

Cancer Epidemiology Biomarkers & Prevention

August 1996
Volume Five ■ Number Eight
Pages 587-672
ISSN 1055-9965



An Official Journal of the
American Association for Cancer Research
Cosponsored by the
American Society of Preventive Oncology



AMERICAN ASSOCIATION FOR CANCER RESEARCH SCIENTIFIC CONFERENCES

OCTOBER 2-6, 1996

Novel Approaches in Blood and Marrow Transplantation

Second Annual Meeting of the American Society for Blood and Marrow Transplantation

Chairpersons: O. Michael Colvin, Durham, NC;
Bruce R. Blazar, Minneapolis, MN
Hotel Del Coronado, San Diego, CA

OCTOBER 6-9, 1996

Carcinogenesis from Environmental Pollution: Assessment of Human Risks and Strategies for Prevention

Joint Meeting with International Agency for Research on Cancer

Chairpersons: Frederica Perera, New York, NY;
Paul Kleihues, Lyon, France
Hotel Gellért, Budapest, Hungary

OCTOBER 19-23, 1996

Programmed Cell Death

Chairpersons: Stanley J. Korsmeyer, St. Louis, MO; Shigekazu Nagata, Osaka, Japan; Andrew Wyllie, Edinburgh, Scotland
The Sagamore, Bolton Landing (Lake George), NY

JANUARY 10-14, 1997

Basic and Clinical Aspects of Lymphoma

Joint Meeting with the American Society of Clinical Oncology

Chairpersons: Joseph R. Bertino, New York, NY;
James O. Armitage, Omaha, NE
Stouffer Renaissance Esmeralda Resort, Indian Wells (Palm Springs), CA

JANUARY 17-21, 1997

Disrupted Transcription Factors in Cancer

Chairpersons: Peter K. Vogt, La Jolla, CA; Frank J. Rauscher III, Philadelphia, PA
Hotel Del Coronado, San Diego, CA

FEBRUARY 13-16, 1997

Growth Factors, Signaling, and Cancer

Joint Meeting with Lorne Cancer Conference
Chairpersons: Antony Burgess, Parkville, Victoria, Australia; Robert J. Coffey, Nashville, TN; Ashley R. Dunn, Parkville, Victoria, Australia; Webster K. Cavenee, La Jolla, CA
Erskine House, Lorne, Victoria, Australia

FEBRUARY 23-28, 1997

Cell Signaling and Cancer Treatment

In Collaboration with British Association for Cancer Research, Austrian Cancer Society, German Cancer Society, and Austrian Biochemical Society

Chairpersons: Hans H. Grunicke, Innsbruck, Austria; Garth Powis, Tucson, AZ; Paul Workman, Macclesfield, England
Interlpen-Hotel Tyrol, Telfs-Buchen, Austria

MARCH 7-12, 1997

Basic and Clinical Aspects of Breast Cancer

Chairpersons: J. Carl Barrett, Research Triangle Park, NC; Karen S.H. Antman, New York, NY; Mary-Claire King, Seattle, WA
Keystone Resort, Keystone, CO

APRIL 12-16, 1997

88th Annual Meeting

Chairperson: Frederick P. Li, Boston, MA
Co-Chairpersons: Clara Derber Bloomfield, Buffalo, NY; Stephen H. Friend, Seattle, WA
San Diego Convention Center, San Diego, CA
Abstract Deadline: November 12, 1996

JUNE 7-12, 1997

Cancer of the Central Nervous System

Conference with Neurosurgery Joint Section on Tumors

Chairpersons: Peter McL. Black, Boston, MA; Webster K. Cavenee, La Jolla, CA
Loew's Coronado Bay Resort, San Diego, CA

AACR members will receive brochures on the above conferences as soon as they are available. Nonmembers should call or write:

American Association for Cancer Research
Public Ledger Building, Suite 816
150 South Independence Mall West
Philadelphia, PA 19106-3483
215-440-9300 • 215-440-9313 (FAX)
E-Mail: aacr@aol.com

For regular updates to this list visit the AACR's World Wide Web site, <http://www.aacr.org>

Cancer Epidemiology & Prevention Biomarkers

An Official Journal of the American Association for Cancer Research ■ Cosponsored by the American Society of Preventive Oncology

**American Association for
Cancer Research, Inc.**
**Executive Director and
Director of Publications**
Margaret Foti

Publications Staff

**Associate Director
of Publications**
Mary Anne Mennite

Manager, Editorial Services
Heide M. Puzstay

Senior Staff Editor
Lisa A. Chippendale

Staff Editors
Pamela M. Grebow
Michael J. Beveridge
Kathleen C. Assenmacher
Pamela R. Arnold
Laurie B. Baker

Staff Assistant
Mary Ellen Pirring

Administrative Coordinator
Holly M. Haskins

Senior Editorial Assistant
Theresa A. Griffith

Editorial Assistants
Valerie L. Samuel
Andrea Conrad
Katherine V. Pawlowski
Bethann Massarella

Administrative Staff

Director of Administration
Adam D. Blistein

Controller
Joan D. Brokenshire

Coordinator, Financial Operations
George L. Moore

Manager, Meetings and Exhibits
Jeffrey M. Ruben

Meeting Planner
Carole L. Kanoff

Public Information Coordinator
Jenny Anne Horst-Martz

Assistant to the Executive Director
Ruth E. Fortson

Membership Development Coordinator
Robin E. Felder

Administrative Assistant
Margaret A. Pickels

Systems Specialist
Lydia I. Rodriguez

Secretary
Malika L. Wright

Editorial Assistant
Diana F. Certo

Office Clerk
James J. Waters

Data Entry Clerk
Robert A. Simms II

Office of the Editor-in-Chief

Editorial Assistant
Cheryl C. Carter

Editor-in-Chief
Pelayo Correa

Associate Editors

W. Robert Bruce
Webster K. Cavenee
Joseph F. Fraumeni, Jr.
Ellen R. Gritz
Curtis C. Harris
Stephen S. Hecht
Barbara S. Hulka
Fred F. Kadlubar
Laurence N. Kolonel
Frederick P. Li
W. Thomas London
Thomas E. Moon
Abraham M. Y. Nomura
John D. Potter
James A. Swenberg
Steven R. Tannenbaum
Alice S. Whittamore
Chung S. Yang
Mimi C. Yu

Assistant Editor

Elizabeth T. H. Fontham

Editorial Advisory Board

Hans-Olov Adami
Bruce K. Armstrong
Helmut Bartsch
Valerie Beral
Leslie Bernstein
John S. Bertram
Joan R. Bloom
William J. Blot
John D. Boice, Jr.
George E. Bonney
Robert M. Bostick
Ricardo R. Brentani
Eva Buiatti
Neil E. Caporaso

Wong-Ho Chow
Philip Cole
K. Michael Cummings
Susan J. Curry
Janet Daling
Mary Daly
Eduardo DeStefani
Paul F. Engstrom
Virginia L. Ernster
Michael Fiore
David Forman
Eduardo L. Franco
Yu-Tang Gao
E. Robert Greenberg
Raymond S. Greenberg
Peter Greenwald
F. Peter Guengerich
Rodrigo Guerrero
Clark W. Heath, Jr.
Kathy J. Helzlsouer
Elizabeth A. Holly
Waun Ki Hong
Geoffrey R. Howe
Mary Claire King
Leo J. Kinlen
Paul Kleihues
Alfred G. Knudson, Jr.
Bernard Levin
Lance A. Liotta
Martin Lipkin
Richard R. Love
Thomas Mack
Frank L. Meyskens, Jr.
Christopher J. Michajda
Rodney F. Minchin
John D. Minna
Ruggero Montesano
John J. Mulvihill
Alvaro Muñoz
Nubia Muñoz

Alfred I. Neugut
Gilbert S. Omenn
C. Tracy Orleans
David L. Page
Frederica Perera
Nicholas L. Petrakis
John P. Pierce
Miriam C. Poirier
Bruce A. J. Ponder
Ross Prentice
Barbara Rimer
Nathaniel Rothman
George C. Roush
Jose Russo
Jonathan M. Samet
Arthur Schatzkin
Mark H. Schiffman
David Schottenfeld
Paul A. Schulte
Peter Shields
Roy E. Shore
Margaret R. Spitz
Louise C. Strong
Takashi Sugimura
G. Marie Swanson
Eiichi Tahara
Bruce Trock
Sally Vernon
Michael J. Wargovich
Lee W. Wattenberg
I. Bernard Weinstein
John H. Weisburger
Noel S. Weiss
Ansley Weston
Walter C. Willett
Rodger J. Winn
Gerald N. Wogan
Sandra R. Wolman
Ernst L. Wynder
Regina Ziegler

Cancer Epidemiology, Biomarkers & Prevention is published monthly, one volume annually, by the American Association for Cancer Research, Inc. Except for members of the American Association for Cancer Research, all subscriptions are payable in advance to *Cancer Epidemiology, Biomarkers & Prevention*, P. O. Box 3000, Denville, NJ 07834 [Telephone: (800) 875-2997 or (201) 627-2427; FAX: (201) 627-5872], to which all business communications, remittances (in United States currency or its equivalent), and subscription orders should be sent. In Japan, send orders and inquiries to (sole agent): USACO Corporation, Tsutsumi Bldg., 13-12, Shimbashi 1-chome, Minato-ku, Tokyo 105, Japan; Tel. (03) 502-6471. Nonmembers of the American Association for Cancer Research within the United States may subscribe to Volume 5 (1996) of *Cancer Epidemiology, Biomarkers & Prevention* at the rate of \$85 (individual nonmembers) or \$215 (institutional nonmembers), including postage. Institutional and individual nonmembers outside of the United States should add \$40 to their respective rates to offset periodicals postage costs. Canadian subscribers should add 7% GST. Changes of address notification should be sent 60 days in advance and include both old and new addresses. Member subscribers should send address changes to: Member Services, American Association for Cancer Research, Inc., Public Ledger Bldg., Suite 816, 150 South Independence Mall West, Philadelphia, PA 19106-3483. Nonmember subscribers should send changes of address to: *Cancer Epidemiology, Biomarkers & Prevention*, P. O. Box 3000, Denville, NJ 07834. Copies of the journal which are undeliverable because of address changes will be destroyed. Accelerated mailing of all AACR journals to AACR members in Japan is fully supported by a generous grant from the Banyu Pharmaceutical Company, Tsukuba, Japan.



Notice to Members of the American Association for Cancer Research

Officers for 1996-1997

President: Louise C. Strong, UT M. D. Anderson Cancer Center, Houston, TX 77030

President-Elect: Donald S. Coffey, Johns Hopkins University School of Medicine, Baltimore MD 21287-2101

Treasurer: Bayard D. Clarkson, Memorial Sloan-Kettering Cancer Center, New York, NY 10021

Executive Director: Margaret Foti, AACR, Public Ledger Bldg., Suite 816, Philadelphia, PA 19106-3483

Annual Dues

The annual dues of active members of the American Association for Cancer Research are \$160, \$50 of which may be applied toward a subscription to *Cancer Epidemiology, Biomarkers & Prevention*. Corresponding members of the Association will be charged an appropriate fee to offset periodicals postage costs. Payment of dues and changes of address of members of the Association should be sent promptly to Margaret Foti, Executive Director, American Association for Cancer Research, Public Ledger Bldg., Suite 816, 150 South Independence Mall West, Philadelphia, PA 19106-3483; Telephone: (215)440-9300; FAX: (215)440-9313.

Submission of Manuscripts

Cancer Epidemiology, Biomarkers & Prevention publishes original research on cancer causation and prevention in humans, linking three previously unintegrated disciplines: epidemiology, biomarkers, and prevention. Topics include descriptive, analytical, biochemical, and molecular epidemiology; the use of biomarkers to study the neoplastic and preneoplastic processes in humans; chemoprevention and other types of prevention trials; and the role of behavioral factors in cancer etiology and prevention. Manuscripts that address individual subjects in any of the three disciplines are welcome as well as manuscripts with an interdisciplinary approach. All submissions undergo peer review. Papers should be sent directly to Pelayo Correa, M. D., Editor-in-Chief, CEBP, Dept. of Pathology, Louisiana State University Medical Center, 1901 Perdido Street, New Orleans, LA 70112-1393. See Instructions for Authors (page i of this issue) for further information concerning submissions.

Back Issues and Single Copy Sales of the Journal

Copies of back stock of the journal may be ordered from *Cancer Epidemiology, Biomarkers & Prevention*, P. O. Box 3000, Denville, NJ 07834 [Telephone: (800) 875-2997 or (201) 627-2427; FAX: (201) 627-5872]. As long as supplies permit, single copies will be sold by this company at \$12.50/copy. Orders outside the U.S. add \$3.00/copy to offset postage costs.

Advertisements

Advertisement insertion orders and copy must be received one month prior to the date of issue in which the advertisement is to be published. The journal is mailed by approximately the 10th day of the month of issue. Inquiries about advertising should be directed to: M. J. Mrvica Associates, Inc., 155 South White Horse Pike, Berlin, NJ 08009 [Telephone: (609) 768-9360; FAX: (609) 753-0064].

Copyright and Permissions

Authors who wish to publish in *Cancer Epidemiology, Biomarkers & Prevention* must formally transfer copyright to the proprietor of the journal, the American Association for Cancer Research, Inc. It is understood by this transfer that the authors relinquish all exclusive rights of copyright ownership, including without limitation rights of reproduction, derivation, distribution, sale, and display of the work, in whole or in part, in any and all forms of media now or hereafter known.

Authors who prepared their articles as part of their official duties as employees of the U.S. Federal Government are not required to transfer

copyright to the American Association for Cancer Research, Inc., since these articles are considered to be in the public domain. In the case of articles supported by federal grants or contracts, copyright transfer to the American Association for Cancer Research, Inc., is required. The federal government may retain a nonexclusive license to publish or republish such material.

The Journal will routinely allow authors (or others with the permission of the authors) to include select parts of a copyrighted article in reviews, books, or subsequent papers, upon written request to the AACR Director of Publications. Requests to reproduce an article in its entirety will be considered on an individual basis and permission may be granted contingent upon payment of an appropriate copyright fee. All reproduction requests must include a brief description of intended use and a stamped, self-addressed envelope. Third parties should obtain the approval of the authors *before* corresponding with the AACR.

Those who wish to photocopy articles should contact the AACR Publications Department [Telephone: (215) 440-9300; FAX: (215) 440-9355].

No responsibility is accepted by the Editors, by the American Association for Cancer Research, Inc., by the American Society of Preventive Oncology, or by Cadmus Journal Services for the opinions expressed by contributors or for the content of the advertisements.

Cancer Epidemiology, Biomarkers & Prevention is indexed in *Chemical Abstracts*, *Current Contents/CM*[®], *Index Medicus*, *MEDLINE*, and the *BIOSIS Previews*[®] Database. This journal is printed on acid-free paper.

Cancer Epidemiology, Biomarkers & Prevention (ISSN 1055-9965) is published monthly by the American Association for Cancer Research, Inc., Public Ledger Bldg., Suite 816, 150 South Independence Mall West, Philadelphia, PA 19106-3483 for \$50 annually for members, \$85 for individual nonmembers, and \$215 for institutional nonmembers. Periodicals postage paid at Philadelphia, PA and additional mailing offices. POSTMASTER: Send address changes to *Cancer Epidemiology, Biomarkers & Prevention*, P. O. Box 3000, Denville, NJ 07834. Copyright 1996 by the American Association for Cancer Research, Inc. Printed in the U.S.A.

Cancer Research Center, University of Hawai'i Prevention and Control Program

Tenure Track Position Prevention and Control Director

The Cancer Research Center of Hawai'i, a National Cancer Institute designated cancer center, seeks a clinically-oriented scientist at the full professor (researcher) level to provide leadership for its Prevention and Control Program, integrate medical and social science research efforts, and contribute to faculty and staff development. The director will also be expected to maintain an active research program. Other academic responsibilities include contributing to the University's teaching mission and providing service to the University, community, and profession. The mission of the Prevention and Control Program is to conduct research and training to reduce morbidity and mortality due to cancer, with a special focus on Hawai'i's ethnic groups. This Program complements other Center programs in epidemiology, molecular carcinogenesis, and anticancer properties of natural products.

Applicants should have a record of accomplishment in research related to cancer control. Minimum requirements include an M.D. or Ph.D. in a clinically related field and demonstration of sustained extramural research funding. Evidence of effective leadership, strong organizational abilities, excellent communication skills, and the ability to work effectively with community-based health professionals are also required. It is anticipated that the successful applicant will hold a teaching appointment in an appropriate University department. Salary will be commensurate with experience.

Applicants should send a letter addressing their qualifications for the position, curriculum vitae, and list of three persons who can provide references to: Brian Issell, M.D., Director, Cancer Research Center of Hawai'i, 1236 Lauhala Street, Honolulu, Hawai'i 96813. Telephone: 808-586-3013; Fax: 808-586-3009.

Review of applications will begin immediately and continue until the position is filled. *The University of Hawai'i is an Equal Opportunity/Affirmative Action Institution and encourages applications from women and minority candidates.*

AMERICAN ASSOCIATION FOR CANCER RESEARCH

The American Association for Cancer Research (AACR) is a professional society of over 11,000 scientists and physicians involved in all aspects of basic, clinical, and translational cancer research. Members of the AACR enjoy

- subscriptions to *Cancer Research, Cell Growth & Differentiation (CG&D), Cancer Epidemiology, Biomarkers & Prevention*, and *Clinical Cancer Research* at reduced member rates
- reduced registration rates at the AACR Annual Meeting, Special Conferences, and International Meetings
- Employment Register, Directory of Members, public education activities, and many other benefits

Special programs to provide enhanced career development opportunities for minority scientists include

- **Session on Career Development at Annual Meeting**
- **Mentorship Program**
- **Travel Awards to Scientific Meetings**

American Association for Cancer Research

Public Ledger Building, Suite 816
150 S. Independence Mall West
Philadelphia, PA 19106-3483
Telephone: (215) 440-9300

FAX: (215) 440-9313 / E-Mail: aacr@aol.com

Proceedings of the American Association for Cancer Research on CD-ROM

- Contains abstracts for more than 4,000 presentations at the 1996 AACR Annual Meeting
- Search by word, phrase, or Boolean expression to pinpoint the abstracts you need
- Operates on Macintosh and Windows platforms

AACR Members - \$35
Individual Nonmembers - \$45
Institutions - \$90

Canada: Add 7% GST; MD residents: Add state sales tax

Order Today!

Telephone: (215) 440-9300; Fax: (215) 440-9313
For more information, e-mail to: aacr@aol.com

Hit our Home Page on the World Wide Web!

<http://www.aacr.org>

Our web site features . . .

- **AACR scientific meeting schedule**
- **Table of Contents of AACR journals**
- **Instructions for Authors**
- **Information about AACR Research Fellowships and Travel Awards**

Plus . . . The latest AACR newsletter, and much more!

