roisin Connolly  
Ryan B. Corcoran  
Matthew S. Davids  
Robert C. Doebele  
Michael A. Dyer  
Richard S. Finn  
Daniel J. George  
Theodore S. Hong  
David M. Hyman  
Scott Kopetz  
Josep M. Llovet  
Jason J. Luke

Michael L. Maitland  
Robert G. Maki  
Ignacio J. Melero  
Constantine S. Mitsiades  
Amit M. Oza  
Daniel A. Pryma  
John H. Sampson  
Sabina Signoretti  
Alex Sparreboom  
Ulrich G. Steidl  
Amit Verma  
Eduardo Vilar  
Colin D. Weekes  
Douglas Yee  
Evan Y. Yu

### Statistical Reviewers

Cong Chen  
Susan Groshen  
Katherine A. Guthrie  
Byung-Ho Nam  
Megan Othus  
Katherine S. Panageas  
Yu Shyr  
Satoshi Teramukai  
Michael C. Wu

### Editorial Staff

#### Managing Editor

Kim Mackey

#### Assistant Managing Editor

William J. Siegmann

### Special Content Manager

Chris Vesci

### Assistant Director, Production

David Livewell

### Editorial Staff

Brian C. Thomas  
Cara E. Vandy

### Editorial Board

James L. Abbruzzese  
Joseph A. Aisner  
Jaffer Ajani  
Kenneth D. Aldape  
Francis Ali-Osman  
Jennifer Amengual  
Carey Anders  
David E. Avigan  
Rebecca G. Bagley  
Surinder Batra  
James Berenson  
Ray Bergan  
Joseph R. Bertino  
Kapil N. Bhalla  
Ronald G. Blasberg  
Renier J. Brentjens  
Ronald M. Bukowski  
Daniel P. Cahill  
George A. Calin  
Kevin Camphausen  
Michael A. Carducci

(continued on next page)

**Editorial Office:** *Clinical Cancer Research* [ISSN: 1078-0432 (Print); 1557-3265 (Online)] is published twice a month, 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 *Clinical 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 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).

# CLINICAL CANCER RESEARCH

## Editorial Board *(continued)*

William Carroll  
William E. Carson  
Paul B. Chapman  
Dharminder Chauhan  
Cong Chen  
Zhen Cheng  
Paul Chiao  
Fortunato Ciardiello  
Robert Clarke  
Barbara A. Conley  
Joseph Contessa  
Rajvir Dahiya  
William L. Dahut  
Michael A. Davies  
Johann S. de Bono  
Sandra Demaria  
Adam P. Dicker  
Catherine Diefenbach  
Federica Di Nicolantonio  
Colin P. Dinney  
Ronny Drapkin  
Raymond N. DuBois  
Steven DuBois  
Robert P. Edwards  
Adel K. El-Naggar  
Wael El-Rifai  
Jeffrey Engelman  
Alan L. Epstein  
Francisco J. Esteva  
Robert L. Ferris  
Soldano Ferrone  
William D. Figg  
Barbara Fingleton  
Michelangelo Fiorentino  
David A. Frank  
Paul Frankel  
Simone Fulda  
Varsha V. Gandhi  
Stanton L. Gerson  
Michele Ghilmini  
Irene Ghobrial  
Giuseppe Giaccone  
Francis Giles  
Bonnie S. Glisson  
Lucy Godley  
Ajay Goel  
William E. Gooding  
Steven D. Gore  
James S. Goydos  
Steven Grant  
Tim F. Greten  
William E. Grizzle  
Susan Groshen  
Katherine A. Guthrie  
Stephen M. Hahn

Roy S. Herbst  
James G. Herman  
Fred R. Hirsch  
Walter N. Hittelman  
Robert M. Hoffman  
Patrick Hwu  
Rakesh K. Jain  
Jin Jen  
John M. Jessup  
Faye M. Johnson  
Dejan Juric  
Pawel Kalinski  
Michael Kalos  
Judith E. Karp  
Scott H. Kaufmann  
Edward Kim  
John M. Kirkwood  
E. Anders Kolb  
Murray Korc  
Jason A. Koutcher  
Rakesh Kumar  
Marc Ladanyi  
Heinz-Josef D. Lenz  
Ross L. Levine  
Min Li  
Jonathan D. Licht  
Sagar Lonial  
Patricia LoRusso  
Nupam Mahajan  
Sami Malek  
Sridhar Mani  
David A. Mankoff  
H. Charles Manning  
Maurie Markman  
Katherine K. Matthay  
Andrew P. Mazar  
David J. McConkey  
Janice Mehnert  
Alan A. Melcher  
Todd W. Miller  
John D. Minna  
Tetsuya Mitsudomi  
Gareth J. Morgan  
Hasan Mukhtar  
Byung-Ho Nam  
William G. Nelson  
Shuji Ogino  
Frank G. Ondrey  
Ruth M. O'Regan  
Robert Orłowski  
Megan Othus  
Katherine S. Panageas  
Klaus Pantel  
William Pao

George Peoples  
Roman Perez-Soler  
Leonidas Plataniias  
Pingping Qu  
Jerry Radich  
Noopur Raje  
Ramesh K. Ramanathan  
Mark J. Ratain  
C. Patrick Reynolds  
Jeremy N. Rich  
Andrea Richardson  
Rafael Rosell  
Eric K. Rowinsky  
Lawrence V. Rubinstein  
David P. Ryan  
Stefania Scala  
Maurizio Scaltriti  
Gary K. Schwartz  
Michael V. Seiden  
Violeta Serra  
Geoffrey Shapiro  
Dong M. Shin  
Yu Shyr  
Susan F. Slovin  
Keiran S.M. Smalley  
David Solit  
Paul Sondel  
Joseph Sparano  
Vered Stearns  
Patricia S. Steeg  
Barry Storer  
Walter J. Storkus  
Mario Sznol  
Yu-Tzu Tai  
Chris H. Takimoto  
James Talmadge  
Beverly A. Teicher  
Joel E. Tepper  
Satoshi Teramukai  
Lawrence D. True  
Jeffrey W. Tyner  
Carter Van Waes  
Augusto Villanueva  
Emile Voest  
Robert H. Vonderheide  
Jeffrey S. Weber  
Wolfgang A. Weber  
Patrick Y. Wen  
Theresa L. Whiteside  
Ignacio I. Wistuba  
Michael C. Wu  
Keping Xie  
Yun Yen  
Bin Zheng

## CLINICAL 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  
Gloria M. Petersen  
David R. Piwnica-Worms  
William Pao  
Charles W.M. Roberts  
Alice T. Shaw  
Lillian L. Siu  
Saraswati 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

Paul Driscoll

#### Senior Director

Paul Driscoll

#### Design Staff

Susan Moore

### Scope

*Clinical Cancer Research* publishes innovative clinical and translational cancer research studies that bridge the laboratory and the clinic. The Journal is especially interested in clinical trials evaluating new treatments, accompanied by research on pharmacology, and molecular alterations or biomarkers that predict response or resistance to treatment. The Journal also prioritizes laboratory and animal studies of new drugs and molecule-targeted agents with the potential to lead to clinical trials, and studies of targetable mechanisms of oncogenesis, progression of the malignant phenotype, and metastatic disease.

*Clinical 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://ccr.msubmit.net>. Before submitting a manuscript, please read the Instructions for Authors, which are available from the Journal's home page at <http://clincancerres.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://clincancerres.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](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 [www.aacr.org](http://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](mailto: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](mailto:membership@aacr.org)

#### Nonmembers and Institutions

[pubsales@aacr.org](mailto:pubsales@aacr.org)

### Advertising Information

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

### Copyright and Permissions

Content printed in or disseminated by *Clinical Cancer Research* is protected by copyright. Authors who wish to publish material in *Clinical 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>.