

**PROGRAM
AND
ABSTRACTS**

19th Annual Meeting

AMERICAN SOCIETY of PREVENTIVE

ONCOLOGY

March 8 - 11, 1995

**J.W. Marriott Hotel
Houston, Texas**

**Program Chair: Rodger Winn, MD
 The University of Texas
 M. D. Anderson Cancer Center**

Sponsored by:

American Society of Preventive Oncology, The University of Texas M. D. Anderson Cancer Center, Bristol-Myers, Kellogg Company, Marion Merrell Dow, Inc., and a conference grant from the National Institutes of Health/National Cancer Institute.

ASPO

The **American Society of Preventive Oncology** is an active and growing organization that is striving to: 1) promote the exchange and dissemination of information and ideas relating to cancer prevention and control; 2) identify and stimulate research areas in cancer prevention and control; and 3) foster the implementation of programs in cancer prevention and control.

After attending the 19th Annual Meeting of the American Society of Preventive Oncology participants should be able to:

- develop and evaluate new methods and programs for the prevention and early detection of cancer;
- review and monitor programs designed to reduce cancer incidence, mortality and morbidity;
- advise health professionals regarding appropriateness of screening procedures in specific areas
- design methods for reaching underserved populations
- evaluate the cost-effectiveness of cancer prevention and control programs
- train health professionals concerned with preventive oncology.

Meetings of the American Society of Preventive Oncology are organized for professionals in clinical, educational or research disciplines who appreciate the challenges of a multidisciplinary scientific forum and who are committed to a comprehensive approach to cancer prevention and control.

ACCREDITATION:

The University of Texas M. D. Anderson Cancer Center is accredited by the Accreditation Council of Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians.

The University of Texas M. D. Anderson Cancer Center designates this continuing medical education activity for 12.5 credit hours in Category 1 of the Physician's Recognition Award of the American Medical Association.

The evaluation form at the back of this program must be completed in order to receive CME credits. Please turn it in at the Registration Table before leaving.

American Society of Preventive Oncology speakers are in compliance with Disclosure of Interest Policies as outlined by the Accreditation Council of CME. Declaration documentation is available in the registration area throughout the duration of this conference.

ASPO

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ANNOUNCEMENTS

MESSAGES

Contact Judy Bowser at the ASPO registration desk if you are expecting a message or wish to leave one for someone.

CATERED MEALS

We have attempted to include a variety of items at each meal function so those of you preferring vegetarian fare may be easily accommodated.

SPECIAL ACKNOWLEDGEMENTS

The ASPO Executive Committee offers special thanks to Program Chair, Dr. Rodger Winn, for his extraordinary commitment in arranging the program for this meeting.

The ASPO Executive Committee wishes to thank all the co-sponsors of this 19th Annual Meeting. The corporate sponsors have given the Program Committee complete latitude in choosing the speakers and program which are underwritten by their contributions.

Wednesday, March 8, 1995

1:00 - 5:00 pm

New Investigator Workshop (Open only to those with accepted proposals)

Organizer: Alfred Neugut, MD, PhD
Columbia University School of Public Health; Associate Professor of Clinical Medicine and Public Health

1:00 - 5:00 pm

Joint Meeting of NCI Cancer Prevention Fellows and Preventive Oncology Awardees

1:00 - 5:00 pm

REGISTRATION

6:00 - 9:00 pm

ASPO Executive Committee Meeting (Working Dinner)

Thursday, March 9, 1995

7:15 am - 5:00 pm

REGISTRATION

7:30 - 8:45 am

Study Group Breakfast Meetings

Chemoprevention:

Organizers: Mary Daly, MD
Fox Chase Cancer Center; Associate Director of Cancer Control Science Program

Gary Goodman, MD
Swedish Hospital Tumor Institute; Clinical Associate Professor of Medicine and Public Health

Diet and Nutrition

Organizers: Larry Kushi, ScD
University of Minnesota; Associate Professor

R. Sue McPherson, PhD
The University of Texas School of Public Health; Assistant Professor

NOTES

March 9, 1995, Continued

9:00 - 9:15 am

WELCOME:

Ellen R. Gritz, PhD, President

The University of Texas M. D. Anderson Cancer Center;
Professor and Chair, Department of Behavioral Science

9:15 - 10:15 am

Distinguished Achievement Award and Address

From Pathology to Epidemiology to Prevention

Pelayo Correa, MD

Louisiana State University Medical Center, Department
of Pathology; Chief, Section of Epidemiology, Professor
of Pathology

10:15 - 10:30 am

Break

10:30 am - 12 noon

Symposium: *Cigarettes in the 21st Century*

Chair:

Ellen R. Gritz, PhD

The University of Texas M. D. Anderson
Cancer Center

Regulating Cigarette Nicotine Levels: Design and Content

Jack Henningfield, PhD

Chief, Clinical Pharmacology Branch, Addiction
Research Center at NIDA

Legislation: Key Issues in Congress

Mathew Myers, JD

Counsel, Coalition on Smoking or Health; Asbill,
Junkin & Myers, Chtd.

Marketing and Advertising: Techniques and Counter Techniques

John Slade, MD

University of Medicine and Dentistry of New
Jersey, Robert Wood Johnson Medical School

12:00 - 1:30 pm


Lunch on your own (Poster set-up time)

NOTES

March 9, 1995, Continued

1:30 - 3:00 pm

Symposium: *Controversies in Prostate Cancer Screening*

 Chair: Michael E. Stefanek, PhD
Johns Hopkins University School of
Medicine, Department of Oncology

Rationale for Prostate Screening (PRO)

Ian Thompson, MD
Brooke Army Medical Center, San Antonio,
Texas; Chief of Urology Services

Screening for Prostate Cancer (CON)

Barnett Kramer, MD
National Cancer Institute, Early Detection and
Community Oncology

NOTES

March 9, 1995, Continued

3:15 - 5:00 pm

Presented Papers (2 concurrent sessions)
See printed abstracts in section at back of program.



Session A—Behavioral Science/Quality of Life

Chair: Barbara Rimer, DrPH
Duke Comprehensive Cancer Center;
Professor and Director, Cancer
Prevention, Detection and Control

3:15 - 3:35 pm

*The Challenge of Interventions in Multiethnic Communities:
Breast and Cervical Cancer Screening*

Robert A. Hiatt, MD, PhD
Division of Research, Kaiser Permanente

3:35 - 3:55 pm

*Psychologic Outcomes of Participation in a Genetic Cancer Risk
Program*

Mary B. Daly, MD, PhD
Fox Chase Cancer Center

3:55 - 4:15 pm

*Prevalence of Menopausal Symptoms among Women with a
History of Breast Cancer and Attitudes towards Estrogen
Replacement Therapy*

Rima J. Couzi, MB, BCh, MHS
Johns Hopkins School of Hygiene and Public
Health

4:15 - 4:35 pm

*Assessing Intervention Implementation at the Worksite: The
Working Well Experience at M. D. Anderson Cancer Center*

Scott Cummings, MPH
University of Texas M. D. Anderson Cancer
Center

4:35 - 4:55 pm

Development of an Instrument to Measure Breast Cancer Anxiety

Kathryn M. Kash, PhD
Strang Cancer Prevention Center

NOTES

March 9, 1995, Continued

Session B—Epidemiology

See printed abstracts in section at back of program.

Chair: Melissa Bondy, PhD
The University of Texas M. D. Anderson
Cancer Center; Assistant Professor of
Epidemiology

3:15 - 3:35 pm

Iron-Related Proteins and the Risk of Colonic Neoplasia

Katherine A. McGlynn, PhD
Fox Chase Cancer Center

3:35 - 3:55 pm

Family History and Risk of Colorectal Cancer

Loic Le Marchand, MD
Cancer Research Center of Hawaii

3:55 - 4:15 pm

Estrogen Replacement Therapy and Adenomatous Polyps: The Minnesota CPRU Case-Control Study

John D. Potter, MD, PhD
Fred Hutchinson Cancer Research Center

4:15 - 4:35 pm

Associations of Diet and Vitamin Supplements with Adult Brain Cancer

Marion M. Lee, PhD
University of California, San Francisco

4:35 - 4:55 pm

Aspirin and Other Nonsteroidal Anti-Inflammatory Drugs and Risk of Colorectal Adenomatous Polyps among Endoscoped Individuals

María Elena Martínez, PhD
Harvard School of Public Health

5:00 - 7:00 pm

Poster Session and Reception (poster abstracts at back of program)

7:00 pm

Best Poster Award Presentation

Dinner on your own

NOTES

Friday, March 10, 1995

7:15 am - 5:00 pm

REGISTRATION

7:30 - 8:45 am

Study Group Breakfast Meetings

Tobacco

Organizer: Michael Fiore, MD, MPH
University of Wisconsin; Director, Center
for Tobacco Research and Intervention

Presenter: K. Michael Cummings, PhD, MPH
Director, Smoking Control Program
Roswell Park Cancer Institute

Screening

Organizers: Victor Vogel, MD, MHS
The University of Texas M. D. Anderson
Cancer Center; Medical Director, Clinical
Cancer Prevention

9:00 - 10:30 am

Symposium: *Nutritional Aspects of Chemoprevention*

Co-Chairs: Larry Kushi, ScD
University of Minnesota
Margie Clapper, PhD
Fox Chase Cancer Center; Associate
Member

Enzyme Regulation: A Major Mechanism for Chemical Protection Against Cancer

Paul Talalay, MD
Johns Hopkins University School of Medicine;
John Jacob Abel Distinguished Service Professor

Cancer Prevention by Naturally Occurring Agents and Vegetables

Michael Wargovich, PhD
The University of Texas M. D. Anderson Cancer
Center; Associate Professor of Medicine

NOTES

March 10, 1995, Continued

Dietary Fiber and Colon Carcinogenesis

Joanne Lupton, PhD

Texas A & M University; Associate Professor of
Human Nutrition

10:30 am There will be no formal break; however, refreshments will be available.

10:30 - 11:15 am **Business Meeting**

11:15 am - 12:15 pm **Presidential Address**

Ellen R. Gritz, PhD

The University of Texas M. D. Anderson Cancer
Center

12:15 - 1:30 pm **Luncheon**

Joseph Cullen Memorial Lecture

Joseph Cullen Awardee—Donald R. Shopland

Coordinator, National Cancer Institute Smoking and
Tobacco Control Program

1:30 - 3:00 pm **Symposium: *Minority Issues in Community Outreach***

Co-Chairs:

Roshan Bastani, PhD

UCLA Jonsson Comprehensive Cancer Center;
Associate Director, Division of Cancer Prevention
& Control Research; Assistant Professor, School
of Public Health

Robert Hiatt, MD, PhD

Kaiser Permanente; Assistant Director,
Epidemiology; Director of Prevention Science,
North California Cancer Center

NOTES

March 10, 1995, Continued

Cancer Control Interventions in Latino Communities

Eliseo Perez-Stable, MD

University of California, San Francisco; Associate
Professor of Medicine

Dietary Behavioral Changes in Minority Populations: Results of the Women's Health Trial

Deborah Bowen, PhD

Fred Hutchinson Cancer Research Center

Issues in Conducting Interventions in the African American Community

Shelly Harrell, PhD

UCLA Jonsson Comprehensive Cancer Center;
Assistant Research Psychologist, Division of
Cancer Prevention and Control Research

3:00 - 3:15 pm

Break

NOTES

March 10, 1995, Continued

3:15 - 5:00 pm

Presented Papers (2 concurrent sessions)

See printed abstracts in section at back of program.

Session C—Chemoprevention/Nutrition

Co-Chairs:

Margie Clapper, PhD

Fox Chase Cancer Center

Gary Goodman, MD, PhD

Swedish Hospital Tumor Institute

3:15 - 3:35 pm

Feasibility of Increasing Vegetable & Fruit Intake for Colon Cancer Prevention

Patricia J. Elmer, PhD

University of Minnesota, Division of
Epidemiology

3:35 - 3:55 pm

Adherence to Aspirin in a Phase I Chemoprevention Trial in Normal Subjects: Implications for Future Chemoprevention Trials

Mack T. Ruffin IV, MD, MPH

University of Michigan, Department of Family
Practice

3:55 - 4:15 pm

Antioxidant Status and the Risk of Mortality in the Nutritional Prevention of Cancer Trial Cohort

Larry C. Clark, MPH, PhD

Arizona Cancer Center, Department of
Epidemiology

4:15 - 4:35 pm

Polyamine Studies of Patients with Cervical Intraepithelial Neoplasia Grade 3 (CIN3) Receiving α -Difluoromethylornithine (DFMO) for Phase I Chemopreventive Trial

Kenji Nishioka, PhD, DMSc

The University of Texas M. D. Anderson Cancer
Center

4:35 - 4:55 pm

Increase in Volume of Nipple Aspirate Fluid During Ingestion of Soy Protein Isolate

Nicholas L. Petrakis, MD

University of California, San Francisco,
Department of Epidemiology

NOTES

March 10, 1995, Continued

Session D—Cancer Screening

See printed abstracts in section at back of program.

Chair: Richard R. Love, MD, MS
University of Wisconsin Comprehensive
Cancer Center; Director, Cancer
Prevention Program; ASPO President-elect

3:15 - 3:35 pm

*Screening and Early Detection of Bladder Cancer in an
Occupationally-Exposed Cohort*

Thomas J. Mason, PhD
Fox Chase Cancer Center

3:35 - 3:55 pm

*The Efficacy of Serum Prostate Specific Antigen (PSA) and
Digital Rectal Examination (DRE) in the Screening and Early
Detection of Prostate Cancer*

Edward DeAntoni, PhD
University of Colorado Health Sciences Center,
Department of Urology

3:55 - 4:15 pm

*Consistency of Mammography Predictors among Low SES
Women*

Maria J. Schymura, PhD
University at Albany School of Public Health,
Department of Epidemiology

4:15 - 4:35 pm

*Use of Standardized Patients in Teaching Clinical Breast
Examination and Performance Evaluation Yielding a Proficiency
Score*

Elizabeth Ann Coleman, PhD
University of Arkansas College of Nursing

4:35 - 4:55 pm

*Physician Intention to Refer FOBT+ Patients for Complete
Diagnostic Evaluation*

Ronald E. Myers, PhD, DSW
Thomas Jefferson University

7:00 pm

Banquet

Speaker: David Zaridze, MD, DSc
Director, Institute of Carcinogenesis
Moscow, Russia

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Saturday, March 11, 1995

7:30 - 8:45 am

Study Group Breakfast Meetings

Women's Health

Organizer: Kathy Helzlsouer, MD, MHS
Johns Hopkins University

Presenter: Anne McTiernan, MD, PhD
Fred Hutchinson Cancer Research Center

Genetic Markers

Organizer: Peter G. Shields, MD
National Cancer Institute, Laboratory of
Human Carcinogenesis

9:00 - 10:40 am

Session E—Plenary Session (highest-ranked papers in each discipline—abstracts at back of program)

Chair: Rodger Winn, MD, The University of Texas
M. D. Anderson Cancer Center

9:00 - 9:20 am

Long Term Effects of a Low-Fat High Carbohydrate Diet on Serum Levels of Sex Hormones in Premenopausal Women

Norman F. Boyd, MD, FRCPC
Ontario Cancer Institute, Division of
Epidemiology and Statistics

9:20 - 9:40 am

Comparison of the Effects of Calorie Restriction on Spontaneous Tumorigenesis in p53-Knockout and Wild-Type Mice

Stephen D. Hursting, PhD, MPH
National Cancer Institute, Laboratory of
Nutritional and Molecular Regulation

9:40 - 10:00 am

Colorectal Epithelial Cell Proliferative Kinetics and Risk Factors for Colon Cancer in Sporadic Adenoma Patients

Roberd M. Bostick, MD, MPH
Wake Forest University, Bowman Gray School of
Medicine

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March 11, 1995, Continued

10:00 - 10:20 am

Effects of Individualized Breast Cancer Risk Counseling: A Randomized Trial

Caryn Lerman, PhD

Lombardi Cancer Research Center, Georgetown University Medical Center; Associate Professor of Medicine; Director, Bio-Behavioral Research

10:20 - 10:40 am

Barriers to Repeat Mammography in Older Women

Marcy A. List, PhD

University of Chicago Cancer Research Center

10:45 am - 12:15 pm

Symposium: *Economics in Cancer Prevention and Control: Promise and Pitfalls*

Chair:

Jon Kerner, PhD

Lombardi Cancer Research Center, Georgetown University Medical Center; Associate Director for Prevention and Control; Associate Professor of Medicine

Economic Implications of Prevention and Control for Health Policy

Judith Wagner, PhD

Office of Technology Assessment, United States Congress; Senior Associate, Health Program

Cost-Effectiveness in Cancer Screening

Jeanne Mandelblatt, MD, MPH

Lombardi Cancer Research Center, Georgetown University Medical Center; Associate Professor of Medicine, Cancer Prevention & Control

Prostate Cancer Screening: A Decision Analysis

Scott Cantor, PhD

University of Texas M. D. Anderson Cancer Center; Assistant Professor of Medicine

Cost-Effectiveness in Chemoprevention

Henry Glick, MA

University of Pennsylvania Medical Center, Division of General Internal Medicine, Health Economist; Leonard Davis Institute of Health Economics; Senior Fellow

Conclusion of Annual Meeting

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ABSTRACTS

ORAL PRESENTERS

Paper Session A - March 9, 1995
Behavioral Science/Quality of Life
Chair: Barbara Rimer, Dr. PH

The Challenge of Interventions in Multiethnic Communities: Breast and Cervical Cancer Screening. Robert A. Hiatt, Rena Pasick. Northern California Cancer Center, Union City, CA.

The Breast and Cervical Cancer Intervention Study (BACCIS) is evaluating the effects of a multifactorial program for underserved women that includes neighborhood outreach, computer reminders and training for providers, and follow-up of abnormal results. Baseline data from a household survey of 1599 women in low-income, minority communities in two San Francisco Bay Area counties provided the opportunity to evaluate screening knowledge, attitudes, and behaviors across race/ethnic groups controlling for calendar time and geographic area. Results revealed that the prevalence of ever having had a mammogram over age 50 years to 91% in white and 89% in black women, but only 43% among Chinese-American women and 78% among Latinas; the prevalence of ever having had a Pap smear was 98% among whites, and blacks, 97% for Latinas, and 56% for Chinese Americans. These rather high rates were not matched by maintenance measures of cancer screening. For example, for mammography over age 50 years only 65% of whites and blacks, 41% over age 50 years of Latinas, and 18% of Chinese women were getting tests on a regular basis. Marked differences were seen for English vs non-English speaking Latinas and Chinese American women (49 vs 27% and 50 vs 8%, respectively). BACCIS Interventions are based on the similarities in barriers, but have tailored aspects of the message for the observed differences across these race/ethnic groups. Outreach workers from the target communities, whose activities are primarily focused on personal woman-to-woman contact, have been a key feature of the intervention. Process evaluation measures suggest that the intervention is having its intended effect, although the program is labor intensive. The broader use of neighborhood outreach prevention services for underserved women needs to be explored.

NOTES

PSYCHOLOGIC OUTCOMES OF PARTICIPATION IN A GENETIC CANCER RISK PROGRAM (Mary Daly, Caryn Lerman, Generosa Grana, Tracy Jones, Colleen Sands, Agnes Masny, Josephine Wagner) Fox Chase Cancer Center, Philadelphia, PA

It is estimated that 5-10% of all cancers are directly attributable to hereditary cancer syndromes. The isolation of genes associated with hereditary cancers will provide more precise tools for determining an individual's risk for cancer. While the availability of molecular genetic tools to assess cancer risk offers an attractive means of directing cancer control efforts to the most appropriate individuals, the psychological risks associated with such an approach have not been fully evaluated. To address these needs, the Family Risk Assessment Program was established at Fox Chase Cancer Center to provide education to families about their personal cancer risk and preventive options, and to develop and test models of counseling and support to accompany genetic risk information. Information preference styles are measured by the Miller Behavioral Style Scale. Participants are followed prospectively to monitor psychological and behavioral consequences of the genetic risk information provided. To date, 197 women with a family history of breast and/or ovarian cancer are available for 12 month follow-up. Perceived risk for cancer at baseline was high, with 71% considering themselves at increased risk for ovarian/breast cancer. Initial psychologic distress levels on the Profile of Moods States (POMS) suggested moderate levels of total mood disturbance (mean 26.1) and scores were high on the Intrusion and Avoidance Scales of the Impact of Events Scale (10.4 and 8.2). One year after undergoing genetic risk assessment, counseling, and risk modulation by preventive measures, risk perception remained stable, but the Intrusional and Avoidance Scales were significantly reduced. An interaction was seen between total mood disturbance and coping styles, with high monitors experiencing a significant decline in mood disturbance ($p=.01$), while high blunters had increased levels ($p<.001$). The implication of these findings for the tailoring of risk messages to information coping styles will be discussed.

PREVALENCE OF MENOPAUSAL SYMPTOMS AMONG WOMEN WITH A HISTORY OF BREAST CANCER AND ATTITUDES TOWARDS ESTROGEN REPLACEMENT THERAPY

Rima J. Couzi MB. BCh., MHS.; Kathy J. Helzlsouer MD., MHS.; John H. Fetting, MD.

Purpose: To determine the prevalence of menopausal symptoms among breast cancer patients, their beliefs about estrogen, and willingness to take it under medical supervision.

Methods: Mail survey of 320 women aged 40-65 years and diagnosed with in-situ or loco-regional breast cancer in 1988-1992.

Results: The response rate was 77%. The prevalence of symptoms among these women was: hot flashes, 65%; night sweats, 44%; vaginal dryness, 48%; dyspareunia, 26%; difficulty sleeping, 44%; and feeling depressed, 44%. The latter two symptoms increased in frequency with increasing severity of vasomotor symptoms (p for trend ≤ 0.001). Overall, 31% of postmenopausal women would consider taking estrogen. Those who perceived that they had experienced a menopausal problem were more likely to consider estrogen than those who did not (42% vs. 22%, $p=0.003$). The proportions willing to take estrogen increased with worsening symptoms, particularly feelings of depression and sleep disturbance (p for trend 0.008 and 0.007, respectively). Awareness that estrogen decreases the risks of heart disease and osteoporosis was not associated with an increased willingness to take it. However, beliefs that estrogen increases the risks of recurrent breast cancer and uterine cancer were associated with a decreased willingness to take it (p 0.003 and 0.08, respectively).

Conclusions: Menopausal symptoms affect the quality of life of breast cancer patients. Clinical trials are needed to determine safe and effective ways of relieving these symptoms.

NOTES

Assessing Intervention Implementation at the Worksite: The Working Well Experience at M. D. Anderson Cancer Center
Robert M. Chamberlain, Ingrid Nielsen, Scott Cummings, James Eldridge, Bill Mann, Ellen R. Gritz, Division of Cancer Prevention, U.T. M. D. Anderson Cancer Center, Houston, Texas.

The purpose of this paper is to assess the level of intervention implementation among the M.D. Anderson Cancer Center experimental and control worksites participating in the NCI Working Well Trial.

Our project involved small worksites in predominantly rural areas in a randomized prospective intervention designed to reduce cancer risk factors (specifically tobacco and nutrition). A multi-level intervention targeted to achieve both individual and organizational change was utilized. Intervention delivery involved worker committees, pre-packaged programs, local community resources and incorporating activities into existing worksite structures (e.g. safety programs). Control sites received a minimal intervention consisting of quarterly mailings of health promotion print materials.

Preliminary results indicate that over twice as many respondents in experimental sites (94%) reported having Working Well programs at their worksite compared to 43% in control sites. In addition, 45 % of respondents in experimental sites compared to 27% in control sites had participated in health promotion activities at their workplace during the two year intervention. For both nutrition and smoking interventions, employees at experimental sites reported higher usage of intervention materials such as self-help booklets, videos and other awareness materials.

Our data indicate that despite limited on-site research staff support, high levels of program awareness and participation were achieved by capitalizing on employee involvement, existing worksite structures and community resources. This approach can be utilized by most community hospitals and medical centers in establishing cancer prevention outreach with local worksites.

DEVELOPMENT OF AN INSTRUMENT TO MEASURE BREAST CANCER ANXIETY. Kathryn M. Kash, Ph.D., Paul B. Jacobsen, Ph.D., Jimmie C. Holland, M.D., Daniel G. Miller, M.D., & Michael P. Osborne, M.D., Strang Cancer Prevention Center & Memorial Sloan-Kettering Cancer Center, New York, NY 10021 & H. Lee Moffitt Cancer Center, Tampa, FL 33612

Women with family histories of breast cancer (two or more first degree relatives) are at a much higher risk for developing the disease than women with no family history. Early detection currently offers the best chance for decreasing morbidity and mortality from breast cancer. Prior work with high risk women indicated that general cancer anxiety interfered with breast cancer screening behaviors. The purpose of this study was to develop an instrument; 1) to measure cognitive and emotional aspects of anxiety about breast cancer, and 2) to examine possible differences in breast cancer anxiety among women who vary in family histories of the disease. The breast cancer anxiety measure consists of 21 items rated on a four point scale from Not at all (0) to Often (3). Data have been collected on 75 women at high risk and 30 women at normal risk (no family history) who are attending screening programs. Cronbach's alpha was 0.90, indicating that the items had excellent internal consistency. We were able to discriminate between high and low risk women on breast cancer anxiety ($p < .03$). Divergent validity was demonstrated by modest correlations with both state and manifest anxiety (0.51 & 0.52, respectively) and convergent validity was upheld by a high correlation with breast cancer worries (0.77). As expected, women at high risk perceived their susceptibility as greater ($p < .0001$) than women at normal risk. However, there were no differences between the two groups of women on other health beliefs (perceived seriousness, benefits, or barriers), intrusive and avoidant thoughts about breast cancer, knowledge about breast cancer and risk factors, and social support. This instrument shows promise as a measure of disease-specific aspects of anxiety. By focusing on breast cancer anxiety rather than general anxiety, it may be possible to plan interventions that target the cognitive and emotional barriers most likely to interfere with early detection behaviors.

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Paper Session B - March 9, 1995

Epidemiology

Chair: Melissa Bondy, PhD

Iron-related proteins and the risk of colonic neoplasia.

Katherine A. McGlynn,¹ Kenneth H. Buetow,¹ Richard Goldstein,² Ellen Haig,³ Douglas Trate,³ & Ira Kelberman³ ¹Fox Chase Cancer Center, Philadelphia, PA 19111; ²St. Mary's Hospital, Langhorne, PA 19047; ³Temple U. Hospital, Philadelphia, PA 19140

Elevated body iron stores have been speculated to increase the risk of colonic neoplasia. We are testing this hypothesis in a case-control study of individuals with colon cancer (n=298), adenomatous polyps (n=47) and no disease (n=274). Serum ferritin, a direct correlate of iron stores, and serum transferrin (Tf), an indirect correlate, are being measured on all participants.

Consistent with the hypothesis, analysis showed that controls had significantly lower ferritin levels (55.9 ng/mL) than either the cancer cases (81.2 ng/mL) ($F=11.3$, $p<.001$) or the polyps cases (88.1 ng/mL) ($F=8.0$, $p<.01$). Unexpectedly, the cancer cases also had significantly higher Tf levels (223.4 mg/dL) than did the controls (187.8 mg/dL) ($F=58.3$, $p<.0001$). After stratification on sex, the female results remained unchanged, higher ferritin ($F=11.8$, $p<.001$) and Tf ($F=31.2$, $p<.0001$) levels were significantly associated with cancer and higher ferritin levels were significantly associated with polyps ($F=3.5$, $p<.001$). The male results found that higher Tf levels were significantly associated with cancer ($F=26.3$, $p<.0001$) while the relationships between ferritin and colonic neoplasia no longer attained significance.

These results may indicate that a general disruption in iron metabolism, rather than simply an increase in iron stores, is related to colonic neoplasia and that the disruption may be more significant in females.

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FAMILY HISTORY AND RISK OF COLORECTAL CANCER. Loïc Le Marchand, Lue-Ping Zhao, Filemon Quiaoit, Lynne R. Wilkens. Cancer Research Center of Hawaii, University of Hawaii, Honolulu, HI 96813.

The authors examined the colorectal cancer risk of first degree relatives of patients with sporadic colorectal cancer, especially as influenced by characteristics of the patient and kinship. They conducted a population-based case-control study of 1,194 incident colorectal cancer cases and 1,194 sex-, age- and ethnicity matched population controls. The study identified 7,605 relatives of cases and 7,778 relatives of controls. Using an estimating equation-based regression method, relatives of cases were found to have a 2.6-fold increased risk of colorectal cancer compared to relatives of controls (95% confidence interval (CI): 1.9-3.1), after adjustment for covariates. This increase in risk was greater among Japanese (OR=3.2, 95% C.I.: 2.0-5.0) than Caucasians (OR=1.9, 95% C.I.: 1.1-3.3), for siblings (OR=3.2, 95% C.I.: 2.2-4.7) than parents (OR=2.1, 95% C.I.: 1.4-3.2), and when the index patient was diagnosed before age 50 (OR=6.3, 95% C.I.: 1.7-23.1) or with a cancer of the right colon (OR=3.4, 95% C.I.: 2.2-5.3). The increase in risk was not affected by the relative's gender. Relatives of cases were not at increased risk for other common cancers. Colorectal cancer clearly aggregates within families and, hence, having an affected relative is indicative of a higher risk for the disease. Characteristics of the index case, such as age at diagnosis, subsite of the tumor and race, as well as kinship, should be considered when assessing the colorectal cancer risk of a relative. These results may also have some implications with regard to genetic mechanisms, as well as presymptomatic genetic testing for the disease.

Estrogen replacement therapy and adenomatous polyps: the Minnesota CPRU case-control study. Potter, J.D.*, Bostick, R., Grandits, G., Fosdick, L., Elmer, P., Wood, J., Grambsch, P., Louis, T.A. U of MN, Minneapolis MN 55454 and Digestive Healthcare PA, Minneapolis MN 55404. *Now at Fred Hutchinson CRC, Seattle WA 98104

Aspects of reproduction have been implicated in the etiology of colon cancer although the data are not entirely consistent. Use of exogenous steroids, both oral contraceptives and ERT, has also been associated with lower risks of colon cancer. In order to explore these variables in the etiology of the precursor lesion, adenomatous polyps, a case-control study was undertaken by the Minnesota Cancer Prevention Research Unit (CPRU). In a study of women, a total of 219 colonoscopy-proven first incident cases, 438 colonoscopy-negative controls, and 247 community controls (frequency-matched on age and zipcode) were enrolled over 36 months. The cases had similar parity histories to both groups of controls. Age-adjusted odds ratios (OR) and 95% CI for AFB \geq 26 years vs. <20 years = 1.3 (0.7-2.2); 0.6 (0.3-1.2) vs. colonoscopy-negative controls and community controls, respectively. Oral contraceptive use was unrelated to risk when cases were compared with either control group; OR for ever- vs. never-users = 1.2 (0.8-1.8) and 1.3 (0.9-2.1) for the 2 control groups, with little evidence of differences by duration of use. On the other hand, ERT use was associated with a reduced risk of adenomatous polyps when comparing cases with colonoscopy-negative controls (OR = 0.6 (0.4-0.8) for ever- vs. never-use) and less markedly when comparing with the community controls (OR = 0.8 (0.6-1.2)). Some aspects of hormonal metabolism or some factor associated with the lifestyle of those using ERT are important in reducing the risk of adenomatous polyps.

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Associations of diet and vitamin supplements with adult brain cancer. Lee, Marion, Wrensch, Margaret, Miike, Rei. University of California, San Francisco, CA 94143.

To investigate associations of dietary components, especially N-nitroso compounds and vitamin supplements with adult onset brain cancer, this preliminary report compares dietary data for the first 100 adult malignant glioma cases with 100 frequency age, gender, and race matched controls from our ongoing population based study in the San Francisco Bay Area. Histologically confirmed cases newly diagnosed between July 1, 1991 and April 30, 1994 were identified through the regional cancer registry's rapid case finding system. Controls were obtained through random digit dialing. A self-administered questionnaire asked consumption frequency of 79 food items and vitamin supplements during the previous year for controls and the year before diagnosis for cases. The items were modified from Block's questionnaire. Because brain cancer is often debilitating, 30% of cases' questionnaires were completed by proxies. Consequently, here we report findings using the selfreporting cases and matched controls. Cases reported higher weekly intake of bacon*, cured meats, red meats, cured fish, dairy products, eggs, complex carbohydrates, soups, beer, other alcoholic drinks, and overall nitrite and lower intake of poultry, fish, carotene and vitamin c rich fruits and vegetables, other fruits, nuts, high fiber carbohydrates*, and overall nitrate than controls; (*=t-test $.05 < p \leq .10$). Cases were less likely than controls to report use of vitamin supplements for multiple vitamins, C, A, and D (odds ratios were .8, .4, .4, and .5 respectively; statistical significance (chi-square $p=.02$) was noted for vitamin C). These results support previous studies suggesting a protective association of vitamin supplements, especially vitamin C, with malignant glioma.

Aspirin and other nonsteroidal anti-inflammatory drugs and risk of colorectal adenomatous polyps among endoscoped individuals. Maria Elena Martínez, R. Sue McPherson, Bernard Levin. Harvard School of Public Health, Boston, MA, University of Texas School of Public Health and University of Texas M.D. Anderson Cancer Center, Houston, TX

Most epidemiologic evidence supports the inverse association between use of aspirin and other nonsteroidal anti-inflammatory drugs (NSAIDs) and colorectal cancer. Few studies have investigated the relation between use of aspirin and other NSAIDs and adenomatous polyps, which are precursors of colorectal cancer. We examined the association of adenomatous polyps and the use of aspirin and other NSAIDs in a case-control study of dietary risk factors for colorectal adenomatous polyps. The study population comprised individuals who underwent an endoscopy at a collaborating gastroenterology clinic in Houston, Texas. Face-to-face interviews were conducted to obtain risk factor data which included information on frequency and duration of use of aspirin and other NSAIDs. The multivariate odds ratios for individuals who took aspirin and other NSAIDs on a weekly basis, and for those who took these once per day or more were 0.77 (95% CI, 0.39-1.55) and 0.36 (95% CI, 0.20-0.63), respectively, compared to the non-users. Duration of use of aspirin and other NSAIDs was also inversely associated with the risk of adenomatous polyps, but a dose response was not observed. The results of this study suggest that aspirin and other NSAIDs are associated with a decreased risk for sporadic adenomatous polyps.

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Paper Session C - March 10, 1995

Chemoprevention/Nutrition

Co-chairs: Margie Clapper, PhD
Gary Goodman, MD, PhD

Feasibility of Increasing Vegetable & Fruit Intake for Colon Cancer Prevention. Patricia J. Elmer, Lisa Fosdick, Theresa M. Tharp, Stephanie A. Smith, Brian Laing, John Potter. University of Minnesota, Division of Epidemiology, Minneapolis, MN

Vegetables & fruit (V&F) are associated with lower colon cancer risk. The protective effect of V&F may act through changes in levels of nutrients or other phytochemicals (antioxidants, fiber, indoles, phenols, etc), gut physiology, or hormone levels. Recent conflicting data on the efficacy of antioxidant supplementation for cancer and cardiovascular disease prevention has heightened the need to investigate the effects of V&F intake separately from the study of nutrient supplements. A one year randomized clinical trial of increasing V&F intake was conducted in pathology confirmed adenomatous polyp patients. Men and women aged 30-74 were randomized to: Diet (n = 100) or Control (n = 101). The Diet group increased V&F intake to > 8 servings per day. Changes in V&F intake, acceptability of the diet, serum levels of antioxidants and colonic cell proliferation were evaluated. Comparison of treatment group differences at 1 year showed the Diet group ↑ V&F intake to 11.5 serv/day (p=0.0001) and ↑ V&F high in β-carotene to 0.8 serv/day (p<0.002), while no changes occurred in the Control group. Serum levels of total carotenoids, β-carotene, α-carotene, and lutein were all significantly ↑ in the Diet group as compared to the Control group. For example, total serum carotenoid levels ↑ 9.8 μg/dl in the Diet group, while the Control group showed a decrease of 1.3 μg/dl (p<0.002). Lycopene and cryptoxanthine increased in the Diet group but were not significantly different from the Control group. No between group differences were observed in serum tocopherol levels. These data support the reported diet changes and indicate the magnitude of serum antioxidant changes possible by increasing fruit and vegetable intake. These diet changes were well accepted. No side effects were observed. Strategies used to ↑ V&F will be reported. Results indicate that major changes in V&F intake can be achieved and maintained over time.

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Adherence To Aspirin In A Phase I Chemoprevention Trial In Normal Subjects: Implications For Future Chemoprevention Trials. Burney KD, Krishnan K, Ruffin MT, Brenner DS. Departments of Internal Medicine, and Family Practice, University of Michigan Medical School, Ann Arbor, MI 48109 and VA Medical Center, Ann Arbor, MI 48105.

Purpose: Adherence to regular drug intake is essential in determining the efficacy of chemopreventive agents. The purpose of this study was to determine the adherence of healthy subjects to a single daily dose of aspirin. **Methods:** Sixty-five healthy subjects were recruited to participate in a study of aspirin's affect on rectal epithelial prostaglandin levels. The study involved taking a single daily dose of aspirin or placebo for 14 days along with completing serum collection and rectal biopsies. Participants were informed that their adherence would be monitored by self-report (SR) and medication event monitoring system (MEMS). MEMS prescription bottles are normal appearing bottles that contain a pressure activated microprocessor in the cap. Each opening is recorded as a presumptive dose, listing the date, time and duration of opening for later retrieval. The subjects were instructed to take the dose daily at a specified time for 14 days. **Results:** Data on 62 subjects (32 female, 30 male, mean age 27.4 years) were analyzed. Subjects were defined as nonadherent if they took the drug less than 80% of the prescribed time. By SR, 8/62 (13%) had at least one missed dose and 43/62 (70%) had dosing interval errors. By MEMS, 19/62 (31%) had missed doses and 52/62 (84%) had dosing interval errors. Only 9/62 (14%) subjects completed the entire trial taking every dose \pm 2 hours of the chosen time. 13/62 (21%) subjects took doses beyond 14 days of treatment. **Conclusions:** Normal, paid, subjects failed to be completely adhere to a daily single dose for a short duration trial. SR tended to overestimate adherence. Dosing interval errors are more likely than missed doses. The percentage of nonadherent subjects varies with the definition of adherence. Objective monitoring and behavior modification will be required to improve adherence in long-term chemoprevention trials. (Support: NCI CN-15336 and PHS GCRC MO1RR00042)

ANTIOXIDANT STATUS AND THE RISK OF MORTALITY IN THE NUTRITIONAL PREVENTION OF CANCER TRIAL COHORT

Larry C. Clark, Mary E. Reid, Gerald F. Combs Jr., Bruce W. Turnbull, Gloria F. Graham, Cameron L. Smith, J. Richard Allison Jr., Earl Gross, Beverly Sanders Jr., Jack L. Leshner, J. Richard Taylor, H. Kim Park, Renee Glover, Jim Chow, and Dan L. Chaulker.

The Nutritional Prevention of Cancer Trial is a double blind cancer prevention trial which utilizes the trace element selenium as the intervention agent. The trial population of 1738 patients has a history of non-melanoma skin cancer and resides in the low Se region of the eastern coastal plains of the U.S. Prior to randomization, plasma samples were obtained in order to assess baseline concentration of plasma selenium, alpha tocopherol, gamma tocopherol, beta carotene and retinol. The plasma was collected in heparinized vacutainers and stabilized for the vitamin assays was with propyl gallate prior to freezing. Samples were stored at -75°.

This investigation is limited to 4,331 person years of observation for the 874 patients in the placebo group. This interim analysis utilizes the first 459 patients with valid antioxidant assays, including 88 of the 143 reported deaths. The univariate analysis suggests a 36% decreased risk of mortality (RR=0.64, p=.04), with multivariate adjustment the decreased risk of death is 20% (RR=0.80, p=.12) in patients with above the median concentration of α tocopherol. No significant associations with mortality were observed for plasma retinol, β carotene or γ tocopherol.

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Polyamine studies of patients with cervical intraepithelial neoplasia grade 3 (CIN3) receiving α -difluoromethylornithine (DFMO) for phase I chemopreventive trial. Kenji Nishioka, Alejandro B. Melgarejo, Rosanna R. Lyon, and Michele F. Mitchell
The University of Texas M. D. Anderson Cancer Center, Houston, TX, 77030

CIN3, the most advanced premalignant cervical dysplasia, is a precursor of invasive cervical cancer. Polyamines play critical roles in cell growth and transformation; ornithine decarboxylase (ODC), a key enzyme in polyamine biosynthesis, is a protooncogene crucial for regulation of these roles. Thus, we are utilizing DFMO for a chemopreventive trial for CIN3, evaluating patients for changes in polyamine metabolism as an intermediate marker of DFMO effect. A preliminary study showed that several mg of cervical biopsy tissues contain detectable levels of ODC activities and polyamines. Additionally, the presence of cadaverine suggested bacterial contamination of tissues. For this reason, biopsies were rinsed prior to freeze storage. Patients were then treated with deescalating dosages of DFMO (1-0.06 g/m²/d, 3 patients/dose) for 1 month. DFMO was measurable in all postdose plasma samples. RBC (blood polyamine carrier) putrescine levels were mostly decreased relative to predose samples. Spermidine/spermine ratios in biopsy tissue were consistently decreased only at 1 g/m²/d dose, indicating consistent tissue effect of DFMO at this dose. N¹-acetylspermidine, a product of spermidine/spermine acetyltransferase, was detectable only in abnormal tissues, not in normal tissues. These results indicate that polyamine metabolism is an effective marker in analyzing DFMO effects in this chemoprevention trial.

Increase in Volume of Nipple Aspirate Fluid During Ingestion of Soy Protein Isolate. Nicholas Petrakis, UCSF; San Francisco, CA 94143-0560; Stephen Barnes, Departments of Pharmacology and Biochemistry, University of Alabama, Birmingham, AL 35294.

We sought to determine if ingestion of soy protein isolate influenced breast secretory activity in normal pre- and postmenopausal women. The consumption of soy foods, rich in the isoflavones genistein and daidzin, reportedly has protective effects against breast cancer, but no studies have reported any measurable influence of soy on breast gland function. At monthly intervals for 12 months, 24 white women, ages 30 to 58, underwent nipple aspiration, and gave blood and 24-hour urine samples for biochemical studies. No soy was administered in months 1-3 and 9-12. From the 3rd to 9th months, the women ingested 40 grams of soy protein isolate daily. The volume of nipple aspirate fluid (NAF) obtained and the concentration of specific NAF biochemical constituents were used as quantitative markers of action of soy protein.

Compared with NAF volumes obtained in months 1-3, an increase in NAF volumes occurred in all premenopausal women, ranging from a 50% to a ten-fold increase by the 9th month. Minimal or no response was observed in postmenopausal women not using menopausal E₂. Menopausal E₂ use was associated with increased NAF volumes, similar to premenopausal women.

Genistein is an estrogen agonist and antagonist with about 1/1000 the activity of estradiol. Large intakes of soy may increase NAF volume, possibly by its estrogenic influence on prolactin secretion or a direct effect of genistein on breast epithelium. Repeated monthly NAF sampling may directly induce prolactin release from the pituitary gland. Our biochemical studies may explain these mechanisms.

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Paper Session D - March 10, 1995

Cancer Screening

Chair: Richard Love, MD, MS

SCREENING AND EARLY DETECTION OF BLADDER
CANCER IN AN OCCUPATIONALLY-EXPOSED COHORT.
Thomas J. Mason, Ph.D., Alicia B. Anderson, B.A., Kathleen
Lee, R.N.

This screening study has evaluated a home self-testing protocol for microscopic hematuria as a method of early detection of bladder cancer among chemical workers exposed to a known bladder carcinogen. The study also serves as a medical monitoring program to these workers who were exposed through the manufacture, packaging, or formulation of a pesticide used on cotton crops. A total of 618 workers from manufacturing sites have enrolled in the program. On an annual basis, workers have tested their urine at home for the presence of blood for 14 consecutive days using the Ames Hemastix®. As part of the annual testing, a special urine specimen collection system has been piloted. This system (CytoShuttle®) allows for 1) the collection and processing of urine specimens at sites which are distant from the reference laboratory, 2) marked improvements in processing [stable at room temperature], and 3) the facilitation of assaying for soluble tumor markers. Comparisons with standard laboratory procedures have found this system markedly superior. Compliance with this study has been high: 79% returned for rescreening in the second annual wave; 76% complied with dipstick self-testing. Two hundred twenty-three have been found to have hematuria or abnormal cytology in the first annual screening cycle. Two new cases and one recurrent case of transitional cell carcinoma of the bladder have been detected by this screening protocol. Other serious urologic conditions that have been diagnosed include: BPH (41), calculi (8), renal cyst (8), urethral stricture (7), cystitis (6), prostatitis (5), and bladder outlet obstruction (2). These results support self-testing as an acceptable means of screening and early detection of bladder cancer in an occupationally-exposed workforce. The approach taken is transportable to worksites which do not have in-house clinical support.

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THE EFFICACY OF SERUM PROSTATE SPECIFIC ANTIGEN (PSA) AND DIGITAL RECTAL EXAMINATION (DRE) IN THE SCREENING AND EARLY DETECTION OF PROSTATE CANCER (CaP). Edward DeAntoni; E. David Crawford, University of Colorado Health Sciences Center. Denver CO

Purpose: To establish efficacy parameters for CaP screening and early detection, including positive predictive value, acceptable cancer detection rates for PSA and DRE separately and together in the early detection of prostate cancer (CaP), and detection of curable cancers.

Methods: Analysis was conducted of data from a community-based longitudinal study of prostate cancer screening. Records of 32,929 men from 148 centers were reviewed.

Results: The cohort was predominantly Caucasian (91.3%) with 4.7% Black, 1.7% Latino, 1.1% Asian. Less than 5% were <50 years of age; 74.2% were aged 50-69; and 21% were 70-79. A total of 6,091 men had abnormal test results: an abnormal DRE only (n=2962); an elevated PSA(>4 µg/mL) only(n=2496); or both (n=633). In the entire cohort, 9.5% of men had an elevated PSA, 10.92% a suspicious DRE, and 18.5% either or both. 1,288 biopsies (Bx) were performed for a Bx rate of 21.2%. DRE detected 63.7% of cancers (200/314); PSA detected 77.7% (244/314). 22.3% of cancers were detected solely by DRE, and 36.3% solely by PSA. The positive predictive value (PPV) for DRE was 25%; PPV for PSA, 32%; PPV for DRE or PSA, 24.4%; and PPV for DRE and PSA, 47.1%. The cancer detection rate for DRE is 2.87%, for PSA 3.5%, and for DRE or PSA is 4.51%. Of pathologically-staged cancers, 89% were organ-confined (Stages A and B).

Conclusions: While a reduction of mortality is the standard measure of screening efficacy, the effectiveness of DRE and PSA to detect curable prostate cancer has been firmly established by smaller clinical studies and large community-based programs. This study more accurately represents community practice in terms of its patterns of follow-up care for abnormal test results and its Bx rate.

CONSISTENCY OF MAMMOGRAPHY PREDICTORS AMONG LOW SES WOMEN. M.J. Schymura, G.R. Harper, M.S. Baptiste, J. Crucetti, C.G. Blanchard

Predictors of mammography use (ever/never, within last two years) were examined in two urban, low SES communities. Baseline (n=473) and follow-up surveys (n=216) were conducted 1-2 years apart by community health workers to assess mammography utilization and changes in use. At baseline, black women were more likely than whites to have ever had a mammogram (OR=2.5) and to have had a recent mammogram (OR=1.9). Age and education did not predict mammography utilization. Multivariate analyses indicated that recent well care visit, recent clinical breast exam (CBE), and having a doctor or clinic talk about mammography were all independent predictors of mammography recency for both blacks and whites. Among black women, mammography recency was also influenced by attitudinal factors and medical coverage. Recent CBE and having a doctor or clinic talk about mammography remained important predictors of mammography recency for all women interviewed at follow-up. Among women who reported never having had a mammogram at baseline, all women who received their first mammogram between the two surveys, reported that a health care provider discussed mammography with them and that they would have a mammogram if a doctor recommended one. They were also more likely (OR=3.8) to have had a recent CBE than were women who never had a mammogram. Among women who at follow-up still reported never having had a mammogram, fear of radiation, having no time, and agreeing with the statement "I would never go for a mammogram" were significant barriers. The results of these surveys reinforce the importance of targeting cancer screening interventions at health care providers.

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Use of Standardized Patients in Teaching Clinical Breast Examination and Performance Evaluation Yielding a Proficiency Score. Elizabeth Ann Coleman, Ph.D., R.N.P.; Jeanne Keel Heard, Ph.D., M.D.; University of Arkansas for Medical Sciences, Little Rock, AR 72205

The most common use of standardized patients (SPs) in medical schools is in training students in breast and pelvic examination. At UAMS, the role of SPs was expanded to teach risk factors for breast cancer and screening recommendations in addition to clinical breast exam. These SPs learned a clinical scenario in which a woman presented to the clinic for a breast exam and was concerned about breast cancer. The student had to interview her regarding her past medical history, delineate risk factors, and make recommendations for breast cancer screening. One group of students was instructed in the CBE by the SPs. A second group of students learned CBE by viewing a videotape and attending a didactic session. During a formal clinical skills examination, each student's proficiency in performing CBE was evaluated using a scoring system developed from a paired comparison study. Twenty-one experts in teaching the MammaCare method of CBE participated in the survey to help in developing the composite measure of proficiency. Students who interacted with the SP had a mean score of 84% compared with 69.6% in the other group indicating that the SPs was an effective way for students to become proficient in CBE and knowledgeable in advising women concerned about breast cancer.

PHYSICIAN INTENTION TO REFER FOBT+ PATIENTS FOR COMPLETE DIAGNOSTIC EVALUATION. R. Myers, PhD, T. Wolf, MA, A. Balshem, BA, E. Ross, ScM, R. Deber, PhD, M. Gerrity, MD, PhD, N. Schlackman, MD.

In Spring 1994, a telephone survey was conducted with a random sample of 517 primary physicians (72% Family and General Practice and 28% Internal Medicine) in Pennsylvania and New Jersey who care for HMO and fee-for-service patients. The survey was done to identify factors associated with physician intention to refer HMO patients 50 or more years of age with an abnormal screening fecal occult blood test (FOBT+) for complete diagnostic evaluation or CDE (either colonoscopy or combined flexible sigmoidoscopy and barium enema x-ray). A total of 375 (72%) physicians completed the survey.

Survey data were collected on physician practice characteristics, sociodemographic background and training, perceptions about screening and CDE, and social influence. Intention to refer patients for CDE was measured using patient vignettes. Only 258 (69%) respondents stated that they would be likely to refer an FOBT+ patient for CDE. This figure is remarkably low, as self reports concerning preventive practices are generally much higher than actual behavior. Multivariate analyses show that intention to refer for CDE was positively and independently associated with whether the physician believes that the benefits of CDE to the patient are likely to outweigh related risks (OR=1.7). Intention to refer was also negatively related to the physician's perception that the CDE process requires too much of his/her time (OR=0.50).

Physician failure to refer FOBT+ patients for CDE could delay detection of early-stage disease, and, thus, minimize the potential impact of screening for older adults. Practitioner concerns about CDE risks and time involved in follow-up appear to be barriers to CDE referral in this population. Research is needed to assess actual CDE referral patterns in HMO and fee-for-service settings, factors related to referral, and methods to increase referral. Patient adherence should also be explored.

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Paper Session E - March 11, 1995

Plenary Session

Chair: Rodger Winn, MD

Long term effects of a low-fat high carbohydrate diet on serum levels of sex hormones in premenopausal women. NF Boyd, L Martin, C Greenberg, G Lockwood, D Tritchler. Division of Epidemiology and Statistics, Ontario Cancer Institute, Toronto, Canada.

Purpose: To examine the long term effects of a low-fat, high carbohydrate diet on serum levels of sex hormones in premenopausal women. **Methods:** Serum levels of sex hormones were measured in participants in a large long term randomized controlled trial of intervention with a low-fat high carbohydrate diet to determine if risk of breast cancer is reduced in high risk subjects. Subjects with extensive mammographic densities are recruited to the trial and randomly allocated to receive either a control group that is given general dietary advice, without specific guidance to reduce intake of fat, or to an intervention group that is given intensive education and advice to reduce dietary fat intake to a target of 15% of total calories. Blood is taken and stored at entry and at annual intervals, and the date of the last menstrual period recorded. Sex hormones were measured in the first 200 subjects to complete 2 years in the trial. **Results.** Of 200 subjects half were in the intervention group and half controls. All subjects were premenopausal and of mean age 42 years. The mean intake of dietary fat in the after randomization was 20% of total calories for the intervention group and 33% for controls.

Two years after randomization serum concentrations in the luteal phase of the menstrual cycle for 44 subjects in the intervention group (I) and 55 controls (C) were as follows: estradiol (I) 264 iu/L and (C) 390 iu/L ($p<0.001$); progesterone (I) 14.8 and (C) 22.4 ($p=0.03$), FSH (I) 43.1 iu/L and (C) 22.8 iu/L ($p<0.02$). There were no differences in any of these hormone concentrations in 57 members of the intervention group and 42 controls sampled in the follicular phase of the menstrual cycle at 2 years. **Conclusions.** These results show that the adoption of low fat high carbohydrate pattern of eating has marked long term effects of serum levels of sex hormones in the luteal phase of the menstrual cycle that may be relevant to breast carcinogenesis and suggest a mechanism by which diet may influence risk of breast cancer.

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Comparison of the Effects of Calorie Restriction On Spontaneous Tumorigenesis in p53-Knockout and Wild-Type Mice. Stephen D. Hursting, Susan N. Perkins and James M. Phang. Laboratory of Nutritional and Molecular Regulation, Division of Cancer Prevention and Control, National Cancer Institute, Frederick, MD.

Transgenic mice with both alleles of the p53 tumor suppressor gene knocked out by gene targeting provide an attractive model for cancer prevention research because they develop tumors (primarily lymphomas and sarcomas) rapidly and spontaneously. We previously showed that calorie restriction (CR) delays spontaneous tumorigenesis in p53-knockout (p53^{-/-}) mice, indicating that CR can modulate tumor development via p53-independent mechanisms. To compare the effects of CR on tumorigenesis in p53^{-/-} and wild-type (p53^{+/+}) mice, tumor development was monitored for 104 weeks in male p53^{-/-} and p53^{+/+} littermate mice (28-30/ treatment group) fed *ad libitum* (AL) or restricted to 60% of AL calorie intake. CR:p53^{-/-} mice experienced lengthened survival ($p=0.0002$) relative to AL:p53^{-/-} mice (time to first tumor-related death=11 versus 8 weeks; median survival=25 versus 16 weeks). CR:p53^{+/+} mice also experienced lengthened survival ($p<0.0001$) relative to AL:p53^{+/+} mice (time to first tumor-related death=60 versus 49 weeks, median survival=99 versus 68 weeks). CR in each genotype, relative to AL feeding, increased the slopes of the survival curves (once tumor-related deaths began to occur) by approximately two-fold and the median times to death by ~45%. No diet-dependent differences were observed in the types of tumors developed; ~80% of mice in each group developed either lymphomas or sarcomas. Thus, while the time required for fatal tumors to develop in p53^{-/-} and p53^{+/+} mice is p53-dependent, the effect of CR, relative to AL feeding, on tumorigenesis was similar in both genotypes. These findings suggest CR modulates tumor development in both p53^{-/-} and p53^{+/+} mice by p53-independent mechanisms and further validate the utility of p53^{-/-} mice as a rapid model for testing cancer prevention strategies.

Colorectal Epithelial Cell Proliferative Kinetics and Risk Factors for Colon Cancer in Sporadic Adenoma Patients. Bostick RM, Fosdick L, Grandits GA, Lillemoe T, Wood JR, Grambsch P, Potter JD, Louis TA.

Colorectal epithelial cell proliferative kinetics are altered in patients at increased risk for colon cancer: proliferation rates (labeling index or LI) are higher and there is a shift of the proliferative zone from one confined to the lower 60% of the colonic crypt to one that includes the entire crypt (higher ϕ_h). To assess factors associated with LI and ϕ_h , we performed a cross-sectional analysis using baseline rectal mucosal biopsies from sporadic adenoma patients participating in a chemoprevention trial. Non-prep biopsies were taken 10 cm above the level of the anus and proliferation was assessed by detection of endogenous S-phase-associated proliferating cell nuclear antigen (PCNA) by immunohistochemical methods. Adequate, scorable biopsies were obtained on 115 patients, and using ANCOVA and multiple linear regression, the LI and ϕ_h were evaluated in relation to diet and other lifestyle factors, demographics, anthropometrics, family history of colon cancer, and polyp history. Statistically significant findings included: 1) The LI for those in the upper vs the lower tertile of vegetable and fruit consumption was, proportionately, 35% lower (3.4 vs 5.3%; $p<.01$); for vitamin supplement users vs nonusers it was 36% lower (3.3 vs 5.2%; $p<.01$); for recurrent vs incident polyp patients it was 36% higher (6.2 vs 4.0%; $p<.01$); and for those with rectal polyps only vs colon polyps only it was 28% higher (6.0 vs 4.3%; $p=.05$). 2) The ϕ_h for those in the upper vs the lower tertile of sucrose consumption was, proportionately, 48% higher (7.1 vs 3.7%; $p=.01$). These results 1) indicate that cell proliferation rates are higher in recurrent adenoma patients than in incident adenoma patients, and in patients with rectal adenomas only vs those with colon adenomas only; and 2) support current hypotheses that a higher intake of sucrose increases, and higher intakes of vegetables and fruit, and vitamin/mineral supplements decrease risk of colorectal neoplasia.

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EFFECTS OF INDIVIDUALIZED BREAST CANCER RISK COUNSELING: A RANDOMIZED TRIAL. Caryn Lerman, Edward Lustbader, Marc Schwartz, Barbara Rimer, Mary Daly, Suzanne Miller, and Colleen Sands.

Specialized programs for individualized breast cancer risk counseling have been initiated in medical centers across the U.S. However, there have not been any empirical studies to evaluate the behavioral or medical impact of providing this information. We are conducting a prospective randomized trial which compares individualized breast cancer risk counseling (BCRC) to general health counseling (control). The subjects are unaffected women ages 35 and older who have a family history of breast cancer in a first-degree relative. Individualized breast cancer risks are calculated based on the regression model developed by Gail et al. (1989). The outcome variables of interest are evaluated via telephone interviews at baseline, 3-months and 12-months post-intervention. The results of logistic regression analysis showed that women who received BCRC were significantly more likely to improve their personal risk comprehension, compared to women in the control condition (OR=3.5, CI=1.28-9.48, $p=.01$). However, BCRC did not improve risk comprehension among women who had high levels of baseline anxiety (p [interaction]=.02). With regard to the psychological impact, BCRC did not produce the anticipated reduction in anxiety in the total sample. However, among women with less formal education, BCRC led to significant reductions in anxiety (time x group x education interaction, $T=4.2$, $p=.04$). The long-term effects of risk counseling on screening behavior are under investigation. We conclude that efforts to counsel women about their breast cancer risks are not likely to be effective unless their breast cancer anxieties are also addressed. This will become increasingly important as DNA-based risk counseling is integrated into the management of women at increased risk for breast cancer.

BARRIERS TO REPEAT MAMMOGRAPHY IN OLDER

WOMEN. Marcy A. List, Greg A. Sachs, Chris Ritter-Sterr, M.S., R.N., Amy Siston, B.S., Alicia Toledano, Sc.D. Univ. of Chicago

The primary objective of this study was to assess barriers to repeat screening mammography among older women. A short, knowledge and attitude survey was sent to women age 65 or older who had had only one screening mammogram between 1987 and 1993, based on University of Chicago Radiology database. One hundred and sixteen (116) of 189 potentially reachable eligible women completed the survey; 51 women reported having had only one mammogram (Group 1) and 65 reported having had more than one screening mammogram (at other institutions) (Group 2). There were no differences between the groups in knowledge or beliefs; rather the groups were distinguished by organizational, system related factors. Women who were getting mammograms more frequently had physician recommendations, insurance coverage, and were informed of results in person. Overall, knowledge about breast cancer risk and need for regular screening mammography was limited; over 50% believed their risk to be low and over 25% believed that screening was not needed in the absence of symptoms or if a previous mammogram was normal. While findings document the misperceptions and gaps in breast cancer screening knowledge among older women, they suggest that these beliefs may not significantly contribute to low rates of repeat mammography, at least in this population. Physician practice procedures were more important and, in fact, promoted screening in spite of misperceptions. If confirmed in larger, population based studies, these findings suggest the development of interventions targeting health care procedures rather than intensive efforts to change individual beliefs. Supported in part by National Cancer Institute Cancer Center Support Grant, number 3P30CA14599.

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ABSTRACTS

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ABSTRACT: The Establishment of a National Research Network Devoted to the Study of Sociobehavioural Issues Pertaining to Cancer. Fredrick D. Ashbury, PhD, Associate Director, Centre for Behavioural Research and Program Evaluation National Cancer Institute of Canada

In April 1994, the Centre for Behavioural Research and Program Evaluation (CBRPE), National Cancer Institute of Canada issued a request for applications to participate in a national sociobehavioural cancer research network, focussing on five populations of interest: persons being treated for cancer; persons living with cancer; school-aged children and youth; family physicians; and, communities with populations of 10,000 to 50,000 persons. Several factors appear to be related to the success of a research network, including: perception by network members of their ownership of the network; the ability of network members to propose and approve studies for inclusion in the network's research agenda; a commitment to pilot test all study protocol within the network prior to initiating a full-scale study; network members must agree to participate in all studies that are approved by its members; the network must have some ongoing research activity; and finally, a research network must establish and maintain a system of communication among its members, and between its members and the central management committee. This paper describes the development and implementation of a national sociobehavioural cancer research network in Canada.

PREDICTORS OF RETENTION IN A CHEMO-PREVENTION TRIAL. Deborah Bowen, Brenda Cartmel, Gary Goodman, Gil Omenn.

Retention of participants is critical in long-term prevention trials, where the length of follow-up is often several years and the preventive regimen being tested provides no identifiable benefit to individual participants during the course of the study. Little is known about the predictors of retention in trials over years of participation. The Carotene and Retinol Efficacy Trial (CARET) is an ongoing randomized controlled prevention trial to determine the efficacy of beta-carotene and retinol in preventing lung cancer among cigarette smoking and asbestos-exposed healthy individuals. Smaller-scale Pilot studies were conducted to determine the feasibility and safety of the full scale multicenter trial. When the Full-scale trial began in 1989, the active Pilot participants were recruited to form a Vanguard group within the Full-scale study. This presentation includes the predictors of retention for participants in the Pilot study. Heavy smoker and asbestos-exposed individuals were recruited and randomized to either active or placebo condition. Participants were followed every six months for at least 2 years. A total of 1,845 participants was randomized: 816 (44%) were asbestos-exposed participants, and 1,029 (56%) were heavy smokers. Most of the active Pilot participants (79%) made the transition to the Full-scale trial. A higher proportion of heavy smokers became inactive or died during the Pilot study (24%) than did asbestos-exposed participants (17%). Key reasons for becoming inactive include overall health problems, not wanting to come to follow-up visits, and concern about symptoms. Demographic variables, such as marital status and education, and mental and physical health status variables at baseline will be presented as predictors of becoming inactive. These analyses provide an understanding of individual factors that influence participation in prevention trials.

Support for sociobehavioural cancer research when restructuring research programs in tough economic times. Fredrick D. Ashbury, PhD and Peter Shephard, MA, Centre for Behavioural Research and Program Evaluation, National Cancer Institute of Canada, 10 Alcorn Avenue, Suite 200, Toronto, Ontario, M4V 3B1.

Over the past several years the National Cancer Institute of Canada (NCIC) has struggled to maintain all of its programs and initiatives and to balance its expenditures with its revenues. By early 1994 it was evident that minor adjustments would be insufficient. As a result, in April of 1994 the NCIC held a workshop to explore a restructuring of its research programs. The report of this workshop and an accompanying self-administered survey was circulated so that input could be sought widely from members of the cancer research and cancer control communities throughout Canada. The purpose of the survey was to obtain feedback on the proposals to restructure the funding of research awards, including intervention research and program delivery/evaluation (behavioural research). Findings suggest two things: (1) discipline of study influences responses regarding support for behavioural research; and (2) respondents' profiles must be understood as a source of potential bias when interpreting results for policy decisions. This study may indicate that support for sociobehavioural research in cancer declines during tough economic times.

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Impact of silicone breast implants on the lives of women with breast cancer. Elizabeth Ann Coleman, Ph.D., R.N.P.; Patricia J. Thompson, Ph.D., R.N.P.; and Sharon K. Coon, B.S.N., O.C.N., R.N.; College of Nursing, University of Arkansas for Medical Sciences, Little Rock, AR 72205.

Since the 1960s, approximately 260,000 American women have had breast implants following mastectomy as a treatment for breast cancer. Living with concerns about known and potential risks of silicone breast implants, ambiguity of medical advice and physical symptoms, and, in some cases, diagnosed disease, affects these women's quality of life, yet few researchers have studied this issue. This study describes: 1) their concerns and feelings about their breast implants, 2) possible problems with silicone implants they heard about, from what sources they heard these reports, and how they coped with the controversy, 3) problems related to their breast implants, 4) the effect their reported health problems had on a) their activities of daily living, b) relationships with significant others, c) work, d) any other important aspects of their lives, 5) advice they would give other women, their health care providers, and government agencies regarding breast implant surgery. We conducted in-depth telephone interviews, using pilot tested questions, with 820 women, from all regions of the U.S., who reported problems following breast implant surgery to the F.D.A. Respondents were primarily 40 to 69 years of age (92%) at the time of interview, white (95%), married (75%), and educated beyond high school (66%). Analysis of narrative data from the 120 interviewed women who had breast implants following mastectomy for breast cancer will end January 1995. Study results will help health providers care for patients who are considering treatment options and for those coping with problems and concerns related to breast implants.

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Are parents who smoke cigarettes a cause of smoking among their children? A review of the evidence.

Anthony J. Alberg, George W. Comstock,
Mario A. Orlandi

This research was conducted to evaluate and quantify the influence of parents who smoke cigarettes on the smoking behavior of their children.

Data were extracted from reports published from 1959 to 1992, and analyzed by comparing the proportion of children who smoked according to different patterns of parental smoking. Exploration of these data revealed remarkably consistent patterns across studies, showing that compared with children of non-smoking parents, youths who were exposed to any parental smoking were at increased risk of smoking. This risk increased with the number of parents who smoked and the association was stronger for "regular" than "experimental" smoking. Children whose parents had quit smoking were less likely to be smokers than children whose parents still smoked.

The observed pattern of associations is compatible with several of the epidemiologic criteria for inferring causality from observational studies. Parents should refrain from smoking cigarettes for the sake of the health of their children.

The Epidemiology of Non-melanomatous Skin Cancer in
Delta, Egypt

Amr Soliman, Kadry Ismail, Thomas Moon; Arizona Health
Sciences Center, Tucson, Arizona, 85724

The role of constitutional and environmental factors on the risk of non-melanomatous skin cancer (NMSC) was evaluated in a case-control study in Egypt in 1993-1994. The study was conducted on 142 (75 basal-cell and 67 squamous cell) cases of NMSC and two control groups; 147 general population controls and 149 cancer controls. Skin color, compared with dark brown and black-skinned general population controls, showed multivariate odds ratio (OR) of 4.7 for light-browed, and 11.5 for fair-skinned subjects. It also showed OR of 3.8 for light-browed and 10.3 for fair-skinned subjects in comparison with cancer controls respectively.

In relation to sun exposure, compared with mild sun exposure in the general population controls, cases had (OR) of 2.7 for moderate exposure and 13.8 for heavy exposure and (OR) of 5.0 and 11.6 for moderate and heavy sun exposure in comparison with mild sun exposure of cancer controls respectively.

Acute sun reaction showed (OR) of 1.2 for moderate tanning and 3.9 for easy burning of cases compared with general population controls, and 2.1 and 3.1 for moderate tanning and easy burning compared with cancer controls respectively.

Outdoor occupations of cases showed (OR) of 4.9 and 1.8 compared with indoor work of the general population and cancer controls respectively.

In this Egyptian population, sun exposure, skin color, acute sun reaction, and outdoor occupations are the most important risk factors of non-melanomatous skin cancer.

NATIONAL HISPANIC LEADERSHIP INITIATIVE ON
CANCER: *EN ACCION*

Amelie G. Ramirez; Roberto Villarreal, Kipling Gallion; Alfred McAlister; Jose Martí; Eliseo Pérez-Stable; Gregory Talavera; Edward Trapido

Hispanics are insufficiently involved in recent advances in cancer prevention, treatment, and control. They are subject to significant barriers to screening and early detection and, due to cultural gaps, they are often not well-served in clinical care and follow-up. Communication and education efforts for Hispanics/Latinos need to be culturally sensitive and appropriate for the diverse population groups. Health care settings, schools, worksites, and other community settings provide potential channels for involving Hispanic/Latino populations in cancer treatment, control, and prevention.

To accelerate the participation of Hispanic/Latino populations in research and action, the National Hispanic Leadership Initiative on Cancer: *En Acción* was created. The program's aim is to conduct the first comprehensive assessment of risk factors for cancer in all Hispanic/Latino populations and among both men and women. Experts in public health and in medicine, together with grass-roots community-based organizations, are forming a national network to develop programs aimed to reduce these risk factors. The results of a baseline assessment will be presented as a comparison among different Hispanic/Latino populations.

This quantitative structured telephone survey (n=8,903) among different Hispanic/Latino subgroups was performed with the following findings: 1) significant lower rates of mammograms in the border communities; 2) higher rates of tobacco use; and 3) low daily consumption of fruits and vegetables. Process evaluation and media content analysis data has been collected and will be presented. This work will include local demonstration projects and regional dissemination studies and coalition-building/policy advocacy at the local, state, and national level. This program of outreach activities is being implemented in Texas, California, Florida and New York.

Barriers to Cervical Cancer Screening Among Rural Arizona Women

KAMEL ELBELTAGY, ELIZABETH HAHN, AMR SOLIMAN,
THOMAS MOON; Arizona Health Sciences Center,
Tucson, Arizona, 85724

A population based survey was conducted in 1991 to evaluate barriers to cervical cancer screening among women residing in rural Arizona towns, Coolidge and Eloy. A random sample of households was selected from public utility user lists, stratified by ethnicity. Five hundred seventy two eligible households were selected with 509 (89%) agreeing to be interviewed. An interviewer-administered questionnaire was used to obtain cancer screening history and barriers/promoters of cancer screening.

The subjects (253 from Coolidge and 256 from Eloy) ranged in age from 39 to 88 years, 36.1% Anglo, 38.5% Hispanic, 12.8% Latin-American, 4.9% Native-American, 6.9% African-American and 0.6% Asian. Regarding the most often language used, 47.2% spoke English only, 16.7% spoke Spanish only and 26.2% were bilingual. In addition 3.1% only had finished college, 61.7% were not working, 31.0% had a monthly income between \$500 and \$1000 and 57.7% were married or living with male partners.

Using multivariate logistic regression methods, with having Pap smear in the past 2 years as the outcome, hearing about Pap smear ranked the most important factor (OR=5.09, P=0.0003), followed by having health insurance (OR=2.19, P=0.0020). Age less than 60 years (OR=1.95, P=.0016), being non Anglo (OR=1.89, p=.0052) and being better educated (OR=1.75 and P=0.0162) were all significant.

The results showed the importance of knowledge and health education as the most influential factor and its potential to be affected by conventional cancer control interventions.

CERVICAL CANCER RISK FACTORS, KNOWLEDGE AND SCREENING BEHAVIORS AMONG A

SOUTHWESTERN NATIVE AMERICAN TRIBE. A.
Giuliano, M. Papenfuss, J. de Zapien, S. Katowski, V. Davis,
S. Lash. Arizona Cancer Center, University of Arizona,
Tucson, AZ 85716.

The incidence of cervical cancer among Native American women is approximately 2-3 fold higher than rates among white, non-Hispanic women. Factors that may be related to a higher incidence of cervical cancer are low Pap smear participation rates, low rates of follow-up to abnormal Pap smears, and high rates of human papillomavirus infection. Few data exist on cervical cancer risk factors, and screening behaviors among Native American women. We conducted a population-based survey of knowledge, attitudes, beliefs and behaviors (KABB) of cervical cancer among a Southwestern Indian tribe living on-reservation. A total of 559 randomly selected women aged 18 years and older were administered a KABB questionnaire by trained Native American interviewers. Mean age of participants in this study was 45.1 years. Mean age at first intercourse was 18.3 years, with a mean number of lifetime sexual partners of 3.0. Significant differences by age group were observed for mean age at first intercourse. Age at first pregnancy was 19.9 years, with a mean number of live births of 3.8 per woman. A high proportion of women interviewed knew what the Pap smear was (95.3 %), as well as how frequently it should be performed (73.9 %).

Correspondingly, a large proportion of women interviewed self-reported ever having a Pap smear (95.3 %), having a yearly Pap smear (78.8 %) as recommended by the Indian Health Service, and having a follow-up to an abnormal Pap (87.5%). In contrast, a relatively small proportion (19.1 %) of women could identify risk factors for cervical cancer, or had knowledge of when a first Pap should occur (17.5 %). These data suggest the need for educating women, especially younger women, on cervical cancer risk factors and screening recommendations.

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A Cervical Cancer Screening Information and Reporting System (CSIRS) in Ontario: Design, Implementation, Evaluation. LD Marrett, EA Clarke, M Baker, D Whittick, B. Theis. Division of Preventive Oncology, Ontario Cancer Treatment and Research Foundation, Toronto, Ontario, Canada.

Information systems have been identified as essential to an effective cervical cancer screening program. Staged pilot projects for a CSIRS are being conducted in Ontario, a large jurisdiction (10 million people, 1.1 million square kilometres) with fragmented screening services. Pilots are being developed in two regions of the Province: a county in southern Ontario with one major city containing an academic medical centre, good cooperation between hospitals, very rural surroundings, and a low rate of cervical cancer; and a city in northwestern Ontario which is geographically remote, sparsely populated, and has a high rate of cervical cancer. The CSIRS merges data for all screening-related services (cytology, colposcopy, and histopathology) and provides feedback to data providers (for quality control and patient care) and estimates of screening parameters.

Over the 2-year evaluation period the CSIRS is expected to:

1. reduce the number of unnecessary smears;
2. increase knowledge about screened segments of the population, and about screening practices in the study areas;
3. help target and evaluate recruitment efforts in underscreened groups; and
4. improve quality of smear-reading.

Evaluation will also consider cost, utility to data providers, and feasibility of expansion.

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BREAST CANCER KNOWLEDGE AND SCREENING BEHAVIORS AMONG A SOUTHWESTERN NATIVE AMERICAN TRIBE. M. Papenfuss, A. Giuliano, J. de Zapien, S. Katowski, V. Davis, S. Lash. Arizona Cancer Center, University of Arizona, Tucson, AZ 85716.

Although breast cancer mortality rates are significantly higher among Native American women compared with white non-Hispanic women, little data are available on screening rates for this cancer among Native American women. To investigate the self-reported screening rates and knowledge, attitudes, beliefs and behaviors (KABB) for breast cancer, we conducted a population based survey of a Southwestern Indian tribe living on-reservation. A total of 559 randomly selected women aged 18 years and older were administered a KABB questionnaire by trained Native American interviewers. In addition to questions pertaining to breast cancer, the questionnaire included questions on cultural, social and behavioral factors that may be barriers to or facilitate breast cancer screening in this population. The mean age of participants was 45.1 years. The percentage of women who have ever performed a breast self exam (BSE) or have had a clinical breast exam (CBE) were 81.2% and 80.0%, respectively. However, only 38.6% perform BSE and 56.9% have CBE performed according to the ACS recommended schedule. Although 66.0% of women aged 40 and older have heard of mammography, only 45.4% have ever had a mammogram. Only 29.8% have a mammogram performed at least bi-annually. Our data indicate a lack of knowledge with respect to age of initial exams and frequency of breast cancer screening examinations. In addition, we observed the following barriers to breast cancer screening: lack of access to no-cost/low-cost screening mammography, transportation, and difficulties receiving health care through the IHS system. Collectively these data suggest the need for an education intervention to increase breast cancer knowledge and screening practices among this population of Native American women.

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Knowledge, attitudes, and practices related to breast and cervical cancer screening among older low-income African-American women.

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L. Douglas Case, Ph.D., Ramon Velez, MD, MS,
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Bowman Gray School of Medicine, Winston-Salem, NC.

Incidence rates for breast and cervical cancer are highest for women aged 65 and older. This group of women, however, are also less likely to receive appropriate breast and cervical cancer screening. As part of a study aimed at improving cancer screening among African-American women in low-income housing communities, baseline measures of knowledge, attitudes, and practices were obtained. A random sample of 556 women, aged 40 and older, from housing communities in two towns, were surveyed. Approximately half of the sample was under age 65, allowing for a comparison of knowledge, attitude and practices between women over age 65 and women under age 65. Screening rates for having had a Pap smear in the last 3 years were significantly lower among older women (69.4% vs. 84.7%; $p < .001$) while rates for appropriate mammography use were slightly lower among older women (39.5% vs. 48.7%; $p = .10$). Older women were less likely to answer correctly on knowledge variables for both screening tests and had poorer attitudes related to screening. These findings have implications for intervention strategies which are now being implemented in the FoCaS project.

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STRATEGIES FOR INCREASING COMPLIANCE WITH RECOMMENDATIONS FOR EARLY DETECTION OF BREAST CANCER IN AN ASIAN POPULATION

Through fund-raising efforts of the WARRIORS WIVES SAVE LIVES program, mammograms for uninsured, low-income women are available in Alameda County, California.

Mar. 1993 - Dec. 1993 outreach to the Asian Health Clinic in Oakland yielded 51 non-English speaking Asian women receiving screening mammograms at Summit Medical Center, 3 miles from the clinic. Of these, 5 were abnormal and required diagnostic services at the county hospital (Highland General Hospital). Through chart review, it was learned that 2 of these 5, or 40%, did not comply with the recommendation for follow-up.

Jan. 1994 - Sept. 1994: The screening mammograms were scheduled within a block of the Asian Health Services. 69 women were screened in these nine months, with 11 being abnormal. Again, a chart review determined that 2 of the 11, or 18%, did not follow-up at the county hospital, 4-5 miles from Chinatown.

In 10/94, a small grant was secured to hire on-call, bilingual patient advocates to accompany women to the county hospital and serve as interpreters during the Dr. visit/diagnostic procedure. It's anticipated that the intervention of the advocate will increase compliance with the follow-up recommendations to close to 100% and this will be documented.

Factors Affecting Participation in a Mammography Screening Program Among Members of an Urban Detroit HMO. Michael S. Simon, Jennifer L. Coombs, Phyllis A. Gimotty and Robert C. Burack. Michigan Cancer Foundation-Meyer L. Prentis Comprehensive Cancer Center of Metropolitan Detroit, Detroit, MI 48201.

The purpose of this study was to evaluate patterns of health beliefs that would facilitate mammography screening among members of an HMO in Detroit. A 61-item telephone survey was administered to women, 40 years and older, who were due for a mammogram and to whom a reminder letter had been sent 2 weeks previously. The primary outcome measures included the intention to obtain a mammogram in the future, past mammography history and current practice of breast self-exam. Predictor variables included knowledge of screening recommendations, access to health care and health beliefs. Attempts were made to contact 470 women and 202 (43%) interviews were completed. 80% of those not interviewed had absent phone service. Approximately 90% of the respondents were African-American, 61% did not complete high school and 62% were unemployed. Over 70% of the respondents remembered receiving a mammography reminder letter, however only 38% correctly recalled the recommendation in the letter and 7% reported taking the recommended action. Women who recalled what the letter said were more likely to indicate their intention to obtain a mammogram. Prospective follow-up of response to the reminder letter will support identification of barriers and facilitators of mammography screening in this population. The explanation for non-adherence to the reminder letter remains to be determined.

The Effect Of Physician Reminders Upon Mammography Use In An HMO Serving Minority Women in Detroit, MI. R. Burack, P. Gimotty, M. Simon, J. George, A. Moncrease, and P. Dews. Wayne State University, Mich. Cancer Foundation, Detroit, MI

We conducted a randomized controlled trial of patient and physician reminders intended to promote mammography (mamm) among women 40 years of age or older served by 2 sites of an HMO. 2,379 women were randomly assigned to one of four treatment groups: patient letter recommending an HMO visit when mamm-due; medical record reminder (MRR) to prompt physician referral of mamm-due visitors; both; or neither. The majority of enrolled women are Medicaid eligible. Less than 40% had completed mamm in the preceding year. The effect of the MRR is evaluated as differences in mamm rates during the study year. Among the 73% of randomized women who visited during the study year the MRR was unassociated with mamm use at site 1 (44% w/ MRR vs. 43% w/o MRR). The MRR was effective at site 2 (57 vs. 41%, $p < 0.001$). At both sites patient age was also associated with mammography (higher in those 50-64 yrs vs. either younger or older). Site specific logistic regression analysis was employed to examine the independent effects of MRR intervention and the interaction of MRR with other factors. At site 2 the effect of MRR intervention was greatest among women ≥ 65 years of age and for those who had also received a letter reminder. Odds ratios (95% CI) describing the MRR intervention effect size by sub-group follow.

	Age 39-49	50-64	65+
With letter	3.5 (1.8-6.9)	2.5 (1.2-5.4)	10.3 (3.6-30.1)
w/o letter	1.6 (1.0-2.4)	1.1 (0.6-2.1)	4.6 (1.8-12.2)

The MRR can increase mamm use in the study population and by older women in particular, but the effect varies by site. The effect of MRR may be increased among women who are "sensitized" by prior receipt of a letter reminder. Improved impact requires identification of site specific mamm barriers.

Pre-scheduled invitation for screening mammography: who complies?

L. Ore, L. Hagoel, G. Shifroni, G. Rennert. Dept. Community Medicine, Carmel Medical Center & Technion, Faculty of Medicine, Haifa, Israel

Mammography (MMG) is efficient in reducing mortality of breast cancer. Yet, women's compliance with screening MMG in Israel is low. **Aim:** The characterization of own-initiative compliant and intervention-compliant eligible women, in terms of demographic, health behavior and attitude-related variables. **Methods:** Invitations for a pre-scheduled MMG were mailed to 1500 women, ages 50-74, members of a general sick fund in 8 urban Israeli clinics. Data collection included telephone interviews (March-June 1994) with 1183 (79%) of the women and a computerized search of the national MMG program data base for compliance with the invitation and eligibility status (not having been screened within the last 2 years). **Findings:** 384 (26%) women were not eligible as they have had a MMG in the last 2 yrs. 434 (29%) of the eligible women complied. 302 (20%) did not comply and another 380 (25%) could not be classified due to missing data. Reported contact with medical personnel (family physicians and gynecologists) is significantly related to compliance. No differences were found in the demographic and most of the health behavior variables between the compliant (to the pre-scheduled invitations) and the non-compliant women. However, taken together, these 2 groups as a whole were significantly different from the women who had MMG formerly, on their own initiative. **Conclusions:** 1. Pre-scheduled invitations for screening MMG double the number of complying women (from 26% to 52%). 2. Health behavior patterns exhibited by women performing MMG on their own initiative may provide clues for planning an intervention aimed at increasing compliance of all eligible women.

USING HEMOCCULT SENS A IN A POPULATION-BASED SCREENING PROGRAM FOR COLORECTAL CANCER IN ISRAEL

G. Rennert, E. Miron, L. Ore

National K.H. Cancer Control Center, Dept. Community Med and Epidemiology, Carmel Medical Center, Technion Faculty of Medicine, Haifa 34362, Israel.

Colon cancer screening with the use of higher sensitivity fecal occult blood testing (Hemoccult-Sensa) was made available free of charge to all insurees over the age of 50 in a large health insurance institute in Israel in 1992. All test slides (3 consecutive days under proper diet) are being tested in one center to achieve high quality of interpretation. Results of the first 7,500 tests have shown a positivity rate of 4.8% of the tests. Evaluation of the positive results was properly carried out in 73.6%, not properly carried out in 17.3% and refused by 9.1% patients. The evaluation yielded a possible cause for the detected occult blood finding in 42.2% of the positive tests, out of them 35.7% benign tumors and 7.1% malignant tumors. It is judged following these preliminary results that screening using Hemoccult Sensa has the potential of serving as an efficient screening method for the average risk asymptomatic adult population.

A COMMUNITY-ORIENTED FAMILIAL CANCER CONSULTATION SERVICE

G. Rennert, Y. Raz

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Family history is one of the strongest risk factors for cancer. Yet not enough is done with regard to counseling the healthy family members on possible cancer prevention (behavioral, chemical, surgical) and early detection measures. Familial cancer counseling is especially difficult in the Israeli population due to its large proportion of immigrants and Holocaust victims whose family's histories/records are often unknown or unavailable. 604 families were evaluated in our country-wide service during the year of 1993. Of these only 151 were found to meet the criteria of possible hereditary cancer. In a third of the families, no information on the grandparents' generation was available. Most families demonstrated predominance of breast cancers (70%) and colon cancers (35%). 52 (34%) of the families had a pure single cancer clustering and the others demonstrated various tumor combinations. As the genetic basis for most common familial clusters of cancer is not yet well known, it is important to develop policies regarding the proper counseling process for these families.

The recent discovery of genetic mutations relevant to common tumors raises the need for ethical and clinical guidelines for the counseling teams.

EARLY DETECTION OF BREAST CANCER IN ISRAEL

G. Rennert, L. Ore.

National K.H. Cancer Control Center, Carmel Med Ctr, Technion Fac Med, Israel Cancer Association and Ministry of Health, Israel.

The National Israeli Breast Cancer Screening program currently recommends mammography for all women ages 50-74 at two-year intervals. In contrast with the policy of some European countries, women are not personally invited to be screened. In spite of the fact that mammography is provided free of charge to the vast majority of the eligible women, the attendance rate is still very low reaching only 26% of the women in the various age groups. All screening centers are similarly computerized and report to a central follow-up and quality control module of the National Screening program. After screening more than 100,000 women, detection rate of the program has reached the target of 6/1,000 women while maintaining a low recall rate of 4.5%. A marked variability in performance (quality) criteria has been noticed between the various screening centers which led to specific interventions in the outlying units. Central organization of breast screening helps maintain high diagnostic standards country-wide. A general rather than personal invitation to women to attend the program, however, results in a low attendance rate in the 50-74 age group.

THE ISRAELI CHERNOBYL HEALTH EFFECTS STUDY (ICHES)

G. Rennert, S. Shapiro, H.S. Rennert.

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During the years 1989-1994 more than 500,000 immigrants from the former USSR arrived in Israel. Of them, about 50,000-100,000 are estimated to have lived in areas with possible radiation exposure from the 1986 nuclear power plant accident in Chernobyl. The ICHES study was initiated to study the long term health effects of the nuclear accident in these immigrants. About 8,000 exposed immigrants have entered the study group and have provided health information covering the periods before and after the accident and data on length and type of exposure to radiation. A control group was sampled, with age-sex cluster matching, from the cohort of immigrants from Moscow and St. Petersburg (non-exposed areas). These controls are expected to provide the baseline health information unique to an European Russian population. Information from most of the controls is not yet available. Prevalence rates of various benign and malignant tumors and thyroid problems have demonstrated a probable high rate of various thyroid diseases and of overall cancer. As these results are based on self reporting, are still preliminary and uncontrolled, they should be regarded with caution.

A PROFILE OF LATINO PARTICIPANTS IN A PROSTATE CANCER SCREENING STUDY. Edward P. DeAntoni, Colleen Ross and E. David Crawford, Denver CO.

Purpose: To profile demographic, clinical and screening test results of Latino participants (n=1158) in a nationwide longitudinal study of prostate-specific antigen (PSA). Methods: Records of Latino men were extracted from a data base of 55,379 men and analysis conducted.

Results: Only ~3% of a national screening cohort per annum (1989-1993) has been reported as Hispanic/Latino. A 1993 profile of this population (n=1158) exhibits important similarities and differences among racial groups. Mean age was 53 years. Younger Latinos (<65) were as likely to have had a physical exam (65%) and a digital rectal examination (DRE) (60%) within the last two years as all others. More Latinos than other minorities reported never having a DRE. Reported medical history included: prostatitis (11%); benign prostatic hyperplasia (BPH) (17%); prostate surgery (4%); prostate cancer (CaP)(1%); and another cancer (0%). Reported BPH among Latinos rises dramatically by age: 40-49, 9%; 50-59, 17%; 60-69, 21%; 70-79, 27%. Vasectomy was reported by 14%, with highest rates among the 50-59 age group (18.4%). No significant relationship was found between vasectomy and diagnosis of CaP across all ages (p=0.3), which may be related to comparatively low vasectomy rates among the oldest cohorts (60-69 yrs., 14%; ≥70 yrs, 4%). DRE results for Latinos were: normal (56%); abnormal (11%); and clinical BPH (33%). Mean PSA for all Latinos was 1.5 ng/ml (SD=3.0 ng/ml); mean elevated PSA (n=150) was 10 ng/ml. PSA velocity rates were comparable to Caucasians across age groups. Biopsy (Bx) rate was 2.4% (28/1158); +Bx rate (21.4%) was comparable to all others; all +Bx occurred in Latinos ages 50-69.

Conclusions: Risk profiles of Latinos will assist in identifying men who would benefit from prostate cancer screening.

AN AMBI-DIRECTIONAL STUDY OF PSA AND PROSTATE CANCER, Mary E. Reid, R.N., M.S.P.H., Larry C. Clark, M.P.H., Ph.D., and Bruce Turnbull, Ph.D.

Prostate cancer remains the second leading cause of cancer related deaths among males in the United States. Contributing to this high mortality rate is the stage of the disease at presentation. The measurement of Prostate Specific Antigen (PSA) as an intermediate marker for prostate cancer is the subject of several current large scale prospective trials. This screening project utilizes a population of males subjects randomized into a pair of double blind clinical trials evaluating the chemopreventive potential of nutritional doses of selenium. This population was selected based on their risk of non-melanoma skin cancer, independent of their risk of prostate cancer or prostate related problems. Approximately 10,000 person years of follow up has been observed in this population over the last decade.

The PSA screening protocol included the analysis of the most recent plasma sample collected on study patients during routine dermatologic examinations. More than 2000 PSA analyses have been completed on more than 1200 male subjects. Included in these analyses are 287 PSA levels from 37 cases of prostate cancer diagnosed prior to the initiation of the screening protocol. The presentation will describe patients, both with and without PSA levels ≥ 4.0 ng/ml, by summarizing demographic characteristics, previous prostate cancer screening behaviors, and relevant past medical histories.

KNOWLEDGE, ATTITUDES AND HEALTH BEHAVIORS (KAHB) OF MEN IN A PROSTATE CANCER (CaP) SCREENING PROGRAM. Edward P. DeAntoni; Bridget A. Dyer; E. David Crawford.

Purpose: To identify possible areas for psychosocial intervention research by establishing baseline KAHB data.

Methods: A Likert-type scale questionnaire with a 5-level response pattern was administered to 571 men in a CaP screening program. Completion compliance was 87%. Analysis was conducted by age, race, education, and income variables. Results: Participants knew more about general cancer facts than CaP or CaP screening. Knowledge was inversely related to age and differentiated by race. Most (84%) believed CaP screening was proven to save lives. Urethral constriction was recognized as a prostate-related problem by >90%. Two-thirds were able to identify the prostate's basic function (fluid for sperm motility), but 50% thought the prostate also provided hormones for sexual development. Knowledge of treatment options was limited. One-fourth equated CaP surgery with transurethral resection of the prostate; only 50% acknowledged treatment options to surgery. Just 27% agreed that treatments included unwanted side effects. Although 82% felt that sex was an important aspect of their life, a majority (60%) expressed willingness to consider treatments that would compromise sexual functioning. Fewer (particularly younger men) expressed willingness to undergo surgical castration to treat CaP. Most were unsure CaP was curable, but a majority believed they had control over cancer through personal habits and disagreed that cancer always causes death. Men ≥ 70 years and with lower educational levels felt less personal control. Less than 1/3 believed cancer strikes randomly; a majority considered cancer preventable before warning signs appear. Nearly 3/4 reported annual physical examinations, and 57% participate in free screenings. Conclusions: Areas for educational intervention include CaP risk factors, its natural history, and risks and benefits associated with screening and treatment.

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Economic Costs Associated With The Use of Prostate-Specific Antigen (PSA) in Canada

Isra G. Levy, Laurie Gibbons, Howard Morrison

Between 1970 and 1988, Canadian prostate cancer incidence rates increased by 3% per year, while between 1989 and 1992 the rates increased by 10-15% annually. This dramatic change is likely due to the advent of widespread use of the Prostate-Specific Antigen (PSA) test. We estimated the excess number of prostate cancer detected by PSA in 5 Canadian provinces in 1992 and applied associated treatment costs to estimate the direct economic burden attributable to PSA testing in those provinces. A regression equation of the log of the annual number of new prostate cancer cases from 1970-1988 was computed and extrapolated to 1992. The difference between the estimated number and actual number was assumed to be the excess number. Estimated stage-specific proportions were applied to both the excess and expected number of cases and estimated treatment costs associated with each stage were applied. Treatment costs and complication and secondary treatment probabilities were derived from average charges submitted to the U.S. Medicare system in 1988 and the literature respectively. Of the 10,400 incident cases reported in 1992, 23% (2,424) would not have been diagnosed in the absence of widespread PSA screening. The cost of treating those cancers that would not have been detected in the absence of PSA screening was estimated to be \$36 million.

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Incidence of breast and prostate cancer in first-degree relatives of men with newly diagnosed prostate cancer. Pack R, Bondy M, Amos C, Babaian R, von Eschenbach A, Spitz M. UT M.D. Anderson Cancer Center, Houston, TX 77030

A family history study was conducted to determine the incidence of breast and prostate cancers in first-degree relatives of men with newly diagnosed prostate cancer. Detailed personal interviews were conducted with 149 white males with adenocarcinoma of the prostate registered at The University of Texas, M.D. Anderson Cancer Center between March and July 1993. Information was collected on 1,128 first-degree relatives. Analyses included only cancers verified by medical record or death certificate in relatives diagnosed at < 75 years of age. Documentation was received for 114 relatives (90.5%) and 104 cancer diagnoses were verified (91.2%).

Standard incidence ratios were calculated using Connecticut Tumor Registry data. Significant aggregation of prostate cancer was found in brothers but not among fathers. We observed eight cases in brothers where 3.36 cases were expected (SIR=2.38, 95%CI=1.02, 4.68). When the data were partitioned by proband age at diagnosis ≤ 65 years or > 65 years, brothers in the younger age group had an increased risk of prostate cancer (SIR=5.11, 95% CI=1.37, 13.09). These data suggest that familial aggregation based on inherited susceptibility is associated with earlier age onset disease in younger patients and their brothers.

A nonsignificant excess of breast cancer was found in sisters consistent with a co-aggregation hypothesis. We observed 15 cases of breast cancer where 9.92 cases were expected (SIR=1.15, 95% CI=0.84, 2.49). Younger age of onset at proband diagnosis was not associated with increased risk of breast cancer in mothers or sisters. Excess breast cancer was not observed among mothers. (Supported in part by NCI R25-CA57730).

HEALTH KNOWLEDGE AND BELIEFS IN AFRICAN- AND MEXICAN-AMERICANS

Robert M. Chamberlain, Margaret R. Spitz, John Fueger, Karen Suchanek Hudmon; The University of Texas M.D. Anderson Cancer Center, Houston, TX 77030

To explore differences in health beliefs and cancer-related knowledge between African- and Mexican-Americans, a risk questionnaire was administered to subjects participating in a case-control study of lung cancer. Although significant differences between the two ethnic groups were evidenced for many knowledge items, the associations became nonsignificant when adjusted for education. For example, Mexican-Americans were more likely to respond "True" to the statement, "Just about everything causes cancer" ($p = .02$) but this apparent fatalism was more a reflection of the lower level of education than the independent influence of the Mexican-American culture ($p = .30$ after adjusting for education). Outcome evaluations of altering health habits to reduce cancer risk were significantly associated with gender and level of education, with more highly educated females being most likely to disagree with the statement, "Changing my health habits doesn't seem to benefit me enough" ($p = .001$). In summary, existent differences in cancer beliefs and knowledge between African- and Mexican-Americans were largely a function of education in our sample. However, these educational differences also have been reported to exist in the general population of Southeast Texas. Awareness of ethnic differences can better equip researchers and other health care providers to design and deliver health interventions.

Supported by a grant from the National Cancer Institute CA 55769, "Ecogenetics of Lung Cancer in Minority Populations," Margaret R. Spitz, M.D., Principal Investigator.

PARTICIPANTS' PERCEPTIONS OF A COLON CANCER CHEMOPREVENTION TRIAL

Karen Suchanek Hudmon, Cynthia L. Stoltzfus, and Robert M. Chamberlain; The University of Texas M.D. Anderson Cancer Center, Houston, TX 77030

A post-trial assessment of participant perceptions can provide researchers with valuable information about benefits and barriers encountered during the trial. Questionnaires were mailed to participants ($n = 75$; 97% response) at the conclusion of a Phase I colon cancer chemoprevention trial using a calcium intervention. The questionnaire addressed key areas, including: 1) perceived benefits and barriers of participation, 2) likelihood of participating in future trials, and 3) willingness to pay "out-of-pocket" expenses to participate in future prevention trials. The most important perceived benefit was "the possibility of lowering one's chance of getting cancer again," and the most important barrier was "problems with billing." When asked if they would participate in another colon cancer prevention study of a longer duration, 64% indicated that they would "probably" or "definitely" join. However, when asked how much they would be willing to pay to participate, only 22% indicated a willingness to pay out-of-pocket expenses. Results of this study may be applied in future chemoprevention trials to assist in the recruitment of subjects, as well as to reduce attrition by emphasizing salient benefits and minimizing perceived barriers associated with participation.

Ethnic Distribution of the Glutathione S-Transferase μ Null Phenotype. Margie L. Clapper, Katherine A. McGlynn, Gordon R. Pfeiffer, Lynette C. Everley, Jeannine P. McKeogh, Cara Spallone and Stacey Rubin. Division of Population Science, Fox Chase Cancer Center, Philadelphia, PA.

Glutathione S-transferase μ (GST M1) plays a critical role in protecting cells from the cytotoxic damage produced by exposure to highly reactive epoxides. Approximately 50% of the population fails to express this enzyme because of the deletion of the GST M1 gene. Although an association between the absence of the GST M1 gene and increased susceptibility for smoking-related cancers has been suggested, the data remain equivocal.

The present study examines the frequency of the GST M1 null phenotype in East Indians, African Americans, Chinese and Caucasians. Volunteers included healthy employees of the cancer center and members of the community. Eighty-two samples of whole blood were assessed for the presence or absence of GST M1 using an enzyme-linked immunoadsorbant kit (Biotrin International, Dublin, Ireland). The percentage of individuals in each group who possessed the GST μ null phenotype was: East Indians - 40% (N=5); African Americans - 26% (N=42); Chinese - 46% (N=24) and Caucasians - 54% (N=52). A 95% correlation was observed between these phenotypic results and those obtained from PCR-based restriction fragment length polymorphism analyses. Additional investigations are required to determine if the varied frequency of this null phenotype correlates with ethnic differences in susceptibility for specific cancers. (Supported by the McGrorty Foundation.)

THE METABOLIC AND HORMONAL CORRELATES OF BREAST CANCER (Mary B. Daly, Faith Ottery, Tracy Jones, Agnes Masny, Colleen Burke Sands, Doris Gillespie) Fox Chase Cancer Center, Philadelphia, PA

Most of the breast cancer risk factors identified in the epidemiologic literature strongly support a hormonal basis in breast cancer development. Additionally, both animal studies and international comparisons support the interaction of dietary factors and hormone regulation in initiation and/or promotion. A pilot feasibility study was developed at Fox Chase Cancer Center to collect a range of dietary measures to examine the relationship between diet, body composition, hormone levels, and risk for breast cancer in preparation for conducting a larger longitudinal study. Three risk groups were sampled: 16 women with a diagnosis of breast cancer, 18 with a positive family history of breast cancer and 20 normal risk controls. All women completed the Willet Diet Assessment, a weight history form, height, weight, and waist/hip ratio, body composition via Bioelectrical Impedance Analysis and gluteal/abdominal adipose samples. Blood samples were collected for hormone and lipid levels. Age ranged from 26-77 yr with a median of 46 yr. Two thirds of the sample reported dissatisfaction with their current weight, and 40% with their current dietary habits. Significant weight shifts (gain and loss of 10-24 lb. 2 or more times) were reported by 60% of the sample. Although 77% reported receiving dietary advice, only 37% responded that they were aware of which foods were high in fat, 42% were uncertain about the optimal daily fat intake, and 43% were unsure about their own daily fat intake. Measures of weight, waist/hip ratio, and % body fat did not differ significantly by risk group, however there was a trend for higher cholesterol levels in the breast cancer group compared to the other risk groups. Serum hormone levels, and serum and adipose tissue fatty acid profiles will be examined by risk group. This pilot has established the feasibility of obtaining extensive diet and weight information as well as biologic specimens from a spectrum of women, and highlights a widespread need for nutritional education for healthy eating.

Novel Optical Techniques for the Diagnosis of Cervical Pre-cancers: Comparison to Colposcopy. Mahadevan, Anita¹, Ramanujam, Nimmi¹, Mitchell, Michele Follen², Thomsen, Sharon², Malpica, Anais², Wright, Thomas³, Tortolero-Luna, Guillermo², Richards-Kortum, Rebecca¹. University of Texas, Austin¹, UT MD Anderson Cancer Center², Houston, TX, Columbia University, New York, NY³

Objective: Fluorescence and Raman spectroscopic techniques are being studied to diagnose cervical intraepithelial neoplasia (CIN).

Method: Fluorescence spectra were acquired from normal and dysplastic (CIN) human cervical tissues *in vivo* at 337, 380 and 460 nm excitation. One normal and abnormal area from each patient investigated were biopsied and frozen. Raman spectra were collected at 789 nm excitation using a diode laser, spectrograph and CCD camera.

Results: Using a combination of principal component analysis (dimension reduction) and fisher discriminant analysis (classification), fluorescence spectra at 337 nm excitation could differentiate normal from abnormal tissues (sensitivity, specificity, and positive predictive value of 84%, 82%, and 80%, respectively). Fluorescence spectra at 380 nm excitation could differentiate inflammatory tissues from squamous intraepithelial lesions (SILs) with a sensitivity, specificity, and positive predictive value of 80%, 70%, and 70%, respectively. At 460 nm excitation, high grade SILs could be differentiated from low grade SILs with a sensitivity, specificity, and positive predictive value of 75%, 85%, and 75%, respectively. Raman spectra show peaks at 626, 755, 812, 980, 1066, 1185, 1248, 1322, 1454, 1566, 1646 and 1744 cm^{-1} . The peak intensity at 1454 cm^{-1} is lower in abnormal tissues and absent in samples with CIN. The ratio of intensities at 1646 to 812 cm^{-1} is lower in abnormal cervix.

Conclusion: The sensitivity of fluorescence spectroscopy is comparable to colposcopy in expert hands and specificity is improved. Raman spectroscopy may also provide a sensitive method of detecting dysplasia.

PHYSICIAN SURVEY ON OVARIAN CANCER SCREENING (Mary Daly, Generosa Grana, Tracy Jones, Colleen Sands, Agnes Masny, Doris Gillespie) Fox Chase Cancer Center, Phila., PA

Epithelial ovarian cancer is the most common gynecologic cancer in women in the United States, resulting in more than 13,000 deaths each year. As awareness of the familial nature of the disease grows, increasing numbers of relatives of women with ovarian cancer will seek advice about their potential risk, and will create a demand for preventive options. We have conducted a survey of primary care physicians designed to elicit attitudes and preventive practices currently used in the management of high risk women. A total of 210 physicians, 72% of the target group, responded. The median age was 46 yr (29-77 yr). The sample was 72% male, and consisted primarily of family practitioners (27%) and ob/gyn specialists (50%). Male and female physicians were equally distributed among specialty types. All of the respondents reported routinely recording family history information on their patients. Despite the lack of official guidelines, the majority favored some form of screening for ovarian cancer, including 71 (36.6%) who would recommend screening all women regardless of risk. Routine pelvic exam was the method most often chosen (97%), followed by ultrasound (53.2%), and CA-125 level (50.7%). Annual testing was favored by 70%. Attitudes towards primary prevention differed significantly by specialty, with 83% of ob/gyn specialists recommending oral contraceptives as means of protection against ovarian cancer, compared to 41% of all other practitioners ($p > .001$). Similarly, 80% of ob/gyn specialists would consider prophylactic oophorectomy for women with 2 or more affected 1st degree relatives, compared to 60% of their counterparts ($p = .01$). The use of genetic markers to improve risk estimation for ovarian cancer was favored by 93% of the sample. In view of the lack of evidence of the efficacy of current screening modalities for ovarian cancer, the strong support offered by this sample of physicians suggests a somewhat overly optimistic expectation of the value of these tests for current screening practice. These data provide guidance for the development of educational materials directed towards health professionals caring for high risk family members.

AWARENESS OF HEIGHTENED RISK AMONG FIRST-DEGREE RELATIVES OF NEWLY DIAGNOSED BREAST CANCER PATIENTS

Janet Audrain, PhD, Caryn Lerman, PhD & Rebecca Steffens, MPH, Georgetown University Medical Ctr., David Cella, PhD, Rush Cancer Institute, & Barbara Rimer, DrPH, Duke Comprehensive Cancer Ctr.

Purpose: This study had two goals: (a) to determine the proportion of first-degree relatives (FDRs) of newly diagnosed breast cancer patients who are unaware of their elevated risk for breast cancer; and (b) to identify demographic, medical, and lifestyle factors that may contribute to risk awareness. **Methods:** The subjects were 395 women ages 30 to 75 years old who had a family history of breast cancer in at least one FDR. All subjects completed a structured telephone interview. **Results:** 25% of women believed their risk for breast cancer was "the same as or less than" women who do not have a family history of breast cancer, despite the fact that all subjects had an objectively increased risk. In logistic regression analysis, four variables were significant independent predictors of lack of awareness of heightened breast cancer risk. Being African American vs. white (OR=3.7, $p<.05$), current smoking (OR=4.1, $p<.05$), the absence of formal risk notification by a health care provider (OR=.4, $p<.05$), and a later stage of disease in the affected relative were associated with lack of awareness (OR=3.2, $p<.05$). **Conclusions:** Based on these results, it appears important to target smokers and ethnic minorities for risk notification interventions. Psycho-educational programs which offer risk education may enhance adherence to breast cancer screening regimens and increase the likelihood that breast cancer is detected at an early stage.

SKIN SELF-EXAMINATION PRACTICES AMONG MELANOMA CASES AND THE GENERAL POPULATION IN CONNECTICUT

Berwick Marianne, Fine Judith A, Roush George C, Barnhill Raymond B.

Purpose of Study. We conducted a population-based case-control study of skin self-examination practices (SSE) to characterize SSE behaviors among the general population in order to design interventions.

Methods. We identified all newly-diagnosed cases of CMM in Connecticut between January 15, 1987, and May 15, 1989. Simultaneously, we ascertained age- and sex-matched controls through random-digit dialing from the population of Connecticut. Of those subjects eligible, 75 percent of cases participated and 70 percent of controls. In-person interviews and nevi counts were conducted by trained R.N.'s. Measures of SSE were developed.

Results. Skin self-examination was practiced more frequently by those with thinner lesions (NS). Few subjects had ever practiced SSE; however a significantly protective effect was associated with CMM, Odds Ratio 0.72 (95% Confidence Limits 0.52-0.99). The role of physicians and spouses was not significantly associated with CMM. Those who conducted SSE were more likely to be female, younger, better educated, and married.

Conclusion. A low level of SSE among the general population in Connecticut was found: 13.2% among cases of CMM and 17.5% among controls. The protective effect of SSE is consistent with a removal of precursor lesions, or it could be the result of bias.

Effect of Dietary Intervention on Selected Biomarkers

Daniel Sepkovic, Charles Martucci, Barbara Levine, H. Leon Bradlow, George Tint, Susanna Cunningham-Rundles and Daniel Miller; Strang Cancer Prevention Center, Cornell University Medical College, and East Orange, NJ Veterans Administration Hospital.

Twenty-one volunteers participated in a three month study on the effect of a low-fat high fiber diet on selected steroid, bile acid and immunological markers. These were assessed and correlated with dietary food records. Serum testosterone (T) and estradiol (E_2), urinary 2-hydroxyestrone/16 α -hydroxyestrone ratios and chenodeoxycholic acid/ursodeoxycholic acid ratios (c/u) were determined as well as lymphocyte subsets. The individuals who completed the study fell into two response groups (an isocaloric group and a reduced caloric intake group based on dietary food record data). The isocaloric group (n=11) reduced percent of calories from fat by $39 \pm 26\%$ (S.D.) of baseline and increased fiber by $49 \pm 28\%$. The reduced caloric intake group (n=10) exhibited percent fat reduction of $26 \pm 26\%$ and increased crude fiber by $24 \pm 86\%$. In the isocaloric group, increase in percent fiber was associated with slight decreases in T and E_2 . Estrogen metabolite ratios (2-/16 α -hydroxyestrone) increased in both groups ($18 \pm 39\%$ and $25 \pm 45\%$ respectively). Modest increases in the ratio of serum bile acids (c/u) were observed in both groups. No between group differences were observed in lymphocyte subsets. Changes in serum steroid levels are consistent with prior nutritional intervention studies. Further studies using chemically defined diets are underway.

Simultaneous detection of the relative levels of transcripts of multiple DNA repair genes by reverse-transcriptase polymerase chain reaction (RT-PCR) Qingyi Wei, Xudong Xu, Randy Legerski, and Francis Ali-Osman. The U.T. M.D. Anderson Cancer Center, Houston, TX 77030

Genotypic and phenotypic defects in DNA repair genes vary from individual to individual and are reflected in their expression. Such defects are implicated in the development of cancer in certain genetic disorders. **Purpose:** To simultaneously measure and evaluate the relative levels of transcripts of multiple DNA repair genes in cultured lymphocytes using quantitative reverse-transcriptase polymerase chain reaction (RT-PCR). **Methods:** RT-PCR was used to measure the relative levels of transcripts of four DNA repair genes: ERCC1, XRCC1, XPC, and hMSH2 in lymphoblastoid cell lines. Random primers were used for the RT reaction. PCR was performed using pairs of primers unique for each gene and chosen for optimal PCR in terms of the required annealing temperatures and minimum dimer formation. The PCR product of each gene was confirmed by direct sequencing. β -actin gene was used as an internal control for RNA degradation, DNA contamination, as well as a reference for quantitating the levels of transcripts. **Results:** The conditions chosen for PCR reactions generated distinguishable and measurable levels of the transcripts of each of the four target genes in a single reaction tube. The levels of transcripts of the target genes could be measured with as little as 10^6 cells. Cell lines deficient in DNA repair had lower levels of the relevant gene transcripts than repair proficient cell lines and the levels varied among normal cell lines. **Conclusions:** We described a RT-PCR technique that is efficient and allows simultaneous quantitation of the expression of multiple DNA repair genes in the same sample. This approach may facilitate the screening for germline alterations or defects in target genes. It has the potential to become a biomarker for identifying individuals at increased risk of cancer.

Mutagen Sensitivity and DNA Repair in Patients with Triple Primary Cancers

Daniel G. Miller, Raj Tiwari, T.C. Hsu; Strang Cancer Prevention Center, New York, NY and M.D. Anderson Cancer Center and Tumor Institute, Houston, TX

Mutagen sensitivity and DNA repair deficiencies have each been associated with cancer susceptibility syndromes. In this study both mutagen sensitivity and DNA repair assays were carried out in patients with three primary cancers accessed from tumor registries. Twelve patients were studied, five males (ages 25-74) and seven females (ages 57-82). Six of the seven females had colon cancer associated with breast or ovarian cancer plus a third primary. No pattern emerged among the males; however, one male (age 30) had colon cancer associated with testicular cancer and melanoma. DNA repair capacity was determined by the ability of peripheral blood lymphocytes (PBL) to repair UV light-induced damage to a plasmid-bearing chloramphenicol acetyl transferase gene. The mean repair value for controls was 92.23 ± 8.12 and for patients 60.40 ± 9.75 . By the Wilcoxon signed rank test the two-tailed probability value was, $p=0.0117$. Mutagen sensitivity in PBL was determined by the number of breaks per cell after incubation with bleomycin and with 4-nitroquinoline-1-oxide (4-NQO). For bleomycin sensitivity, 7 of 12 patients tested and for 4-NQO sensitivity, 5 out of 12 patients tested had increased sensitivity compared to a pre-established set of normal values. DNA from these patients is currently being studied for mismatch repair genes.

AFB1-Albumin Adduct Levels in Two Populations at High Risk for Hepatocellular Carcinoma (HCC). Alison A. Evans, Tianlun Zhou, Margie L. Clapper, Christopher P. Wild, Babacar Dramé, Fu-min Shen, Gong-chao Chen and W. Thomas London. Fox Chase Cancer Center, Philadelphia, PA

Aflatoxin B1 (AFB1), a hepatotoxin, and chronic infection with hepatitis B virus (HBV) have been implicated in the etiology of HCC. We evaluated serum AFB1-albumin adducts (Wild, *Carcinogenesis* 11:2271, 1990), a measure of >1 month exposure to AFB1, in relation to markers of chronic HBV infection in 2 HCC endemic areas. The first group of serum samples were collected from 38 healthy male Army recruits (22 HBV carriers), age 20-22, in a training camp in Senegal. All subjects ate the same diet. Samples were drawn in November, a low season for AFB1 exposure. All had detectable adducts [mean (\pm s.d) $23.5 (\pm 6.4)$ pg AFB1/mg-albumin, range 8.8-42.6].

The second samples were from 86 male residents (53 HBV carriers) of Haimen City, Jiangsu Province, China, age 25-55, drawn between February and May, a moderate to high season for AFB1 exposure. 66 samples (76.7%) had detectable adduct levels (≥ 5 pg/mg-albumin); the mean among those with detectable levels was $18.5 (\pm 8.5)$ pg/mg-albumin. There was no difference in either population in mean levels between subjects who were HBV carriers vs. non-carriers, or, among carriers, those positive or negative for HBV DNA. No other potential explanatory variables examined within populations accounted for differences in adduct levels. In the Senegalese population, the range of adduct levels was very broad despite all men eating the same diet. Although differences between the two populations must be evaluated cautiously, very high levels of exposure are present in Senegal even in the low season of the year, and such exposures may be higher than those in Haimen, one of the world's highest HCC incidence areas. Studies of seasonal, geographic, and genetic determinants of AFB1 exposure are needed to devise feasible preventive strategies.

HUMAN PAPILLOMAVIRUS (HPV) AND CERVICAL NEOPLASIA IN BLACK WOMEN, P Kanetsky, J Mandelblatt, Z Zhang, E Ramsey, S Matseoane, N Lazaro, H Felton, and the Harlem Study Team

Background: Despite national decreases in cervical cancer rates, Black women continue to have elevated incidence and mortality compared to White women. To date, few studies have examined risks for this cancer among Black women.

Objective: To assess the association between HPV infection and cervical neoplasia and to determine the prevalence and types of HPV.

Design: Case-control design comparing women with histology-proven incident cervical neoplasia to a group of women with cytologically normal Papanicolaou smears.

Subjects & Setting: Black non-Hispanic women at least 18 years old (no upper age limit) and HIV negative attending colposcopy or gynecology/family planning clinics at a large, urban hospital.

Measures: Cervical lavage is obtained during examination for HPV determination by PCR methods; specimens are also taken for immune assays (HIV and T-cell counts) and nutritional status (folate and carotinoids). A nurse-administered questionnaire elicits information on screening, sexual, medical, pregnancy, and smoking histories, demographics, and diet.

Results: Preliminary analysis indicates an HPV infection prevalence of 21%; the majority of HPV types are novel and 31/33/35. A significant association between HPV and cervical neoplasia is noted [OR=6.1, 95% CI (1.8-20.1)].

Conclusions: HPV infection is predictive of cervical neoplasia in Black women.

Physical activity and risk of colorectal adenomatous polyps. R. Sue McPherson, Harold W. Kohl, III, Maria Elena Martinez. University of Texas School of Public Health, Houston, TX, Cooper Institute for Aerobics Research, Dallas, TX, and Harvard School of Public Health, Boston, MA.

Physical inactivity has repeatedly been reported to increase risk of developing colon cancer. Few data are available, however, regarding the association of inactivity to potential precursor lesions of colon cancer. Such information may be helpful in elucidating disease mechanisms. In a case control study of endoscoped individuals (157 cases and 480 controls) from three gastroenterologists in Houston, TX, we examined the relationship of physical activity to the risk of colorectal adenomatous polyps. Based on personal interviews, the 327 men and 310 women reported the average time per week spent in specific physical activities during the prior year, usual dietary intake and other colon cancer risk factors. After controlling for age, sex, body mass index, smoking, family history, use of nonsteroidal anti-inflammatory drugs and aspirin, energy intake, dietary fiber, calcium, total fat and alcohol, the odds and 95% confidence intervals of having adenomatous polyps across physical activity quintiles were: Q1(low)-1.0; Q2-1.19(0.61-2.32); Q3-0.62(0.32-1.2); Q4-0.74(0.39-1.42); Q5-0.76(0.39-1.48). Unlike data on colon cancer from other studies, physical activity was not associated with a significant decrease in risk of adenomatous polyps in this group of men and women.

OCCURRENCE OF BREAST CANCER IN RELATION TO RECREATIONAL EXERCISE IN POSTMENOPAUSAL WOMEN. Anne McTiernan, Janet Stanford, Noel S. Weiss, Janet Daling, Lynda Voigt. (Fred Hutchinson Cancer Research Center, Seattle, WA) Data from 537 women with breast cancer and 492 population controls were analyzed to evaluate the relationship between breast cancer risk and history of recreational exercise. Cases were all white, female King County, WA, residents, aged 50-64 years, diagnosed 1/1/88-6/30/90 with histologically confirmed invasive or in situ breast cancer. Random-digit-dialing controls were 5-year frequency matched to cases. There was a suggestion of a decreased risk with increasing number of hours of exercise per week in adulthood (RR for 5 increasing categories compared with RR of 1.0 for 0 hours of exercise: 1.1, 0.75, 0.67, 0.62, 1.1; p trend=.20). This inverse relation was confined to women aged 55 and over (p trend=.03). Calculated total energy expenditure in adulthood, but not in adolescence, was also associated with a reduced risk of breast cancer occurrence. Adjustment by means of logistic regression for age, body mass index, family history, and parity did not change the results. The hypothesis that exercise in adulthood may protect against the development of postmenopausal breast cancer warrants additional evaluation.

HOW MANY READINGS ARE NEEDED FOR THE BLEOMYCIN SENSITIVITY ASSAY? A STATISTICAL ANALYSIS OF THE RELIABILITY AND CLASSIFICATION ERRORS

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Statistical analysis was applied to evaluate the reliability and classification errors of the *in-vitro* bleomycin sensitivity assay (BSA). It has been demonstrated that BSA can be used for determining an individual's genetic susceptibility to cancer. The standard practice is to read 50 metaphases in each sample and compute the mean chromatid breaks per cell (b/c). Since scoring breaks is a time-consuming task, various fixed number and variable number designs were evaluated to establish efficient and reliable reading strategies. A collection of 160 cases with 100 consecutive readings for each case was obtained. The b/c values were between 0.14 and 1.30 (mean: 0.61). Standard errors (SE) based on scoring 50 and 100 metaphases were 0.15 and 0.11, respectively. After evaluating the first 50 metaphases, the gain in reducing SE is less than 1% with each additional reading. Comparing to 100 readings, the misclassification error for scoring 50 metaphases is less than 4% but the maximum bias can be as high as 0.35. Variable number designs reduce the bias of the fixed number design by reading additional metaphases until the estimated SE is within a prespecified bound. The maximum bias is reduced to 0.13 when $SE < 0.15$. Reading 50 metaphases is sufficiently accurate for bleomycin-resistant ($b/c < 1.0$) subjects while the variable number design should be applied to increase the reliability for bleomycin-sensitive ($b/c \geq 1.0$) subjects. Efficient and reliable scoring methods can be applied in large scale cancer epidemiology studies for individual risk assessment. (Supported by NIH grant CA-52051)

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Hysterectomy, Infertility, Nulliparity, and Risk for Colorectal Neoplasia in Females. Judith S. Jacobson, Alfred I. Neugut, Gail C. Garbowski, Habib Ahsan, Kenneth Forde, Jerome Waye, Michael Treat. Columbia University School of Public Health, New York, and Mt. Sinai Medical Center, New York.

Nulliparity has been found in some but not all studies to increase colorectal cancer risk. We investigated the association of reproductive variables with risk of colorectal neoplasia (adenomas and cancers) in patients 35-85 years of age examined in three colonoscopy practices in New York. Data were collected by telephone or mailed questionnaire. Female study participants included 124 cases with one or more colorectal adenomas, 53 cases with colorectal cancer, and 281 controls with negative colonoscopy. Age at interview modified the effect of parity; among women aged 50 or younger, 11/12 adenoma cases and 4/4 cancer cases but only 50/67 controls were parous. Among women over age 50 with no history of hysterectomy, the OR for nulliparity and adenoma was 2.2 (95% CI 1.1-4.3); the OR for nulliparity and cancer was 3.0 (95% CI 1.2-7.3). The OR for parous women with hysterectomy was 1.4 (95% CI 0.8-2.4); for adenoma and 2.0 (95% CI 1.0-4.0) for cancer. Cancer risk was greatest among women who reported having tried unsuccessfully to conceive (OR 3.5, 95% CI 1.1-11.5) compared to parous women. Among women who had had a hysterectomy, nulliparity did not affect risk; and among the nulliparous, hysterectomy did not affect risk. Women who had 3 or more children did not appear to have lower risk than women with fewer than 3 children.

We conclude that if childbearing is protective against colorectal cancer, the benefits accrue mainly to older women without a history of gynecologic disorders.

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Higher Lung-Cancer Risk for Younger African Americans With the Pro/Pro p53 Genotype. Xifeng Wu¹, Xiaomei Jin², Jack A. Roth², Christopher I. Amos¹, Terri M. King¹, Cynthia Branch², and Margaret R. Spitz¹. Department of Epidemiology¹ and Thoracic and Cardiovascular Surgery², the University of Texas M. D. Anderson Cancer Center, Houston, Texas 77030

A restriction fragment length polymorphism in codon 72 of the p53 gene has been implicated in lung cancer risk, although the functional significance of the polymorphism has not been determined. This association was examined in 86 lung cancer cases (57 African-American and 29 Mexican-American) and 88 controls (61 African-American and 27 Mexican-American) identified from our ongoing molecular epidemiologic study of lung cancer. The susceptible Pro/Pro genotype was associated with 1.7 fold higher risk of lung cancer in African-Americans, but no case control differences were detected in Mexican-Americans. In fact the prevalence of the Pro/Pro genotype was only 3.7% in Mexican-American controls, compared with 21.3% for African-American controls. Patients with the susceptible genotype had significantly earlier age at diagnosis and lower mean cigarette pack-year exposures than did patients with the Arg/Arg or Arg/Pro genotypes. Risk estimates for the susceptible genotype were 15.4 (1.7, 136.0) for patients less than 55 years of age and 10.0 (1.1, 93.4) for patients who reported less than 30 pack-years smoking. The Pro/Pro genotype was not associated with elevated risk in older patients (>55 years), nor with heaviest smokers (>30 pack-years). If Pro/Pro is a susceptible genotype, the lower prevalence evident in Mexican-Americans may partly explain their lower rates of lung cancer. (Supported by NCI grant CA 55769)

CANCER INCIDENCE AND RISK AMONG AN HIV-INFECTED COHORT OF HOMOSEXUALS AND INJECTION DRUG USERS IN THE PULMONARY COMPLICATIONS OF HIV INFECTION STUDY (PACS) POPULATION.

Christine Johnson, Timothy Wilcosky, Paul Kvale, Jeffrey Glassroth, Philip Hopewell, Lee Reichman, Mark Rosen, Jeanne Wallace and the Pulmonary Complications of HIV Infection Study Group

Malignancies, particularly Kaposi's sarcoma (KS) and non-Hodgkin's lymphoma (NHL), have been shown to be associated with HIV infection. The purpose of this analysis was to study cancer rates among an actively followed, multisite, cohort of HIV-infected individuals in different demographic and HIV transmission categories. The cohort consisted of 1,078 HIV+ individuals, aged 20+ years and asymptomatic at baseline, classified as homosexuals and bisexuals (HB) or injection drug users (IDU). During four years of follow-up, at least one cancer was diagnosed in 110 cohort members. The rate per 100 person-years for overall cancer was 4.1; for KS 2.6 (n=70); and for NHL, 1.3 (n=36). Adjusted rate ratios for all cancers combined were significantly lower for blacks, but higher for those with a lower baseline CD4 and for HBs compared to IDUs. This pattern was reflected for KS and NHL. The incidence of lung cancer was found to be high among white HBs at 0.21 per 100 person-years (n=4). These results support the hypothesis that KS requires a sexually transmitted cofactor and that, like the general population, there is a protection against NHL associated with black ethnicity. White HIV-infected HBs may be at higher risk for lung cancer.

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Testicular Cancer Risk and Birth Order

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Elevated levels of circulating maternal estrogens in a first pregnancy may increase testicular cancer risk in sons, but epidemiologic studies have produced conflicting results. The relationship of testicular cancer with birth order, being first born, and sibship size was investigated in a hospital-based case-control study. 184 cases of testicular cancer were identified between April, 1986 and October, 1992. Controls were 360 non-urogenital cancer patients diagnosed over the same period, frequency matched to cases by age (± 5 years). Cases and controls were white U.S. male residents aged 18 to 69 who had completed a comprehensive self-administered questionnaire as part of the M. D. Anderson Cancer Center Patient Risk Evaluation Program. Univariate analyses showed birth order not significantly related to testicular cancer. Odds ratios (OR) for birth order from 1 to ≥ 4 were: 1.0 (referent), 0.9 (95% confidence interval (CI) 0.6-1.4); 1.2 (CI 0.6-2.1); and 0.7 (CI 0.4-1.5), respectively. First born vs. later born males did not show excess risk: OR = 1.1 (CI 0.7-1.7). Sibship size was inversely related to testicular cancer, with sibships ≥ 4 significantly protective; OR = 0.5 (CI 0.2-0.9). Adjustment for income, education, marital status, and cryptorchidism by logistic regression did not substantially alter the odds ratios. An unexpected association between circumcision and testicular cancer was found. Uncircumcised men had a statistically significant elevated risk of testicular cancer (OR=1.8, CI 1.0-3.2) which remained after adjustment for the covariates previously mentioned. This study did not support an association between birth order and testicular cancer, but showed sibship size as a protective factor.

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CHANGING CIGARETTES AND THE RISE IN LUNG ADENOCARCINOMA: MJ Thun, CA Lally, JT Flannery, EE Calle, WD Flanders, CW Heath Jr.

The histopathologic distribution of lung cancer is changing; adenocarcinomas of the peripheral lung have become more common and squamous carcinomas of central bronchi less common since approximately 1970. We measured secular trends in squamous, small cell, and adenocarcinoma of the lung in the Connecticut tumor registry from 1950-91, and in two large prospective epidemiologic studies conducted by the American Cancer Society (ACS) from 1959-65 and 1982-88. In Connecticut, the incidence of squamous carcinoma peaked in men in the mid-1970's and decreased among birth cohorts after 1910 for men and after 1940 for women. Adenocarcinoma incidence continued to rise until 1990 but decreased among both men and women born after 1940. No determination of smoking status could be made in these data. In the ACS studies, smokers but not lifelong non-smokers experienced higher death rates from squamous, adeno-, and small cell carcinomas in the 1980's than in the 1960's. Cessation of smoking dramatically reduced mortality from all three cell types.

Conclusion: These changes in histologic distribution of lung cancer appear to be real and confined to smokers. Additional work is needed to identify the specific changes in cigarettes or smoking behavior that caused the changing histopathology.

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Chromosomal alterations in colon and lung carcinomas: A lymphocytic chromosomal analysis. Dave, Bhavana J., Hopwood, Vicki L., King, Terri M., Spitz, Margaret R., and Pathak, Sen. U.T. M.D. Anderson Cancer Center, Houston, TX 77030.

The genetic profile of an individual plays an important role in cancer predisposition. To determine whether specific chromosomal alterations are associated with specific cancers and to assess whether these changes could be detected in normal tissue *i.e.*, peripheral blood lymphocytes (PBL), we studied karyotypic changes from cultures established from PBLs of 19 untreated colon cancer patients, 10 adenomatous polyps patients, and 10 asymptomatic first degree relatives of these patients. Chromosome 5 was altered in 60% of polyps patients and 40% of asymptomatic relatives indicating that the PBL analysis can aid in identifying genetically susceptible individuals. We next examined chromosomal alterations in 100 untreated lung cancer patients and 74 controls. A case-control comparison showed that these aberrations were significantly elevated in chromosomes 7, 9, 12, and 21 in cases as compared with controls. Multivariate analysis adjusting for amount of smoking indicated that only chromosome 9 aberrations were significantly associated with case status (OR = 5.99, 95% CI = 1.77, 20.27). These analyses are suggestive of an association between specific spontaneous chromosome aberrations in PBLs and colon and lung cancers. These findings have potential implications for high risk identification and early detection. (Supported by NIH CA 55769 and RR 04999-01).

Lung Cancer, Smoking Patterns, and Mutagen Sensitivity in Mexican Americans. Sara S. Strom, Alice J. Sigurdson, Xifeng Wu, T.C. Hsu, John J. Fueger, Jose Lopez, Margaret R. Spitz. (U. Texas M.D. Anderson Cancer Center, Houston, TX 77030).

Mexican Americans have lower age-adjusted lung cancer incidence rates than non-Hispanic whites and African Americans. These differences are not completely explained by lower smoking prevalences. Although tobacco exposure is the main risk factor, only a fraction of smokers develops lung cancer. Genetically determined differences in environmental exposures modulation could partly explain these ethnic risk differences. We present data from an ongoing case-control study of lung cancer in Mexican Americans that evaluates ethnic differences in a marker of cancer susceptibility. This *in vitro* assay quantifies mutagen-induced chromosome breaks in short-term lymphocyte cultures. In the 67 cases and 107 controls accrued to date, all measures of cigarette smoking (intensity, duration, nicotine and tar content, depth of inhalation, and type of cigarette) were significant predictors of lung cancer risk. There were significantly higher risks associated with mutagen sensitivity (defined as ≥ 1 break/cell) both for former smokers (odds ratio [OR]=4.5; 95% confidence interval [CI]=0.9-21.9) and current smokers (OR=2.6; CI=0.6-11.1). Mutagen sensitivity also appeared to be implicated in risk in patients ≤ 55 years old at diagnosis (OR=15.0; CI=1.0-228.9) and in those with lower cigarette exposure (OR=11.0 vs. an OR=1.7 for the heaviest smokers). The overall OR for mutagen sensitivity adjusted for age, sex, and pack-years smoked was 2.9 (CI=0.8-9.9). Neither current smoking status nor years of exposure shifted the mutagen sensitivity profile of cases and controls. Although this study showed lower percentages of smokers among Mexican Americans than the African American data, our cases were heavier smokers. These preliminary data support our hypothesis that mutagen sensitivity is an independent risk factor for lung cancer but the prevalence of mutagen sensitivity among the controls does not account for the lower incidence in Mexican Americans. (Supported by grant NIH CA55769)

Oral freeze dried *Lactobacillus acidophilus* reduces endogenous formation of dimethylamine (DMA) and the corresponding carcinogenic nitrosamine (NDMA) in hemodialysis patients. Stephen R Dunn⁽¹⁾, Michael L Simenhoff⁽¹⁾, William E Sandine⁽²⁾, James W Ayres⁽²⁾, Dept. of Medicine, Jefferson Medical College Philadelphia PA⁽¹⁾, & Depts. of Microbiology & Pharmacy, Oregon State Univ, Corvallis, OR⁽²⁾

The purpose of the study was to use a biological intervention to reduce formation of dimethylamine, a precursor of a potent carcinogen, nitrosodimethylamine, in the small intestine by modifying the small bowel bacterial overgrowth (SBBO) and in turn reducing formation of NDMA. Previously, we have shown raised levels of both DMA and NDMA in the blood and gastrointestinal aspirates of patients with end stage kidney disease (ESKD) secondary to SBBO. Increased cancer incidence has been reported in patients with ESKD. We treated 15 hemodialysis patients with oral administration of a human strain of LBA in enteric coated capsules and measured changes in serum DMA and blood NDMA before and at end of treatment. Nine males and 6 females, ages 28-78, were treated twice daily with LBA (10^9 colonies/ capsules) for 30-182 days; each acting as own control (placebo or no treatment (R_x)). Serum DMA (assayed by gas chromatography--GC) decreased in all 15 from 291 ± 107 to 177 ± 86 $\mu\text{g/dl}$, mean \pm SD ($p < .001$) following LBA R_x and rebounded when R_x ceased. Mean blood NDMA levels in 8 patients (measured 5 min after an ethanol challenge using GC and thermal energy analysis) decreased from 178 ± 67 to 83 ± 49 ng/kg ($p = .027$). Seven were not yet tested. We conclude that oral LBA can alter SBBO enough to significantly reduce DMA and NDMA production in a dialysis population who are at risk for cancer. LBA may offer a non-toxic, effective, economical treatment to lessen the body burden of a particular class of carcinogens.

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NSAIDs: A new class of chemopreventive agents against lung carcinogenesis.
 Andre Castonguay, Caroline Duperron, Guylaine Jalbert, Jean-François Bilodeau and Nathalie Rioux, Laboratory of Cancer Etiology and Chemoprevention, Laval University, Quebec City, Canada, G1K 7P4.

The aim of this project was to determine how NSAIDs protect against lung tumorigenesis induced in A/J mice by the tobacco-specific carcinogen, NNK. This carcinogen was given in drinking water between week 0 and week +7. In the first experiment, groups of 25 mice were fed sulindac (123 mg/kg diet), ibuprofen (263 mg/kg), ibuprofen (25 mg/kg) or naproxen (230 mg/kg) in AIN-76A diet from week -2 to the end of the bioassay (week +23). Lung tumor multiplicity was reduced by sulindac (-51%), ibuprofen (-38%), piroxicam (30%) but not by naproxen. Sulindac treatment reduced by 40% plasma levels of PGE₂ but naproxen had no effect. Naproxen was the only drug to reduce plaque forming colony of spleenocytes. In a second experiment, four groups of mice were given either non-formulated acetylsalicylic acid, commercial aspirin (294 mg/kg diet) formulated with or without magnesium carbonate or sulindac (123 mg/kg diet). Lung adenoma multiplicity was reduced by 60%, 63%, 18% (not significant) and 52%, respectively. In a third experiment, sulindac was not effective against benzo(a)pyrene-induced lung tumorigenesis. These results illustrate the specificity of NSAIDs in the prevention of lung tumorigenesis. (Supported by grants from The Cancer Research Society Inc.).

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THE STABILITY OF ANTIOXIDANT (pro)VITAMINS IN BLOOD BEFORE PROCESSING AND STORING IN A BIOLOGICAL BANK

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Lag time between collection and freezing might pose a problem with biochemical stability in cohort studies that collect blood to be stored in a biobank.

EPIC is a cohort study that started in 1992 in 7 European countries which collects a.o. blood of \pm 350.000 persons to be stored at -196°C.

We investigated the consequences of this lag time on the stability of concentrations in serum and plasma of retinol, α and γ -tocopherol, lutein, cryptoxanthin, lycopene, α and β carotene.

Blood samples were collected from 64 volunteers in 5 plain and 5 citrated monovettes, and stored between +5° to +10°C in the dark.

Respectively 2, 6, 24, 48 and 96 hours after blood was taken, the whole blood was centrifuged and processed into serum and plasma, erythrocytes and buffy-coat. These aliquots were then frozen at -86°C. At each time point serum and plasma concentrations of the above mentioned antioxidants were measured. We found that cooled storage of whole blood does not affect serum and plasma concentrations of the (pro)vitamines of interest over at least 96 hours.

This allows collection of whole blood at peripheral centres as well as overnight mailing of cooled samples to one central biobank for processing and storage in liquid nitrogen.

RETENTION IN ONGOING CARET CANCER PREVENTION STUDY IS AFFECTED BY RELATED STUDY REPORTS. J Williams, F Meyskens, J DeJohn, J Zolkower, M Thomquist, G Omenn, G Goodman, B Metch, B Valanis, A Glass, J Balmes, J Keogh, M Cullen. UC Irvine, U Washington, U Oregon, UC San Francisco, U Maryland, Yale U.

CARET is a lung cancer prevention study in the United States examining the potential effects of a capsule containing both β -carotene and retinyl palmitate in males and females with a history of heavy tobacco smoking, and asbestos workers with a history of tobacco smoking. ATBC studied the effects of vitamin supplements containing α -tocopherol and/or β -carotene on lung cancer in male, active smokers in Finland, unexpectedly identifying more lung cancers among persons receiving β -carotene (NEJM, 1994;330:1029). We expected an increase in the number of participants no longer willing to actively participate in CARET following announcement of the ATBC study results. CARET sent a letter to all participants announcing ATBC results 4/94, and local media reported independently. Participants routinely contacted every four months in CARET to monitor participation were specifically asked about the ATBC announcements. Five months data collected pre-ATBC publication (11/93-3/94) were compared to five months post-ATBC (4/94-8/94). Of 18,021 persons originally recruited to CARET, 1.9% inactivated during the five months pre-ATBC, while 5.3% inactivated post-ATBC, of which 2.8% expressed an ATBC-related reason. Among 3952 asbestos workers, these percentages were 1.8%, 2.8%, and 1.2%, respectively, and among 14,069 non-asbestos worker smokers, 1.9%, 5.9%, and 3.3%, respectively. Fortunately, this impact declined with time, and should not much alter the power of CARET to detect an effect of the vitamin preparation long-term. The greater impact on the tobacco smoker-only cohort than the asbestos worker cohort within CARET may reflect greater similarities between the former cohort and participants in the ATBC study, or differences in the methods of recruitment of this CARET cohort.

USE OF A NEW β -CAROTENE DATABASE WITH FOOD FREQUENCY QUESTIONNAIRES. Mark Kestin PhD, MPH, CARET Investigators, CARET Coordinating Center, Fred Hutchinson Cancer Research Center, Seattle, WA.

Updated data on the β -carotene content of fruits and vegetables have recently become available, using new analytical methods. CARET is a randomized intervention trial of β -carotene and retinol in the prevention of lung cancer. In the Efficacy cohort of CARET, baseline food frequency questionnaire (FFQ) estimates of β -carotene intake were available from 14,056 participants, of whom serum β -carotene concentrations were available from 1174 (234 male former asbestos workers, 533 male and 422 female current or former smokers). Using a modified Block/NCI FFQ, β -carotene intake estimates were calculated using the Nutrition Data System (NDS) database and the recently published USDA/NCI database. Serum β -carotene concentrations were determined by HPLC.

Median dietary β -carotene intakes were slightly higher with the USDA/NCI than with the NDS database (2330 vs. 2150 μ g/day, $P < 0.0001$). Pearson correlation coefficients between the log-transformed dietary estimates were very high ($r = 0.97$). Simple and partial correlation coefficients between dietary and serum β -carotene were similar using the USDA/NCI and NDS databases (0.22/0.22 simple and 0.24/0.23 partial, respectively).

In conclusion, similar values for FFQ β -carotene intakes are obtained with the two databases. At present, there may be little advantage in converting to the new USDA/NCI database for β -carotene. However, this database does contain data on other carotenoids of interest, such as lycopene.

An intermediate endpoints evaluation of low dose alpha-difluoromethylornithine (DFMO) in subjects at risk for colon cancer. Celia C. Mamby, M.D.

Carcinogenesis in many mammalian systems can be dissected into at least two qualitatively different steps, i.e. initiation and promotion. Interference with tumor promotion, which occurs over protracted time, is an important strategy in cancer prevention. The enzyme ornithine decarboxylase (ODC) catalyses the first step in mammalian polyamine biosynthesis and appears to play a central role in tumor promotion. Inhibition of ODC induction in animal models blocks tumor formation in several organs. Difluoromethylornithine (DFMO) is a suicide inhibitor of ODC which we have demonstrated will inhibit the induction of ODC in human skin biopsies at a dose of 0.5 gm/m²/day, a fraction of the maximally tolerated doses.

In the proposed research, the overall goal is to determine whether a low nontoxic dose of DFMO significantly suppresses polyamine and ODC activity levels in colorectal mucosal biopsies. Forty (40) subjects at risk for colorectal cancer will be evaluated in a 1-year double-blind placebo-controlled trial, during which proximal and distal colorectal mucosal specimens will be assayed before and after treatment for ODC and polyamine levels.

At the conclusion of this research, the investigators will have specific target tissue data for colon for an apparently non-toxic dose of DFMO. In addition, further toxicity data will be obtained.

As in all chemoprevention studies, the major challenges are recruitment of the necessary subject population and good compliance of subjects with the protocol. Specific strategies have been developed to address these challenges.

Why do Women Gain Weight with Adjuvant Chemotherapy for Breast Cancer? Wendy Demark-Wahnefried, Eric Winer, Marc Drezner & Barbara Rimer. Stedman Center for Nutritional Studies and the Program of Cancer Prevention, Detection and Control Research, Duke University Medical Center, Durham, NC 27710

Significant weight gain occurs in women receiving adjuvant chemotherapy for breast cancer. Gains ≥ 22 pounds are seen in one out of four patients. This weight gain may compromise quality of life. It also may increase morbidity from other disease, as well as increase risk of relapse. A pilot study is being conducted to quantitate changes in energy intake (3-day food records collected during baseline and throughout therapy) and specific components of energy expenditure [i.e. resting metabolic rate (RMR)(determined through indirect calorimetry), diet-induced thermogenesis (DIT)(determined through indirect calorimetry after a standard feeding) and physical activity (Stanford 5-City Project Questionnaire administered at baseline and throughout chemotherapy)] that occur in premenopausal breast cancer patients receiving adjuvant chemotherapy. Changes in body composition are determined via dual energy x-ray absorptiometry conducted at baseline and at completion of therapy. Complete data on 6 subjects suggest that patients lost an average of $0.7 \text{ kg} \pm 0.2 \text{ kg}$ of lean body mass and decreased RMR from $1,412 \pm 89 \text{ kcal/day}$ to $1,220 \pm 161 \text{ kcal/day}$ during the course of chemotherapy. DIT decreased by approximately one third. Physical activity and dietary intake were highly responsive to the timing of treatment and modest decreases were seen during the course of therapy for both (approximately -82 kcal/day and -211 kcal/day , respectively). Findings of this pilot study suggest that chemotherapy provokes significant changes in body composition and metabolic needs. Further research in this arena will provide valuable insight into creating optimal interventions to curb weight gain in hopes of improving both the quality and quantity of life for the woman with breast cancer.

