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Experts Call For Large International Study Of Mammography Screening In Ages 40-42

A multinational U.S. and European prospective randomized trial enrolling 1.5 million women aged 40-42 should be conducted to test the efficacy of mammography and clinical breast examination for women in their forties, an international meeting of screening experts has concluded.

The meeting, sponsored by the International Union Against Cancer (UICC), concluded that studies conducted previously have not been ad-

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In Brief

Ira Kline, NCI Researcher, Dead At 69; Massey Recruits Scientists; ACR Awards

IRA KLINE, 69, a microbiologist who retired in 1986 from NCI, died of complications of heart surgery Oct. 6 in Washington, D.C. Kline, a cancer researcher most of his career, worked at Microbiological Associates in Bethesda, and then at NCI for 20 years. He was a member of the American Assn. for Cancer Research. . . . **DANIEL VON HOFF**, director of research, Cancer Therapy Research Center, San Antonio, will present the Myron Karon Memorial Lecture at Childrens Hospital Los Angeles on Nov. 11. . . . **MASSEY CANCER** Center at Virginia Commonwealth Univ. has appointed **Richard Moran** leader of the preclinical component of its Developmental Therapeutics Program. Moran was previously at the Norris Comprehensive Cancer Center of the Univ. of Southern California. **John Roberts**, Vermont Cancer Center, was named leader of the clinical component of Massey's DTP. **Nicholas Farrell** also comes to Massey from the Vermont Cancer Center. **Saul Yanovich**, Massey's director of clinical research, was named director of the bone marrow transplantation program. . . . **LEUKEMIA SOCIETY** of America awarded its "Triumphs Through Technology" awards to companies that have made significant advances in treating leukemia in the past year. Recipients were Baxter Healthcare, Hoffman-LaRoche, Lederle Laboratories and Scripps Clinic. . . . **RADIOLOGY AWARDS:** American College of Radiology presented its Gold Medals last month to **William Powers**, Wayne State Univ.; **Lee Rogers**, Northwestern Univ.; and **Rosalyn Yalow**, Bronx VA Hospital. . . **AMERICAN INDIAN** women and cancer screening was the subject of a conference this week in Rochester, MN, sponsored by the Mayo Comprehensive Cancer Center. Representatives from 52 Indian tribes were flown in to discuss federal and state screening efforts for Indians and rural populations, said Mayo's John Kovach. Financial support came from the William K. Kellogg Foundation, HHS, CDC and the Indian Health Service.

Experts Call For International Breast Cancer Screening Trial

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equate to answer the question of screening efficacy for women aged 40-49.

In the meantime, "The available data can support a range of guidelines including recommendations to begin screening at age 40 or to begin at age 50," concluded participants at the UICC meeting, held in Geneva two weeks ago.

"There was a very clear statement that the existing studies have not adequately answered the question of screening efficacy in women aged 40-49," Robert Smith, American Cancer Society senior director for detection and a participant in the Geneva meeting, said to **The Cancer Letter.** "That is an important statement because many countries, including our own, are making economic decisions based on that data. It is one thing to say we have demonstrated that screening is not effective, and another to say that there is considerable uncertainty."

The proposed "International Breast Screening Study in Younger Women" would enroll women age 40-42 who have not had a mammogram in the previous two years.

The European branch of the study would randomize 500,000 women to either screening or control group. One-third of the women would be invited for annual screening until age 50. Two-thirds, the control group, would receive usual care until age 50.

The U.S. branch of the study would randomize 1 million women equally to either invitation for annual screening or invitation for biennial screening.

The American Cancer Society would conduct further planning sessions for the study, and the UICC has agreed to coordinate events.

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"We would have to look for creative methods of funding" for this trial, Smith said. "This is the sort of thing that the major cancer control organizations in this country would collaborate on."

European cancer leagues involved in UICC "are very interested in supporting this and looking into it," said Gerald Murphy, secretary general of UICC and director, Pacific Northwest Research Foundation.

Following are excerpts of the reports from the three "workgroups" convened during the meeting. Reports from the meeting will be published in "Cancer" and the "International Journal of Cancer." More information regarding the UICC is available from the UICC, 3, rue du Conseil-General, 1205 Geneva, Switzerland.

Workgroup 1: Methodological issues in the evaluation of the efficacy of screening.

Have the existing studies adequately answered the question of screening efficacy in women 40-49?

Unfortunately there are no adequately designed and conducted prospective randomized trials that can answer the question of screening efficacy in women aged 40-49. Attempts to address the question of efficacy in this age group have focused primarily on retrospective subgroup analysis of studies designed to answer the question of screening women in wider age ranges, and have been limited by inadequate statistical power within the 40-49 age group. However, the analyses of data at hand suggest some reduction in mortality among the group of women invited to screening compared to control groups. Data from nonrandomized studies have also suggested benefits, such as the 14-year follow-up of the Breast Cancer Detection Demonstration Project.

Meta-analysis conducted by combining results of randomized controlled trials relevant to the 40-49 age group conducted prior to the NBSS study have shown a relative risk of 0.85 (95% CI 0.68-1.08), a 15% decrease in mortality among women invited to screening compared to control groups, with a trend toward incremental benefits observed over time. Inclusion of the NBSS study data for women aged 40-49 years gives a combined relative risk of 0.93 (95% CI 0.76-1.15), and a 7% reduction in mortality. While these data are suggestive of a benefit, mortality differences between women invited to screening compared to controls have yet to achieve conventional criteria for statistical significance.

In addition to sample size limitations, individual

and combined subgroup analyses of the randomized trials have been limited by differences in screening intervals, mammographic technique, and study design. The only published trial designed to assess specifically the effect of mammographic screening and physical examination vs. usual care in women aged 40-49, the Canadian NBSS, has been criticized in terms of technical screening quality, staff training, and unanticipated compromises in statistical power. Altogether, the situation regarding the effectiveness of screening women aged 40-49 is one of uncertainty.

Despite these limitations, the existing trial data have provided compelling insights into the potential to significantly intervene in the natural history of breast cancer in this age group. Recent analysis of Swedish trial data suggest that detection of tumors at an earlier stage, in terms of tumor size, node status, and histologic grade, will have the same impact on subsequent mortality from the disease in women under 50 years of age as it has in women aged 50 years and older.

Is it reasonable to expect that the existing trial data will offer significant additional evidence in the future?

Further reliance on long-term follow-up of the randomized controlled trials offers the advantage of developing surrogate indicators of mortality. However, the workgroup felt that there is limited long-range potential for resolution of this issue of screening efficacy in women aged 40-49 years through continued follow-up of the previously conducted trials, with little meaningful change in relative risk estimates anticipated in the near future largely due to limitations listed above. The workgroup agreed that scientists and women have endured this uncertainty for too long, and the greater costs of this uncertainty are borne by women who face the risk of breast cancer.

Are additional studies required to resolve the question of screening efficacy in women aged 40-49 years?

Yes. The workgroup agreed that the question is important and worth answering in a manner that achieves international consensus on study design and with international participation.

An agenda for further research:

The workgroup strongly encourages the continued analysis of existing study data for the purpose of validating interim outcome measures.

The workgroup further proposes that a new trial be conducted to resolve the issue of screening efficacy in women aged 40-49. On the basis of the evaluation of previous studies, it was agreed that the study design should include a strong emphasis on assuring adequate statistical power, high quality screening, double reading, rigorous training of personnel, standardization of pathology, and data collection. While the group agreed that mortality differences are the fundamental evaluative criteria and the basis for study size, there was strong agreement that aggressive monitoring of interim results and early predictive modeling of mortality outcomes would be important part of the study design. There was strong consensus that the trial should be a combined international effort, with participation based on meeting strict criteria for achieving quality control and quality assurance requirements.

Conclusion: The question of screening efficacy in women aged 40-49 remains unanswered because established studies have not been adequate. The question remains an important one because breast cancer is a significant public health problem for women in this age group. A definitive answer is needed, and the only prospect for a definitive answer is the design and implementation of a carefully designed study.

Workgroup 2: Recommendations for current strategies in research and practice.

Many developed countries have established screening guidelines based on reviews of scientific data as well as economic feasibility. The charge to this workgroup was to recommend guidelines based on the best current scientific evidence. It is noteworthy that randomized controlled trial data have shown overall benefit for populations aged 40-74. However, no randomized controlled trial has had the statistical power to show a significant mortality reduction specifically in women screened at ages 40-49. This is due in part to the large number of women required to demonstrate a mortality benefit, and the limited number of younger women included in all of the trials performed heretofore. In spite of the limited power of current trials to achieve statistically significant results, combined data from several different randomized trials suggest modest mortality reduction, albeit with wide confidence intervals. Additional data such as those from the Breast Cancer Detection Demonstration Project and other nonrandomized trials do show a trend toward benefit for women screened at ages 40-49. Another consideration to be balanced with potential benefit of any screening is the experience of recall for a false positive finding.

Data from the HIP and NBSS trials confirm that

skilled clinical examination of the breast augments cancer detection achieved by mammography since mammography is not 100% sensitive. Furthermore, because many breast cancers continue to be detected by women themselves, it is reasonable to believe that regular, competent breast self-examination may enhance earlier detection. There is evidence that smaller tumors are detected by women who perform BSE than by nonperformers. It also has been shown that one-to-one instruction in BSE, even in older women, results in improved BSE performance skill.

Image quality, achieved by adherence to quality control standards, is the most important technical aspect of mammography. Image quality has improved markedly during the last decade largely due to the implementation of quality standards.

On the basis of these observations, the participants developed the following statement concerning the issue of early breast cancer detection in women aged 40-49 in developed countries:

I. The available data can support a range of guidelines including recommendations to begin screening at age 40 or to begin at age 50.

II. Some workshop participants endorsed period screening of women aged 40-49 with two-view mammography, and clinical examination of the breast. Two options for periodicity were considered: annual, and every two years. Some participants believe that current data justify annual screening, others prefer every one or two years.

III. Some participants believe that screening women aged 40-49 should be done only in the context of efficacy evaluation.

IV. There was consensus that the efficacy of screening women 40-49 must be studied further with randomized controlled trials and other means.

V. There was consensus that educational programs should be directed toward: A. Improving clinical examination and breast self-examination skills; B. Educating and motivating physicians to counsel women about breast cancer detection; C. Enhancing public knowledge and awareness of breast cancer prevention and control.

VI. There was consensus that quality assurance and quality control programs must be implemented to ensure high quality mammography.

Workgroup 3: Future Directions

In view of the current uncertainty regarding the usefulness of screening, further well-controlled, large prospective trials must be conducted....The group strongly endorsed continuation and enlargement of the current U.K. trial and suggested concurrent trials in other countries. Case control studies should be carried out in patients with invasive cancers diagnosed in this study to assess risk factors, in particular genetic predisposition....

New screening strategies are needed in young women with first degree relatives with breast cancer. A multinational case control study on possible benefit of screening in these women should be conducted....

Suggestions for future trial design included individual randomization through a central office and collection of data detailed enough for subgroup analysis in particular with regard to age, e.g. 40-45, 45-50. The additional benefit of clinical breast examination should be rigorously evaluated in properly designed clinical trials. Future trials should have state of the art mammography and pathology, with outside auditing included... Diverse populations with different underlying incidence should be studied.... Trials should search for surrogate endpoints and ensure that current surrogates such as tumor size, nodes, stage and grade are measured.

New technologies should be integrated into screening trials after high quality studies demonstrating accuracy and potential usefulness are completed. Among these technologies are digital mammography, non-ionizing radiation, biomarkers, automatic reading of mammograms and slides and genetic screening.

Further study of the natural history of small (less than 1.5 cm) breast cancers was urged since few data are currently available. Among the suggestions were a meeting of pathologists to standardize methods of measuring size and grade of very small tumors, multicentered studies to evaluate prognostic features and metastatic potential of these tumors, and establishment of an international registry.

A need was recognized to study the implications of genetic predisposition to breast cancer. Research is necessary on the interaction between genetic and lifestyle factors, clinical and biological behavior, and screening strategy. International registry for cases of hereditary breast cancer should be established....

Education of medical professionals, the media, and the public in the area of premenopausal breast cancer is essential....

In the area of primary prevention we must identify risk factors in which intervention is possible and will result in a decrease of disease.

Current dietary studies such as the nurses' cohort study are not yet conclusive and investigation should continue.... At this time no firm dietary recommendations can be made other than the avoidance of obesity and decreased alcohol consumption.

Data on other possible carcinogenic factors such as oral contraceptives, ionizing radiation in radiosensitive subsets, and hormone replacement are needed. Unjustified anxiety about questionable factors such as pesticides and other chemicals should be avoided....

Capitol Notes

Conferees Ok $10.9 Bil. NIH Budget, OAM To Get $3.5 Mil.

The Senate and House conferees last week approved a $10.956 billion budget for NIH in fiscal 1994. Both chambers called for a $2.082 billion appropriation for NCI.

Capitol Hill sources saw no obstacles to the conference bill's approval by the House, Senate and the President.

For the programs on which the two bills differed, the conferees agreed on a "high split," taking 75 percent of the difference between the House and Senate version of the bill.

Under the compromise bill, the Office of Alternative Medicine received $3.5 million. The Senate bill called for $4 million, while the House and the Administration called for half that amount. In the current year, the office's budget is about $2 million. (See story below.)

Addressing another matter, the conference report stated that, "the conferees are concerned about serious charges of racial discrimination and sexual harassment at NIH." HHS Secretary was instructed to make semiannual report on the resolution of this problem to House and Senate committees. The initial report was to be expected Jan. 31.

Also under the bill:

--The National Center for Genome Human Research received $128.7 million, instead of $119 million proposed by the House and $131.9 million proposed by the Senate.

--The National Center for Research Resources received $331.9 million instead of $328.9 million proposed by the House and $332.9 million proposed by the Senate.

--John E. Fogarty International Center received $21.7 million instead of $22.2 million proposed by the House and $20 million proposed by the Senate.

--Buildings and Facilities received $111 million instead of $114.4 million proposed by the House and $101 million proposed by the Senate. The agreement includes $27.5 to continue construction of the consolidated office building.

The two chambers are in agreement over appropriations for the following Institutes:

--National Heart, Lung and Blood Institute--$1.278 billion;

--National Institute for Dental Research--$169.5 million;

--National Institute of Diabetes and Digestive and Kidney Disease--$716.1 million;

--National Institute of Neurological Disorders and Stroke--$630.7 million;

--National Institute of Allergy and Infectious Diseases--$1.1 billion;

--National Institute of General Medical Sciences--$875.5 million;

--National Institute of Child Health and Human Development--$555.2 million;

--National Eye Institute--$290.3 million;

--National Institute of Environmental Health Sciences--$264.3 million;

--National Institute on Aging--$420.3 million;

--National Institute of Arthritis and Musculoskeletal and Skin Diseases--$223.3 million;

--National Institute of Deafness and Other Communications Disorders--$162.8 million;

--National Institute of Nursing Research--$51 million;

--National institute of Alcohol Abuse and Alcoholism--$185.6 million;

--National Institute on Drug Abuse--$425.2 million;

--National Institute of Mental Health--$631.4 million.

NIH Alternative Medicine Office Awards 30 Research Grants

The NIH Office of Alternative Medicine has awarded 30 research grants to study modalities that include acupuncture, massage, hypnosis, imaging, Ayrvedic medicine, macrobiotics and "intercessory prayer."

To qualify for the $30,000 grants, unconventional practitioners had to team up with university-affiliated investigators.

Altogether, OAM received 800 grant applications,

which went through the standard NIH Div. of Research Grants review, NIH sources said. OAM is yet to appoint its own advisory body.

The following is a list of just-funded studies in cancer and AIDS:

--Massage therapy in HIV-1. Investigator: John Allen, Morse Physical Health Research Center, OH.

--Electro-chemical effect of DC current on tumors. Investigator: Chung-Kwang Chou, City of Hope National Medical Center, CA.

--Energetic therapy for basal cell carcinoma. Investigator: Steven Sahrion, Menninger Clinic, KS.

--Imagery and immunity in cancer and AIDS. Investigator: Mary Jasnoski, George Washington Univ.

--Support Imagery in Breast Cancer. Investigator: Blair Justice, Univ. of Texas Health Sciences Center.

--Macrobiotic approach to cancer. Investigator: Lawrence Kushi, Univ. of Minnesota.

--Hypnosis and imagery in immune system response to breast cancer. Investigator: Patricia Newton, Good Samarital Hospital and Medical Center, OR.

--Antioxidants in the treatment of cancer. Investigator: Kedar Prasad, Univ. of Colorado Health Sciences Center.

--The effects of massage on development of HIV-infected babies. Investigator: Frank Scadifi, Univ. of Miami.

--Ayurvedic medicine. Investigator: David Simon, Sharp Healthcare, CA.

--Massage in bone marrow transplantation. Investigator: Denise Tope, Dartmouth College.

--Intercessory prayer. Investigator: Scott Walker, Univ. of New Mexico.

Earlier this year, the NIH authorizing legislation changed the status of the OAM advisory committee to a National Advisory Board. Its members will have to be approved by HHS Secretary Donna Shalala.

NCI Awards $7.3 Mil. In Grants For Cancer Communications

NCI has awarded $7.3 million in grants to five institutions to study communications strategies aimed at increasing cancer awareness among minority groups.

The AMC Cancer Research Center in Denver will lead the project, which is made up of three related studies.

Other participating centers are: Fox Chase Cancer Center, Duke Comprehensive Cancer Center, M.D. Anderson Cancer Center, and Univ. of Alabama at Birmingham Comprehensive Cancer Center.

The first project will use radio and television public service announcements and paid advertisements as part of a study to test the effectiveness of a mass media campaign to increase calls to the Cancer Information Service from African Americans, who use CIS services less than other groups.

A second study will determine whether rates of mammography use among minority women can be increased when CIS counselors take a more proactive approach in providing information to callers. Based on these calls, a database of women eligible for annual mammography screening will be created as part of a system that will remind women by mail to obtain regular mammograms.

The third study will use a new strategy to test whether calls made by CIS counselors to women living in low income and minority neighborhoods will increase the use of mammography screening.

DRG Proposes Clinical Study Group To Look At Peer Review

The NIH Div. of Research Grants plans to establish a "clinical study group" to examine the concerns of clinical investigators about the fairness and appropriateness of peer review of clinical research grant applications, DRG Director Jerome Green said to a National Cancer Advisory Board task force.

"I want to assure you I am concerned about clinical research and where it is going nationally," Green said to the NCAB Clinical Investigations Task Force last month.

Clinical investigators in several fields, including oncology, have asked DRG to establish new study sections to review their grant applications, Green said.

"I don't want to repair something unless I know what is wrong," Green said. "Are the reviews in fact biased? Some NCI staff do not think so, and we do not think so. We are going to look at this as a generic problem."

The NCAB task force invited Green and Deputy DRG Director Anthony Dempsey to discuss the problems perceived in clinical cancer research regarding peer review. Last May, the task force called for a new study section in clinical oncology (**The Cancer**

Letter, May 7). The American Society of Clinical Oncology endorsed the NCAB's action in Congressional testimony (**The Cancer Letter**, July 23).

DRG could consider establishing a "special emphasis panel" within an existing study section that would review clinical grant applications in cancer and related fields, such as hematology, Green said.

Such a special emphasis panel is being established within the Behavioral Medicine study section to review prevention and control research, Green said. The special emphasis panel will have a fixed membership that not limited to one disease. The panel could eventually be chartered as a separate study section, Green said.

"Clinical Research Is Dying"

NCAB members and NCI staff expressed impatience with Green's plan to study the problem.

"It doesn't surprise me that you are hearing from many groups about a need for clinical study sections," NCAB Sydney Salmon said. "Clinical research in our country is dying because we can't compete on the same basis as basic science.... I think some action is needed."

Green noted that DRG does not make funding decisions, but gives priority scores to grants. The NCAB has the authority to reach below the payline to fund clinical grants by exception if it feels there is a national need to support clinical research, he said.

"Every time you establish a review group there is an entitlement to funding," Green said. "There are also 25 to 30 other groups seeking that kind of entitlement. And I haven't even mentioned the Presidential Executive Order [on reducing the number of advisory groups across government]."

"Do The Experiment"

NCI Div. of Cancer Treatment Director Bruce Chabner said the Institute has very little flexibility in funding grants by exception. The problem continues to be that preclinical and clinical grants are reviewed by the same study section, he said.

"You have to do the experiment," Chabner said to Green. "I bet if you create a system where clinical grants are reviewed together, you will have a happier applicant community and they will be off your back. Try it. Figure out some way of doing it."

NCI Cancer Therapy Evaluation Program Director Michael Friedman noted that NCI has tried to work with DRG to increase the number of clinical applications being reviewed by the Experimental Therapeutics 2 study section. However, some of the new applications submitted in response to NCI initiatives are going to other study sections.

"The hope that the study section would reorient to clinical research has not really occurred," Friedman said.

NCAB Chairman Paul Calabresi said the task force and DRG should continue their discussions. "It seems we are in agreement that there is a problem," he said. He asked Green to "come back to us with some proposals. Together we want to solve the problem."

Foundation Invites Proposals For Antitobacco Programs

The Robert Wood Johnson Foundation has begun a new program to support statewide efforts to reduce tobacco use, particularly among children and youth.

The program, SmokeLess States, will make grants to statewide coalitions working in partnership with community groups.

Grantees will develop and implement comprehensive tobacco control programs that include education, treatment, and policy initiatives.

The foundation will make available up to $10 million under the four-year competitive program.

The foundation is inviting proposals for either a two-year capacity-building grant or a project implementation grant of up to four years.

As many as 10 capacity-building grants that average $200,000 and about eight implementation grants ranging between $500,000 and $1.2 million will be awarded.

Public and private organizations are eligible to apply. Only one application per state will be accepted. Preference will be given to organizations that are tax exempt under Section 501(c)(3) of the Internal Revenue Code or are public agencies.

Applications will be reviewed by a committee appointed by the foundation. Deadline for applications is Feb. 11.

Application forms with complete instructions are available from: Dr. Thomas P. Houston, Director, Dept. of Preventive Medicine and Public Health, American Medical Assn., 515 North State St., Chicago, IL 60610, Tel. 312/464-5957, fax 312/464-5841.

Letter to the Editor

Broder "Ignoring Questions" On Screening, Kopans Says

To the Editor:

I was pleased that Dr. Broder finally responded through **The Cancer Letter** (Oct. 8) to concerns that had been brought to his attention in March. His reply, however, persisted in ignoring the major questions:

1. Which of the randomized, controlled trials have the statistical power to be able to "prove" with statistical significance an expected mortality reduction of 25-30% for women ages 40-49?

The answer is none. They were not designed to provide such power. There are not even sufficient numbers of women in all the trials put together. He might wish to recheck the claimed "high statistical power of meta-analysis" not "masking as much as a 20-30 percent mortality reduction." Even combining all the women ages 40-49 in the trials there are insufficient numbers to provide the necessary statistical power. When this is coupled with significant design and performance flaws, the power is further diminished.

2. Given the natural history of breast cancer, the fact that many cancers are not detected in the first year of screening, a lead-time for mammography that is, on average, 2-4 years, and the fact that the control women must develop successful metastases and die before a benefit can be shown, how can a mortality reduction be expected to occur within two years of the start of screening? Why would a benefit that begins to appear at 5-8 years be discounted when it makes more sense biologically?

3. Dr. Broder was quoted in **The Cancer Letter** (Sept. 24): "There is no example of a therapeutic regimen that we would recommend without clinical trial data (showing benefit)." Where are the trial data that permit NCI to suggest that breast self-examination and clinical breast examination are "prudent," but not mammography, the one test that has been shown to down-stage cancers in women of all ages?

It is unclear why NCI would suddenly decide to alter the guidelines when the only significant new information that has arisen since they were first promulgated in 1989 is the emergence of a mortality reduction in the Swedish trials that ranges from 14-49%. The Canadian National Breast Screening Study is severely compromised by its design and performance. Furthermore, the "Fletcher Report" clearly states that the analysis of the NBSS data are premature based on their own design parameters. This fact is freely acknowledged by Dr. Cornelia Baines, one of the principal investigators of the NBSS.

Health care professionals are looking to NCI for guidance. There is a fundamental problem when the director is quoted in **The Cancer Letter** as saying, "What I would do as an individual is recommend annual mammograms, but I can't recommend it to the public because I don't have the facts."

It appears that NCI is determined to change the guidelines regardless of the facts. Logic, consistency and science seem to have little influence on the decision.

Daniel B. Kopans
Associate Professor of Radiology
Director of Breast Imaging
Massachusetts General Hospital

NCI Contract Awards

Title: Case-control study of cutaneous malignant melanoma
Contractors: Univ. of Pennsylvania, $306,974; Univ. of California, San Francisco, $324,425.

Title: In vitro screening of chemopreventive agents using human tumor cells
Contractor: Mantech Environmental Technology Inc., $153,322.

Title: In vitro screening of chemopreventive agents using the rat tracheal epithelial focus inhibition assay
Contractor: Mantech Environmental Technology Inc., $288,021.

Title: In vitroscreening of chemopreventive agents in DMBA-induced mammary lesions
Contractor: Univ. of Illinois at Chicago, $204,685.

Title: Prostate, Lung, Colon-Rectum, and Ovary Cancer Screening Trial: PSA assay kits
Contractor: Hybritech Inc., $8,400.

Title: Prostate, Lung, Colon-Rectum, and Ovary Cancer Screening Trial: CA125 assay kits
Contractor: Centocor Inc., $12,375.

Title: Quality control/model development in rodents and tumor cells
Contractor: Southern Research Institute, $6,827,172.