

# 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  
Jennifer R. Grandis  
Susan G. Hilsenbeck  
Pasi A. Jänne  
Ross L. Levine  
Josep Tabernero  
Jedd D. Wolchok

## Senior Editors

Julie E. Bauman  
Ronald G. Blasberg  
Andrew S. Chi  
Ezra E.W. Cohen  
Roisin Connolly  
Ryan B. Corcoran  
Michael A. Davies  
Robert C. Doebele  
Michael A. Dyer  
Wael El-Rifai  
Daniel J. George  
Stephen M. Hahn  
Roy S. Herbst  
Theodore S. Hong  
David M. Hyman  
Dejan Juric  
Scott Kopetz  
Marc Ladanyi

## Senior Editors

Josep M. Llovet  
Michael L. Maitland  
Robert G. Maki  
Katherine K. Matthay  
Ignacio J. Melero  
Amit M. Oza  
Daniel A. Pryma  
Jeremy N. Rich  
John H. Sampson  
Sabina Signoretti  
Alex Sparreboom  
Ulrich G. Steidl  
Mario Sznol  
Eduardo Vilar  
Colin D. Weekes  
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

## Editorial Staff

### Managing Editor

Joe Piccirillo

### Features Editor

Chris Vesci

### Senior Production Manager

David Livewell

## Editorial Staff

William J. Siegmann  
Brian C. Thomas  
Cara E. Vandy

**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. 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 2017 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

*The Journal of Clinical and Translational Research*

# AAGR

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

William E. Grizzle

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

Min Li

Jonathan D. Licht

Sagar Lonial

Patricia LoRusso

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

Katherine S. Panageas

Klaus Pantel

William Pao

George Peoples

Roman Perez-Soler

Leonidas Plataniias

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

Myrna R. Rosenfeld

Eric K. Rowinsky

Lawrence V. Rubinstein

David P. Ryan

Stefania Scala

Maurizio Scaltriti

Gary K. Schwartz

Michael V. Seiden

Violeta Serra

Dennis Sgroi

Geoffrey Shapiro

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

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

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

Michael A. Caligiuri, President  
Elizabeth M. Jaffee,  
President-Elect  
Nancy E. Davidson,  
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. Piwnica-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 <http://aacrjournals.org/content/authors/copyright-permissions-and-access>.