

Cancer Epidemiology Biomarkers & Prevention

July 1996
Volume Five ■ Number Seven
Pages 487-586
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

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. Pusztay

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 Perring

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. Whittemore
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

Wun 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. Michejda

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

Mary Claire King

G. Marie Swanson

Eiichi Tahara

Bruce Trock

Sally Vernon

Michael J. Wargovich

Lee W. Wattenberg

I. Bernard Weinstein

John H. Weisburger

Noel S. Weiss

Ainsley 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 for 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.