

# Clinical Cancer Research

*The Journal of Clinical and Translational Research*

# AACR

American Association  
for Cancer Research

AN OFFICIAL JOURNAL OF THE AMERICAN ASSOCIATION FOR CANCER RESEARCH

## Editor-in-Chief

**Keith T. Flaherty**

## Executive Editor

Marlowe S. Tessmer

## Deputy Editors

James L. Abbruzzese  
Susan E. Bates  
Jennifer R. Grandis  
Susan G. Hilsenbeck  
Pasi A. Jänne  
Josep Tabernero  
Jedd D. Wolchok

## Senior Editors

Ronald G. Blasberg  
Andrew S. Chi  
Ezra E.W. Cohen  
Michael A. Davies  
Robert C. Doebele  
Wael El-Rifai  
Daniel J. George  
William E. Grizzle  
Stephen M. Hahn  
Roy S. Herbst  
Dejan Juric  
Scott Kopetz  
Marc Ladanyi

## Senior Editors

Josep M. Llovet  
Robert G. Maki  
Katherine K. Matthay  
Ignacio J. Melero  
Amit M. Oza  
Jeremy N. Rich  
Sabina Signoretti  
Alex Sparreboom  
Beverly A. Teicher  
Theresa L. Whiteside  
Douglas Yee

## Statistical Reviewers

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

## Clinical Cancer Research Editorial Staff

**Managing Editor**  
Joe Piccirillo

**Features Editor**  
Chris Vesci

**Senior Production  
Manager**  
David Livewell

## Editorial Staff

Maggie Heffernan  
William J. Siegmann  
Cara E. Vandy

# Clinical Cancer Research

*The Journal of Clinical and Translational Research*

**AACR**  
American Association  
for Cancer Research

AN OFFICIAL JOURNAL OF THE AMERICAN ASSOCIATION FOR CANCER RESEARCH

## Editorial Board

Omar Abdel-Wahab  
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  
Renier J. Brentjens  
Ronald M. Bukowski  
George A. Calin  
Kevin Camphausen  
Michael A. Carducci  
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  
Jorge E. Cortes  
Rajvir Dahiya  
William L. Dahut  
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  
Elizabeth Eklund  
Adel K. El-Naggar  
Jeffrey Engelman  
Alan L. Epstein  
Francisco J. Esteva

Robert L. Ferris  
Soldano Ferrone  
William D. Figg  
Barbara Fingleton  
Richard S. Finn  
Michelangelo Fiorentino  
David A. Frank  
Paul Frankel  
Ralph S. Freedman  
Simone Fulda  
Gary E. Gallick  
Varsha V. Gandhi  
Stanton L. Gerson  
Michele Ghilmini  
Irene Ghobrial  
Giuseppe Giaccone  
Francis Giles  
Bonnie S. Glisson  
Lucy Godley  
Ajay Goel  
William E. Gooding  
Leo Gordon  
Steven D. Gore  
Andre H. Goy  
James S. Goydos  
Steven Grant  
Tim F. Greten  
Susan Groshen  
Katherine A. Guthrie  
James G. Herman  
Kenneth R. Hess  
Fred R. Hirsch  
Walter N. Hittelman  
Robert M. Hoffman  
Yujin Hoshida  
Ralph Hruban  
Patrick Hwu  
Rakesh K. Jain  
Jin Jen  
John M. Jessup  
Faye M. Johnson  
Ricky W. Johnstone  
Pawel Kalinski  
Michael Kalos  
Le Kang  
Gary Kao  
Judith E. Karp  
Scott H. Kaufmann

Michael J. Kerin  
Edward Kim  
John M. Kirkwood  
E. Anders Kolb  
Murray Korc  
Jason A. Koutcher  
Rakesh Kumar  
Heinz-Josef D. Lenz  
Ross L. Levine  
Min Li  
Jonathan D. Licht  
Sagar Lonial  
Patricia LoRusso  
Michael L. Maitland  
Sami Malek  
Sridhar Mani  
David A. Mankoff  
H. Charles Manning  
Maurie Markman  
Neil Martin  
Andrew P. Mazar  
David J. McConkey  
Janice Mehnert  
Alan A. Melcher  
Todd W. Miller  
John D. Minna  
Bruce D. Minsky  
Constantine S. Mitsiades  
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  
Klaus Pantel  
William Pao  
George Peoples  
Roman Perez-Soler  
Leonidas Plataniotis  
Bill Plunkett  
Pingping Qu  
Jerry Radich  
Noopur Raje  
Ramesh K. Ramanathan  
Mark J. Ratain

C. Patrick Reynolds  
Andrea Richardson  
Paul G. Richardson  
Victoria M. Richon  
Rafael Rosell  
Eric K. Rowinsky  
Lawrence V. Rubinstein  
David P. Ryan  
John H. Sampson  
Stefania Scala  
Maurizio Scaltriti  
Gary K. Schwartz  
Michael V. Seiden  
Violeta Serra  
Dennis Sgroi  
Jerry W. Shay  
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  
Yu-Tzu Tai  
Chris H. Takimoto  
James Talmadge  
Joel E. Tepper  
Satoshi Teramukai  
Lawrence D. True  
Jeffrey W. Tyner  
Carter Van Waes  
Eduardo Vilar  
Augusto Villanueva  
Emile Voest  
Robert H. Vonderheide  
Jeffrey S. Weber  
Wolfgang A. Weber  
Patrick Y. Wen  
Ignacio I. Wistuba  
Michael C. Wu  
Keping Xie  
Yun Yen  
Benny Chung-Ying Zee

Clinical Cancer Research

# Publishing Information

# AACR

American Association  
for Cancer Research

Print ISSN: 1078-0432 • Online ISSN: 1557-3265

## AACR Officers

Nancy E. Davidson, President  
Michael A. Caligiuri,  
President-Elect  
José Baselga, Past President  
William N. Hait, Treasurer  
Margaret Foti, Chief Executive  
Officer

## Publications Committee

Mary Helen Barcellos-Hoff  
Alberto Bardelli  
Dafna Bar-Sagi  
Michael E. Berens  
René Bernards  
John D. Carpten  
Frederic J. de Sauvage  
Sanjiv Sam Gambhir  
Maura L. Gillison  
Elizabeth M. Jaffee  
Pasi A. Jänne  
Roy A. Jensen  
Jonathan D. Licht  
Steffi Oesterreich  
William Pao  
Helen M. Piwnicka-Worms  
Charles W.M. Roberts  
Lillian L. Siu  
David B. Solit  
Saraswati V. Sukumar  
Toshikazu Ushijima  
Victor E. Velculescu,  
Chairperson

## Publishing Staff

**Publisher**  
Christine B. Rullo  
**Director, Journal Operations and Systems**  
Daniel S. Evanko  
**Director, Journal Sales and Marketing**  
Nicola L. Hill  
**Director, Digital Publishing**  
Robert Spanier  
**Associate Director, Production**  
Charlene Squibb  
**Assistant Director, Institutional Sales & Outreach**  
Karola Rac  
**Marketing and Creative Services**  
**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 [www.aacrjournals.org/site/InstrAuthors/ifora.xhtml#copyrightpermissions](http://www.aacrjournals.org/site/InstrAuthors/ifora.xhtml#copyrightpermissions).