CALIFORNIA
Breast Cancer
Research Program

# Annual Report to the Legislature 2009

## California Breast Cancer Research Program

# Executive Summary

During 2009, the California Breast Cancer Research Program (CBCRP) funded 53 new single- and multiple year research projects that will advance scientific knowledge about breast cancer. With these new awards, we are investing almost $16 million at 22 California institutions. This annual report summarizes the studies that were completed during 2009 and lists the newly funded and ongoing studies.

### Table 1. Research Projects Funded in 2009 by Subject Area

| | Number of Research projects | Amount | Percentage of Total Funding |
|---|---|---|---|
| Community Impact of Breast Cancer | 11 | $2,068,006 | 13.0% |
| Etiology and Prevention | 8 | $8,581,176 | 53.8% |
| Detection, Prognosis and Treatment | 15 | $2,222,312 | 13.9% |
| Biology of the Breast Cell | 19 | $3,072,094 | 19.3% |
| **Totals** | 53 | $15,943,588 | 100% |

Designed to push breast cancer research in new, creative directions, the CBCRP is funded primarily by a California state tax on tobacco. Breast cancer activists have played a leading role in the CBCRP from the beginning. They helped write and pass the statewide legislation that created the Program in 1993. Since then, the CBCRP has provided over $205 million for research in California to prevent, treat, and cure breast cancer.

Women with breast cancer and survivors of the disease are involved in all levels of the CBCRP's decision making, including decisions about which projects get funded. With input from these advocates, the CBCRP has established a record for funding cutting-edge studies and jump-starting new areas of research. The Program's goal is to fund the projects that will lead most rapidly to the end of the breast cancer epidemic.

The need is urgent. Every two hours, on average, a California woman dies of breast cancer. More than 272,000 Californians are living with the disease, and over 22,000 more will be diagnosed this year. Over the past three decades, some progress has been made. The rate at which California women got breast cancer climbed steeply from 1973-1988 and stayed near the 1988 rate for more than a decade. Since then, the


breast cancer incidence rate has dropped by eight percent. Between 1988 and 2005, the breast cancer death rate in California dropped by 29 percent.

In November 2009, the US Preventive Services Task Force (USPSTF) announced new recommended guidelines for screening for women with normal risk of developing breast cancer. They advised that: women in their 40s of average risk for breast cancer should not get routine mammograms; women who are between 50 and 74 should get mammograms every other year. The panel based their recommendations on their analysis of the efficacy of mammography in reducing breast cancer mortality balanced by the harms of over treatment (including scarring, radiation and drug side effects) and psychological distress due to false positives. The resulting analysis led the committee to conclude that as a general screening tool, the harms outweighed the benefits of mammography for screening pre-menopausal women.

The recommendations highlight how critical it is to develop better screening and prevention strategies for breast cancer. This debate arises because we are dealing with an imperfect technology that forces us to make tough choices. The true challenge to the CBCRP and researchers is to make the debate irrelevant by finding an accurate, non-toxic way to identify life threatening breast disease, prevent it, and cure it.

This report has been prepared by the University of California pursuant to Article 1 of Chapter 2 of Part 1 of Division 103 of the California Health and Safety Code, Section 104145; and the Revenue and Taxation Code Sections 30461-30462.1 and 18791-18796 amended by AB-28 Oct. 11, 2008. The following required reporting elements will be addressed in this report:

1. **The number and dollar amounts of research grants, including the amount allocated to indirect costs.** The CBCRP awarded almost $16 million for 53 single- and multiple-year research projects, funded in the form of 60 grants to 22 California institutions in 2009. A complete list of newly funded grants can be found in Table 2.

2. **The institutions and campuses receiving grant awards.** All funded grants are listed with the recipient institutions in Table 2 and in the Research Progress and Results section of this report.

3. **The subject of research projects.** All of the investigator-initiated projects funded by the CBCRP involve key questions in one or more of the following research areas:

> Basic Biology of the Breast (normal breast biology and breast cancer pathogenesis)

> Breast Cancer Causes and Prevention

> Earlier Detection, Diagnosis, and Treatment of Breast Cancer

> Community Impact of Breast Cancer (sociocultural behavioral studies and health policy)

The CBCRP is also devoting 30 percent of program funding to its Special Research Initiatives, which is a program-initiated endeavor to investigate two of the most challenging and under-researched areas in breast cancer: the role of the environment in breast cancer and the reasons why some groups of women—based on characteristics such as ethnicity or race—bear a greater burden of the disease.

4. **The relationship between federal and state funding for breast cancer research.** The CBCRP takes several steps to avoid duplication of funding at the individual research project level and in the Program's research priorities. We identify and attempt to fill important gaps in knowledge about breast cancer. We review priorities yearly in light of changes in the research field, successes and failures of previous funding initiatives, and the results of previous funding. Additionally, as founding members of the International Cancer Research Portfolio and participating members of the Collaborative Summit on Breast Cancer Research, we are able to ensure that CBCRP funding complements, rather than duplicates, grants bestowed by other funding organizations.

The CBCRP's Breast Cancer Research Council sets the Program's funding priorities, taking into account:

- Opinions from national breast cancer experts
- Opinions from California advocates and activists, healthcare providers, public health practitioners, community leaders, biotechnology scientists, and academic researchers
- Current literature on breast cancer and current gaps in knowledge
- Comparisons with portfolios and programmatic goals of other funding agencies
- In-house evaluations of the efficacy of CBCRP grant mechanisms and topic areas in fulfilling program goals

5. **The relationship between each project and the overall strategy of the research program.** The following ten goals are used to set overall programmatic research priorities and calls for applications.

- ***California Specific:*** Fund research that utilizes resources particular to California and/or addresses a breast cancer need that is specific, but not necessarily unique, to the burden of breast

cancer in California.

- ***Career Development:*** Fund research that helps recruit, retain, and develop high-quality California-based investigators who engage in breast cancer research.
- ***Collaboration:*** Fund research that uses multidisciplinary approaches and helps foster collaboration among California scientists, clinicians, advocates, community members, patients, survivors, and others.
- ***Disparities:*** Fund research that addresses disparities, inequalities and/or underserved populations in California.
- ***Innovation:*** Fund innovative research (i.e., new drugs, new strategies, new paradigms, new applications of tested strategies in new populations and contexts).
- ***Non-duplicative:*** Fund research that complements, builds on, and/or feeds into, but does not duplicate, other research programs.
- ***Outcome Driven:*** Fund research that will improve public health outcomes (e.g. preventing breast cancer, detecting breast cancer, effective treatments, and quality of life).
- ***Policy:*** Fund research and evaluation that will have policy implications for breast cancer in California.
- ***Responsive:*** Fund research that is responsive to the perceived breast cancer research needs, opportunities, and expectations of the CBCRP as identified by scientists and the public in California.
- ***Translation:*** Fund research that is on a critical path for practical application and leads to more effective products, technologies, interventions, or policies and their application/ delivery to Californians.

The review of each individual grant application is also designed to ensure that the research projects funded by the CBCRP have both high scientific merit and programmatic interest. Each individual application is evaluated by external scientific review committees for specific aspects of scientific merit including, but not limited to, impact on breast cancer, innovation, feasibility, and approach. All applications of sufficient scientific merit undergo a programmatic review by our Breast Cancer Research Council for responsiveness to program priorities, including whether it fits the goals of the award type, integrates advocacy issues, and is an under-funded research question.

6. **A summary of research findings including discussion of promising new areas.** Summaries of all of the research projects completed in 2009 are included in the body

of this report. Listed below are just a few of the findings:

- **Irene Yen, Ph.D.,** at the **University of California, San Francisco,** studied the association between neighborhood environment and obesity in pre-adolescent girls. She identified the types of city planning policies and neighborhood conditions (food store availability, fast food chains, parks, traffic conditions) that can improve girls' diet and physical activity, influence their pubertal changes, and, potentially, decrease their breast cancer risk as adults. See page 31.
- **Joan Bloom, Ph.D.,** at the **University of California, Berkeley,** and colleagues investigated the quality of life of young breast cancer survivors 10 years after their initial diagnosis to determine how long problems persist. They found that young breast cancer survivors are aging prematurely with respect to certain treatment related problems. However, in general, at this point in their lives, their quality of life was comparable to that of women without cancer. See page 33.
- Resistance of breast cancer stem cells to treatments may be responsible for a cancer recurrence or metastases. **Frank Pajonk, M.D., Ph.D.,** at the **University of California, Los Angeles,** and colleagues explored how breast cancer stem cells respond to radiation treatments. In addition to verifying that these cells were less likely to be susceptible to radiation, Dr. Pajonk and his team discovered a new breast cancer stem cell marker that can be used to identify, track, and more effectively target breast cancer stems cells. See page 40.
- **Michael Press, M.D., Ph.D.,** at the **University of Southern California,** in Los Angeles, investigated whether it is possible to predict whether a HER2-positive tumor will respond to anthracycline therapy based on the presence of extra copies of the TOP2A gene. His findings could lead to better targeted anthracycline therapy. See page 41.
- **Steven Artandi, M.D., Ph.D.,** at **Stanford University,** in Palo Alto, and colleagues extended their work probing the role of telomerase, an enzyme that protects chromosomes during cell division, in relation to breast cancer stem cells. They found that telomerase is a cofactor in the Wnt pathway, an important circuit in cancer and stem cell division. The findings from this research could lead to the development of new and potentially less toxic breast cancer treatments based on telomerase inhibitors. See page 47.

- **Florence Shaffner, Ph.D.**, at the **Scripps Research Institute,** in La Jolla, showed that blocking the activity of targeting tissue factor (TF), a molecule involved in blood clotting and wound healing, reduced spontaneous tumor development and growth in mice. This suggests that TF signaling plays an important role in breast cancer by regulating how a tumor develops blood vessels and gains the ability to metastasize. See page 48.

**7. Inclusion of women and minorities in research studies.** The CBCRP issued 60 grants to pursue 53 research projects in 2009. Forty-three percent (23 of 53) of the research projects that the CBCRP funded in 2009 studied either women or tissues from women. The remaining 57% were laboratory studies that did not directly involve women or human tissues.

Of the 23 research projects that involved women or tissues from women, 91% (21) had women as participants in the study.

Out of the (21) studies that included women:

- Ninety percent, (19) research projects include minority women in the study.
- Thirty-three percent, (7) are focused on minority women.
- Thirty-eight percent, (8) are focused on underserved women.

The CBCRP's activities, goals, and progress during 2009 are described in this report, along with the challenges that must be confronted in order to decrease the economic burden and human suffering caused by breast cancer in California.

# Summary of New Research Funded in 2009

| Institution and Investigator | | Years | Project Title | Direct Costs | Indirect Costs | Total Costs |
|---|---|---|---|---|---|---|
| **Beckman Research Institute of the City of Hope** | | | | | | |
| | Kimlin Ashing-Giwa | 1 | Sister Survivor: Evaluating Best Practices in Social Support | $5,000 | $0 | $5,000 |
| *This is a collaborative planning grant with Carolyn Tapp of Women of Color Breast Cancer Survivors Support Project* | | | | | | |
| A* | Leslie Bernstein | 1 | Women's CARE Study | $19,917 | $13,145 | $33,062 |
| *This is a sub-award of the SRI initiative, "Understanding Racial and Ethnic Differences in Stage-specific Breast Cancer Survival: A Pilot Study"* | | | | | | |
| | Hei Chan | 2 | The Role of Estrogen Receptor in Endocrine Resistance | $76,000 | $0 | $76,000 |
| | Katherine DeLellis-Henderson | 1 | California Teachers' Study | $19,853 | $13,103 | $32,956 |
| *This is a sub-award of the SRI initiative, "Understanding Racial and Ethnic Differences in Stage-specific Breast Cancer Survival: A Pilot Study"* | | | | | | |
| T* | Yani Lu | 2 | Risk Factors and Breast Cancer Survival in Black/White Women | $89,996 | $0 | $89,996 |
| | Sumanta Pal | 1.5 | Survival in *de novo* and Recurrent Metastatic Breast Cancer | $150,000 | $99,000 | $249,000 |
| **Circulo de Vida Cancer Support and Resource Center** | | | | | | |
| | Carmen Ortiz | 3 | Nuevo Amanecer: Promoting the Psychosocial Health of Latinas | $250,453 | $62,614 | $313,067 |
| *This is a collaborative grant with Anna Napoles-Springer of University of California, San Francisco.* | | | | | | |
| **Dr. Susan Love Research Foundation** | | | | | | |
| | Dixie Mills | 1 | 6th Symposium on the Intraductal Approach to Breast Cancer | $25,000 | $0 | $25,000 |
| **Kaiser Foundation Research Institute** | | | | | | |
| | Lawrence Kushi | 1 | Mammary Gland Evaluation and Risk Assessment | $25,000 | $0 | $25,000 |
| | Marilyn Kwan | 1 | Patient and Clinician Knowledge of Breast Cancer Lymphedema | $149,989 | $77,795 | $227,784 |
| | Marilyn Kwan | 1.5 | Pathways: A Study of Breast Cancer Survivorship and Life after Cancer Epidemiology (LACE) Study | $19,952 | $10,528 | $30,480 |
| *This is a sub-award of the SRI initiative, "Understanding Racial and Ethnic Differences in Stage-specific Breast Cancer Survival: A Pilot Study"* | | | | | | |

| | Institution and Investigator | Years | Project Title | Direct Costs | Indirect Costs | Total Costs |
|---|---|---|---|---|---|---|
| **Lawrence Berkeley National Laboratory** | | | | | | |
| | Laurie Friesenhahn | 2 | The Regulation of SATB1 in Metastatic Breast Cancer | $90,000 | $0 | $90,000 |
| | Trent Northen | 1.5 | Metabolite Imaging to Identify Drug Resistant Breast Cancer | $99,133 | $73,104 | $172,237 |
| | Daojing Wang | 1.5 | Role of p68 in Breast Cancer | $100,000 | $65,339 | $165,339 |
| **Northern California Cancer Center** | | | | | | |
| | Scarlet Lin Gomez | 2 | Demographic Questions for California Breast Cancer Research | $299,994 | $130,994 | $430,988 |
| A* | Susan Hurley & Peggy Reynolds | 1 | Exploring Disparities Environmental Risk Factors in Teachers | $99,851 | $32,352 | $132,203 |
| | Esther John | 1 | San Francisco Bay Area Breast Cancer Study | $20,000 | $9,000 | $29,000 |
| *This is a sub-award of the SRI initiative, "Understanding Racial and Ethnic Differences in Stage-specific Breast Cancer Survival: A Pilot Study"* | | | | | | |
| | David Nelson | 2 | Model-building with Complex Environmental Exposures | $191,858 | $86,337 | $278,195 |
| **Public Health Institute** | | | | | | |
| | Barbara Cohn | 5 | Environmental Causes of Breast Cancer Across Generations | $4,564,314 | $435,686 | $5,000,000 |
| | Eric Roberts | 2 | Cancer Mapping: Making Spatial Models Work for Communities | $299,887 | $49,338 | $349,225 |
| **Salk Institute for Biological Studies** | | | | | | |
| | Dannielle Engle | 2 | A Genetic System for Identification of Mammary Stem Cells | $76,000 | $0 | $76,000 |
| **Scripps Research Institute** | | | | | | |
| | Melissa Dix | 2 | Substrate Profiling of Breast Cancer Related Proteases | $76,000 | $0 | $76,000 |
| | Brunhilde Felding-Habermann | 1.5 | Combating Breast Cancer with the Wellderly Immune Repertoire | $150,000 | $134,850 | $284,850 |
| T* | Karin Staflin | 2 | P32: New Functional Target in Breast Cancer Brain Metastasis | $90,000 | $0 | $90,000 |
| | Xiaohua Wu | 1.5 | Targeting DNA Repair Function of Breast Cancer Stem Cells | $150,000 | $134,850 | $284,850 |

| | Institution and Investigator | Years | Project Title | Direct Costs | Indirect Costs | Total Costs |
|---|---|---|---|---|---|---|
| **Stanford University** | | | | | | |
| | Margaret Fuller | 1.5 | Novel Tumor Suppressors in Breast Development and Cancer | $150,000 | $81,058 | $231,058 |
| | Jonathan Pollack | 1.5 | Discovery of Fusion Genes in Breast Cancer | $100,000 | $60,000 | $160,000 |
| | Albert Wong | 1.5 | The Role of EGF Variant mLEEK and Grp78 in Breast Cancer | $150,000 | $91,380 | $241,380 |
| **The Burnham Institute for Medical Research** | | | | | | |
| | Sonia del Rincon | 1.5 | Finding BRCA1 Ubiquitinated Substrates in Breast Cancer | $100,000 | $91,000 | $191,000 |
| | Adam Richardson | 1.5 | Proline Metabolism in Metastatic Breast Cancer | $67,872 | $0 | $67,872 |
| | Holly Hantz | 2 | Dietary Metabolite Inhibition of Breast Cancer Cell Survival | $149,160 | $135,735 | $284,895 |
| **University of California, Berkeley** | | | | | | |
| | John Balmes | 1 | California Chemicals Policy & Breast Cancer | $159,334 | $0 | $159,334 |
| **University of California, Davis** | | | | | | |
| | Steven Chen | 1.5 | Reducing Surgical Morbidity of Breast Cancer Staging | $149,983 | $0 | $149,983 |
| | Damon Meyer | 2 | Control of BRCA2-mediated Homologous Recombination | $90,000 | $0 | $90,000 |
| **University of California, Irvine** | | | | | | |
| | Kyoko Yokomori | 1.5 | Inhibitors of Condensin I as Chemotherapy for Breast Cancer | $100,000 | $0 | $100,000 |
| University of California, Los Angeles | | | | | | |
| T* | Arash Naeim | 1.5 | Health Literacy in Older Patient's Breast Cancer Treatment | $180,890 | $0 | $180,890 |
| | Frank Pajonk | 2 | Modulation of Breast Cancer Stem Cell Response to Radiation | $250,000 | $0 | $250,000 |
| | Richard Pietras | 1.5 | Membrane-associated Estrogen Receptors in Breast Cancer | $150,000 | $0 | $150,000 |
| University of California, San Diego | | | | | | |
| | Jakob Nebeker | 2 | Sound Speed Tomography for Early Breast Cancer Detection | $74,392 | $0 | $74,392 |
| | Michelle Rissling | 2 | Health Anxiety as a Risk for Insomnia in Breast Cancer | $73,855 | $0 | $73,855 |

| | Institution and Investigator | Years | Project Title | Direct Costs | Indirect Costs | Total Costs |
|---|---|---|---|---|---|---|
| **University of California, San Francisco** | | | | | | |
| | Cindy Benod | 2 | Compounds Blocking Assembly of LRH-1 in Breast Cancer | $90,000 | $0 | $90,000 |
| | Frances Brodsky | 1.5 | A Molecular Strategy to Inhibit Breast Cancer Metastasis | $150,000 | $0 | $150,000 |
| | Jonathan Chou | 2 | Understanding the Role of GATA3 in Breast Cancer | $76,000 | $0 | $76,000 |
| | Robert Hiatt | 1 | New Paradigm of Breast Cancer Causation and Prevention | $229,732 | $0 | $229,732 |
| | Dai Horiuchi | 2 | Targeting MYC in Human Breast Cancer | $90,000 | $0 | $90,000 |
| | Kuang-Yu Jen | 2 | Role of Circadian Rhythm Gene Homolog PER3 in Breast Cancer | $90,000 | $0 | $90,000 |
| | Celia Kaplan | 3 | Breast Cancer Risk Reduction: A Patient-Doctor Intervention | $740,690 | $0 | $740,690 |
| | Rita Mukhtar | 2 | Macrophages in Breast Cancer Patients of African Descent | $90,000 | $0 | $90,000 |
| | Anna Napoles-Springer | 3 | Nuevo Amanecer: Promoting the Psychosocial Health of Latinas | $349,547 | $0 | $349,547 |
| *This is a collaborative grant with Carmen Ortiz of Circulo de Vida Cancer Support and Resource Center.* | | | | | | |
| **University of California, Santa Barbara** | | | | | | |
| | Claudia Gottstein | 1.5 | Antibody-based Targeting of Breast Cancer Stem Cells | $150,000 | $0 | $150,000 |
| | Jennifer Smith | 2 | A Predictive Factor for Eribulin Treatment of Breast Cancer | $76,000 | $0 | $76,000 |
| **University of Southern California** | | | | | | |
| | Graham Casey | 1.5 | Podocalyxin as a Basal-like Breast Cancer Stem Cell Marker | $149,911 | $93,765 | $243,676 |
| | Kristine Monroe | 1 | Multiethnic Cohort Study | $19,045 | $11,998 | $31,043 |
| *This is a sub-award of the SRI initiative, "Understanding Racial and Ethnic Differences in Stage-specific Breast Cancer Survival: A Pilot Study"* | | | | | | |
| | Daniel Stram | 2 | New Methods for Genomic Studies in African American Women | $276,588 | $166,043 | $442,631 |
| | Anna Wu | 3 | Soy Treatment for High-risk Women and DCIS Patients | $750,000 | $467,500 | $1,217,500 |
| | Anna Wu | 1 | Los Angeles County Asian American Breast Cancer Study | $103,000 | $63,000 | $166,000 |
| *This is a sub-award of the SRI initiative, "Understanding Racial and Ethnic Differences in Stage-specific Breast Cancer Survival: A Pilot Study"* | | | | | | |
| **Vaccine Research Institute of San Diego** | | | | | | |
| | Per Borgstrom | 1.5 | Breast Cancer Tumor-Stroma Interactions in an *In Vivo* Model | $150,000 | $134,250 | $284,250 |
| **Women of Color Breast Cancer Survivors Support Project** | | | | | | |
| | Carolyn Tapp | 1 | Sister Survivor: Evaluating Best Practices in Social Support | $5,000 | $0 | $5,000 |
| *This is a collaborative planning grant with Kimlin Ashing-Giwa of Beckman Research Institute of the City of Hope.* | | | | | | |
| **Totals** | | | | **$13,017,324** | **$2,926,264** | **$15,943,588** |

*T* = Funded in part by Tax Check-off voluntary donations from individual taxpayers' income tax forms.*
*A* = Funded in part by a grant from the Avon Foundation for Women.*

# TABLE OF CONTENTS

# California Breast Cancer Research Program

**Annual Report to the State of California Legislature 2009**

Report prepared by the University of California, Office of the President pursuant to Article 1 of Chapter 2 of Part 1 of Division 103 of the California Health and Safety Code

**Marion H. E. Kavanaugh-Lynch, M.D., M.P.H.**
Director, California Breast Cancer Research Program

**Steven Beckwith, Ph.D.**
Vice President for Research and Graduate Studies

California Breast Cancer Research Program
University of California, Office of the President
300 Lakeside Drive, 6th Floor
Oakland, CA 94612-3550

Phone: 510 987-9884
Toll-free: 888 313-BCRP
Fax: 510 587-6325
Email: cbcrp@ucop.edu
Web: www.CABreastCancer.org

# About the California Breast Cancer Research Program

## Making California A Leader Among States

In 1993, California breast cancer activists joined forces with scientists, clinicians, state legislators, and University of California officials to propel the state into national leadership for breast cancer research.

The activists, most of them women who had survived or currently had breast cancer, were impatient with the slow pace of progress against the disease. With their allies, they wrote and won passage of statewide legislation to push breast cancer research in new, creative directions. The California Breast Cancer Act, sponsored by then-Assemblywoman Barbara Friedman, raised the tobacco tax by two cents a pack, with 45 percent of the proceeds going to the California Breast Cancer Research Program (CBCRP), which is administered as a public service by the University of California.

Since then, the CBCRP has continued to make California a leader among states by becoming the largest, most stable state-funded breast cancer research effort in the nation.

The mission of the CBCRP is to eliminate breast cancer by leading innovation in research, communication, and collaboration among California's lay and scientific communities.

Since 1993, the CBCRP has awarded 860 grants to 98 scientific institutions and community entities, totaling over $205 million for research in California to prevent, treat, and cure breast cancer. In 2009, the CBCRP awarded nearly $16 million for 53 single- and multiple-year research projects at 22 California institutions.

The CBCRP is funded primarily by the tobacco tax, a steadily declining source of revenue due to decreasing consumption of tobacco products. This funding is supplemented with taxpayer donations contributed through state income tax forms. The CBCRP also receives private contributions.

## Pushing the Research Boundaries

During its fifteen-year history, the CBCRP has established a record for filling gaps not covered by other research funders, jump-starting new areas of research, and fostering new types of collaboration. Now the Program is challenging itself to focus its resources on questions that could change the face of breast cancer research.

The CBCRP's Special Research Initiatives (SRI) are investigating two interconnected research areas that have long received little attention from traditional private and federal research funding sources:

- The environment's role in breast cancer
- The reasons why some groups of women are more likely to get or die from breast cancer, based on characteristics that include race and ethnicity

The CBCRP's Special Research Initiatives were developed through a thor-

ough and thoughtful process. The process included evaluating the impact of the Program's past research projects and gathering input from scientific experts and breast cancer advocates from across the nation. The result of this process is new research into questions that are difficult to investigate, but hold great promise for progress against breast cancer. During 2009, the CBCRP began setting funding priorities for the coming five years. The Program is using a similar thorough and thoughtful process to set priorities, in order to target the CBCRP's research dollars into investigations that will do the most to bring an end to this disease. For more on the CBCRP's priority-setting process see the section titled "The CBCRP's Strategy for Allocating Research Funds" in this annual report.

In recognition of the Program's leadership in funding innovative breast cancer research, the Dr. Susan Love Foundation honored the CBCRP with the 2009 Dr. Otto W. Sartorius Humanitarian Award for Excellence in Philanthropy.

## A Structure That Encourages Public Input

The CBCRP's structure has set a standard for community involvement that has inspired similar changes in other research funding agencies around the nation. Through example, the CBCRP is encouraging other agencies to include community advocates in the review of research proposals and to involve community members in the design and conduct of research. Breast cancer advocates play a critical role in every aspect of the CBCRP's work, from setting research priorities to recommending research projects for funding to getting out the word about research results.

The CBCRP is under the administration of the University of California, Office of the President, in Oakland, with a staff managing the solicitation, review, award, and oversight of grants and dissemination of research results.

The CBCRP's 16-member Breast Cancer Research Council includes scientists, clinicians, representatives of industry and nonprofit health organizations, and breast cancer advocates. The council provides vision, sets research priorities, and determines how the CBCRP invests its funds in research. It also conducts one of the two reviews that every proposal must pass to receive funding. The council reviews research proposals for relevance to the CBCRP's goals, while teams of research scientists and breast cancer advocates from outside California review all proposals for scientific merit.

In addition, all Californians concerned about breast cancer have opportunities to help set the research agenda via several avenues of feedback created by the Program. The Program's research symposia bring the scientific and treatment communities into dialog

with a broader range of the public than is common at such conferences. Each symposium includes a session for members of the public to provide feedback on the Program's work and suggest research priorities. The Program's Special Research Initiatives included several opportunities for the public to take part in identifying and prioritizing the questions to be investigated. During 2009, as part of the CBCRP's strategic planning process to set priorities for the next five years, the Program contacted funded researchers and interested members of the public. Everyone was invited to take part in a confidential online survey that will be used to help decide what kind of breast cancer research should be funded in the future. The CBCRP also encourages public review of its funded research through its annual reports and the Program's Web site (www.CABreastCancer.org), where members of the public can leave written comments.

By bringing the research, advocacy, and treatment communities into closer collaboration, the California Breast Cancer Research Program pushes the boundaries of research, mobilizing greater creativity and resources toward decreasing—and ending—the suffering and death caused by breast cancer.

# Sharing Research With Scientists and the Public

The legislation that established the California Breast Cancer Research Program calls on the Program to disseminate the results of its research. This is because the sponsors of the legislation recognized that funding high quality research is necessary but not sufficient to fulfill the Program's mission. If the research is going to be effective in reducing or ending the suffering caused by breast cancer, then people need to know the results. The scientific community needs to know, to make progress against the disease. The medical community needs to know, to improve prevention and treatment. People with breast cancer need the opportunity to learn about new prevention and treatment options. Breast cancer activists and policy makers need information about research results to shape their advocacy agenda. Communities affected by breast cancer need to know what's been proven to work in other communities. And the taxpayers of California need to know what their taxes are funding.

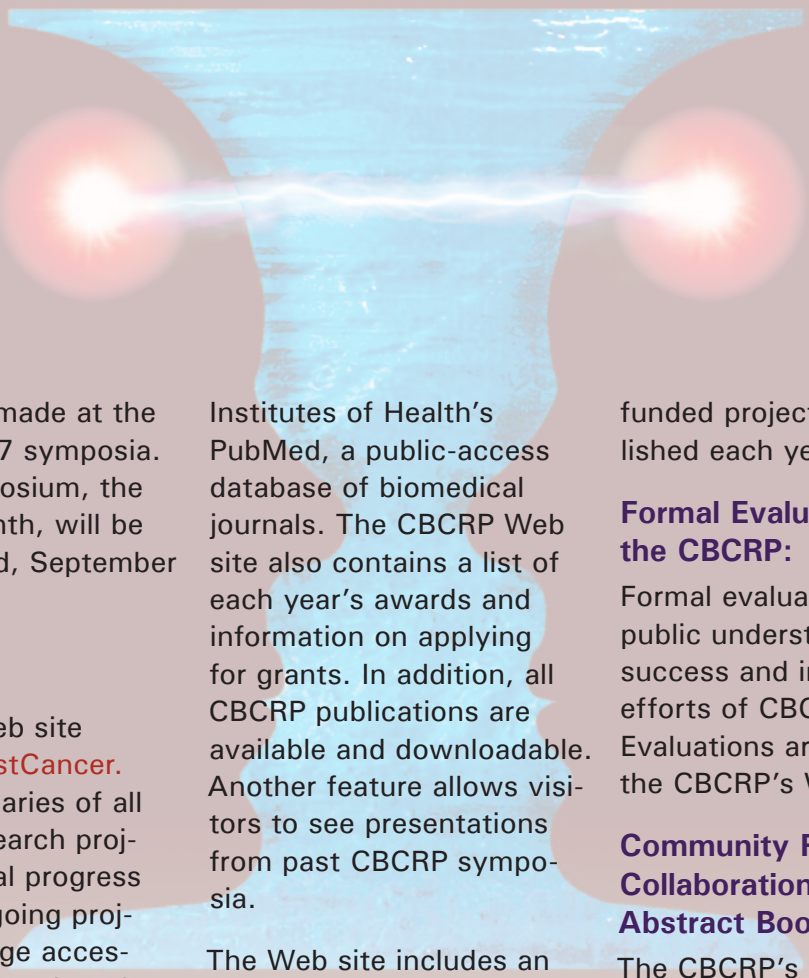
The scientists whose projects are funded by the CBCRP publish their results in peer-reviewed scientific journals and present them at scientific conferences. The California Breast Cancer Research Program is committed to going beyond this venue, and to making the results and progress of research it funds available to a much wider audience. The CBCRP publishes and distributes summaries of Program-funded research widely, in print and over the Internet. The CBCRP is one of the few research funding programs in the world to publish annual summaries of research while the studies are still in progress, so that scientists and other interested people can make use of the information as soon as possible. Research results and research progress are disseminated in a variety of ways:

### Research Symposia

The CBCRP periodically hosts a research symposium, a statewide conference presenting the results of the research the CBCRP funds. A research symposium typically draws 500 or more attendees.

These statewide conferences provide a forum where research scientists present their findings to a concerned public. Equally important, women whose lives have been affected by the disease share their priorities and hopes with researchers. The CBCRP makes a special effort to bring women who have, had, or are at risk for breast cancer to the Program's symposia. Scholarships that cover travel and accommodations are provided. Artwork that portrays the breast cancer experience is displayed. California community organizations also send representatives who provide information on their breast-cancer related programs. In addition, scientists can get information on how to obtain CBCRP funding for their investigations.

Reports, free to the public in booklet form and available on the CBCRP Web site, provide summaries of



presentations made at the 2005 and 2007 symposia. The next symposium, the CBCRP's seventh, will be held in Oakland, September 24-25, 2010.

## Web Site

The CBCRP Web site (www.CABreastCancer.org) has summaries of all completed research projects and annual progress reports for ongoing projects, in language accessible to the general reader. All research on the CBCRP Web site is fully searchable, and visitors who want to keep up with the latest research can search to access the most recently posted findings. A featured researcher section profiles one researcher and her or his findings. Visitors to the Web site can ask this expert questions, and receive answers, via email. Progress on the development of the CBCRP's Special Research Initiatives is also reported on the Web site.

Abstracts of research supported by CBCRP funding have links to the National Institutes of Health's PubMed, a public-access database of biomedical journals. The CBCRP Web site also contains a list of each year's awards and information on applying for grants. In addition, all CBCRP publications are available and downloadable. Another feature allows visitors to see presentations from past CBCRP symposia.

The Web site includes an opportunity to join the Program's volunteer team, request specific information from the CBCRP, and make online donations to the CBCRP.

## Publications

All CBCRP publications are available free to the public in printed form and on the CBCRP Web site. Multiple copies are available free of charge to organizations.

### Compendium of Awards:

To make it easy for scientists and the public to follow CBCRP-funded research from the beginning, a description of newly funded projects is published each year.

### Formal Evaluations of the CBCRP:

Formal evaluations let the public understand the success and improvement efforts of CBCRP work. Evaluations are available on the CBCRP's Web site.

### Community Research Collaboration Awards Abstract Booklet:

The CBCRP's Community Research Collaboration awards bring together members of community groups and academic scientists to conduct breast cancer research. This booklet, with abstracts of many past community research collaboration projects funded by the CBCRP, is designed to make community groups aware of this opportunity.

### Newsletter:

The CBCRP's newsletters report on new awards, research results, scientific meetings where the CBCRP is presenting an exhibit of Program work, and other Program news.

### E-Newsletter:

The CBCRP's email newsletter gives subscribers timely announcements of funding opportunities, early notification of new research resources and breast cancer conferences, and avenues to stay involved, informed, and active in the fight against breast cancer. It is distributed to over 2,000 stakeholders each month.

### Breast Cancer in California: A Closer Look/El Cancer de Seno en California: Una Mirada Mas de Cerca:

This 40-page booklet provides a picture of breast cancer's effect on the lives of California women. It is available in both English and Spanish.

### Identifying Gaps in Breast Cancer Research:

This research paper reviews previous research in the areas covered under the CBCRP's Special Research Initiatives: environmental links to breast cancer and the reasons why some groups of women bear a greater burden of the disease. The draft is available on the CBCRP Web site.

### California Breast Cancer Research Program brochure:

An overview of the CBCRP, our philosophy, and opportunities to get involved. The brochure is available in English and Spanish.

## Further Methods of Sharing Research

### Scientific Presentations at Conferences:

The CBCRP and CBCRP-funded researchers present research results at scientific conferences.

### Expressions: The Art of Healing Breast Cancer:

The CBCRP owns a collection of wearable breast art created by California artists to reflect on the breast cancer epidemic. The entire collection is on exhibit at CBCRP symposia. During 2009, portions of *Expressions: the Art of Healing Breast Cancer* were displayed, along with the CBCRP's exhibit, at community meetings. An art catalog of this collection is available online at the CBCRP Web site.

### Exhibits at Community Meetings:

The CBCRP presented displays of the Program's work at a number of community meetings and events during 2009. These included:

- Avon Walk for Breast Cancer, San Francisco
- 2009 Faith Fancher Breast Cancer Challenge, Oakland
- Northern California Cancer Center's "Each One Reach One," South San Francisco
- Sisters Network San Francisco Chapter's Gift for Life Walk, San Francisco
- Professional Business Women of California Conference, San Francisco
- The North Face Employees Health Fair, San Leandro


- Sisters Network Solano County, Vallejo
- African American Community Health Advisory Committee (AACHAC) 8th Annual Soul Stroll for Health 2009, San Mateo
- Sisters3 Breast Education Project's Healing Day in the Park, Pittsburg

### New Social Media:

During 2009, the CBCRP began making information about breast cancer research available via the social media site Facebook. The CBCRP's Facebook page provides an online space to exchange ideas, ask questions, and get up-do-date news about breast cancer research. Facebook users can also access invitations to events such as the CBCRP symposium, announcements of new CBCRP publications, and links to other breast-cancer-related organizations. During 2010, the CBCRP will also begin using another online social media site, Twitter, to communicate breast cancer news.

### Serving the Media:

The CBCRP does regular outreach to the media about the Program and about CBCRP-funded research projects that are of interest to the general public. When reporters from TV, newspapers, magazines, or other media need information on breast cancer research, the CBCRP links them with the appropriate experts. During 2009, news about the CBCRP and research funded by the CBCRP appeared in local California newspapers across the state. On the Internet during 2009, more than 20 general news, health news, international news, and blog Web sites carried stories that focused on CBCRP-funded research.

### Speakers and Educational Bureau:

When community organizations want speakers on breast cancer research for meetings and public events, the CBCRP provides referrals from the Program's network of researchers and advocates. The Program also refers research experts to teach continuing education classes for healthcare professionals.

# Collaborating with Breast Cancer Advocates and California Communities

People with breast cancer and survivors of the disease are involved in every level of the California Breast Cancer Research Program, from deciding which research the Program funds to actually carrying out some of the CBCRP's research. Non-scientist advocates have played a leadership role in the CBCRP right from the start. The CBCRP has been in the forefront of a nationwide trend among research funding agencies toward a greater voice for the people facing the disease in their day-to-day lives. The CBCRP still sets the standard for including advocates at all levels of leadership.

## Breast Cancer Advocates in Leadership

Breast cancer advocates—survivors of the disease and leaders of breast cancer advocacy organizations—play a leadership role in the CBCRP.

- Breast cancer advocates comprise one-third of the CBCRP's 16-member council, the group that makes the final selection of research projects the CBCRP funds.
- An advocate serves as the council's Chair or Vice-Chair.
- Prior to selection of research by the CBCRP's council, all research proposals submitted to the CBCRP are rated for scientific merit by out-of state panels of scientists and advocates. Advocates are full voting members of the panels and a California advocate observes each one.
- Advocates are involved in setting priorities for the CBCRP's research funding.
- Advocates took part in the development and leadership of the CBCRP's Special Research Initiatives, a multi-year effort to investigate the role of the environment in breast cancer and the reasons why some groups of women bear a greater burden of the disease.

Leadership from breast cancer advocates ensures that the CBCRP funds research important to the people most affected by the disease.

## Communities Conducting Research

Breast cancer advocates are also investigators on a rising number of the CBCRP's research projects. In 1997, the CBCRP pioneered a new type of research grant that allows community groups and breast cancer advocacy organizations to team up with experienced scientists to pursue a research idea of importance to the community in a scientifically rigorous way. These Community Research Collaboration (CRC) awards are open to non-profit organizations or ad-hoc community groups in any California community affected by breast cancer. The majority of community collaborators funded by the

CBCRP to date have been breast cancer survivors.

Research involving community organizations as active partners is gaining credibility in the United States, and the CBCRP has been a prime mover in extending and supporting the use of this kind of research to breast cancer in California. The Community Research Collaboration awards have provided nearly $16 million in funding to 61 collaborative projects. Projects funded over the years include:

- Determining whether Vietnamese nail salon workers have higher breast cancer rates and whether this group of women's workplace exposures to toxic substances exceed healthbased standards
- Investigating immigrant Afghan women's concerns, knowledge, attitudes, behaviors, and sources of information about breast care, and perceived barriers to care
- Educating African American and Hispanic women about the importance of participating in breast cancer clinical trials and developing tools for an educational program entitled *Scientific Literacy and Breast Cancer Clinical Trials Education Program*
- Development of effective breast cancer education tools for South Asian immigrant women
- Determining the benefits of peer-led African American support groups to address the unmet needs of African American women with breast cancer in a geographically underserved area
- Assessing the benefits and acceptability of a videoconferencing support group for rural and isolated women
- Evaluating an ethical will intervention for underserved women at end of life
- Identifying barriers to survival in the Latina population by assessing knowledge, attitudes, beliefs, experiences, and needs in terms of planning for and accessing medical care for surveillance, monitoring, and management of cancer and non-cancer medical issues

- Testing complementary and alternative medicine approaches to improving the quality of life of breast cancer survivors through mindful movement programs
- Breast cancer risk factors of lesbians and heterosexual women
- Culturally-appropriate breast cancer health care for Samoan American and Korean American women
- The effectiveness of "peer navigators," trained volunteer breast cancer survivors who help newly-diagnosed women understand decisions about treatment and cope with the disease
- Testing of a culturally-sensitive DVD to increase knowledge of breast health and breast cancer risk among Native American women
- The breast cancer experience of Slavic American women
- The barriers to older Thai American women participating in breast cancer screening

The CBCRP's Community Research Collaboration awards are designed to have an impact on breast cancer health care:

- Prior to research funded by the CBCRP, no study had investigated whether immigrant Hmong women in the U.S. were getting mammograms to detect breast cancer. Breast cancer was also the leading cause of cancer death in Asian American and Pacific Islander women as a whole. The CBCRP funded a research collaboration between Marjorie Kagawa-Singer, University of California, Los Angeles, School of Public Health, Mary Anne Foo, Orange County Asian & Pacific Islander Health Alliance, and Sora Park Tanjasiri, University of California, Irvine to address this issue. The research team tailored a culturally-relevant outreach and health education program to motivate Hmong women to increase breast cancer knowledge and obtain mammograms. Simultaneous outreach and education of Hmong men was critical, because it built on Hmong decision-making styles and the Hmong cultural strengths of social support and family integrity. The number of Hmong women who had heard of mammograms and obtained them during the study period nearly doubled after the health education program. The CBCRP has funded community-based studies with many of California's at-risk populations, including: African American, American Indian, deaf and hearing impaired, Latina, lesbian, Samoan, and immigrant Afghan, Chamorro, Korean, Slavic, South

Asian and Vietnamese communities.

- Lay health workers, also known as promotoras, are widely used in community clinics as a valuable link between the health care system and the Latino community. However, promotora programs vary significantly, and there is little research that identifies common challenges and synthesizes their solutions. Rena Pasick, Dr.P.H., at the University of California, San Francisco, and Peggy McGuire at the Women's Cancer Resource Center, Oakland, conducted a preliminary study of promotora programs in Alameda County. They found that lay health worker programs empower promotoras, increase community awareness of specific health issues and access to health care, and foster social change. The research team is now developing, implementing, and evaluating breast cancer promotora programs at two primary care clinics in Alameda serving Latinos.

## Fostering Community-Based Research

The CBCRP has taken major steps to enable diverse populations in California to take part in quality scientific research into breast cancer issues of interest to their communities. These efforts included making the application process for the Program's Community Research Collaboration grants more user-friendly.

The CBCRP also conducted technical assistance to community groups and scientists interested in collaborating on scientific research, including:

- Presentations at California community events about the opportunity to receive funding for collaborative research.
- Teleconference training for interested teams of community group members and scientists.
- Outreach workshops where previously funded Community Research Collaboration teams shared their experiences and the challenges they faced conducting research together.

These efforts resulted in the number of applications for Community Research Collaboration grants rising from five in 2003 to a high of 26 in 2007. The scien-

tific quality of these applications was also very high. The CBCRP funded six of these applications, covering a wide range of underresearched breast cancer topics. After reaching this peak in 2007, the CBCRP faced staffing changes. The Program had to reduce, and then eliminate, technical assistance to applicants for Community Research Collaboration grants. Applications dropped to 14 in 2008, and to just 4 in 2009. The CBCRP funded only one of these four applications.

The CBCRP is determined to reverse this downward trend and encourage more applications for community-based research collaborations for 2010 and future years. In fall 2009, the CBCRP resumed providing targeted technical assistance to interested teams of scientists and members of community groups. This assistance included one-on-one training and webinars, where a slide presentation provided over the Internet is combined with a teleconference.

In recognition of her leadership in community breast cancer research, during 2009 the CBCRP's Director, Dr. Marion H.E. Kavanaugh-Lynch, was appointed to and served on the National Institute of Health, National Center on Minority Health and Health Disparities, Special Emphasis Peer Review Panel on Community-based Participatory Research.

During 2010, the CBCRP will continue to facilitate diverse communities in California taking part in quality scientific breast cancer research and to take leadership in community-based participatory research.

# The CBCRP's Strategy for Allocating Research Funds

## The Grant-Making Process

Each year, the California Breast Cancer Research Program funds California investigators' research into the disease. These research projects may be completed during that year, but typically they run for more than a year.

The CBCRP's 16-member Breast Cancer Research Council decides which research projects to fund. The members of the council are listed in the "California Breast Cancer Research Program Council (2009)" section of this annual report. The council bases its decisions on recommendations from expert committees who review all research applications for scientific merit. To minimize conflicts of interest, review committees are composed of experts from outside California. These experts include scientists highly knowledgeable about the broad topic of the applications they consider. Each review committee also has advocate reviewers. These are women and men active in breast cancer advocacy organizations, many of them also living with the disease. The committees use a review process based on established practice at the federal government's National Institutes of Health. The members of the CBCRP's review committees for 2009 are listed in Appendix A of this annual report. During 2009, the CBCRP reduced the cost of this review process, which allowed the Program to allocate nearly $600,000 more for research.

To use the CBCRP's research dollars in ways that will most quickly lead to the prevention and cure of breast cancer, the CBCRP has developed and fine tuned its funding strategy. The Program's current strategy is summarized in this section, as is the priority-setting process that will inform the future strategy for the coming five years.

## Current Funding Strategy: Priority Issues

The subject of each research project the CBCRP funds must fall under one of the Program's Priority Issue areas:

- The Community Impact of Breast Cancer
- Etiology and Prevention
- Biology of the Breast Cell
- Detection, Prognosis, and Treatment

## Current Funding Strategy: Special Research Initiatives

The CBCRP is investing 30 percent of its research funds in the Program's Special Research Initiatives. The initiatives investigate two research areas that have not received enough attention, but that hold great promise against breast cancer:

- Why are some groups of women—based on characteristics such as their ethnic group,

race, or where they work or live—more likely to get, or die from, breast cancer?

- What is the role of the environment in this disease?

Funds are being targeted to research that will most quickly lead to major breakthroughs. The studies funded have been designed not only to increase knowledge, but also to create solutions that will move toward the goal of ending the suffering caused by breast cancer.

To build on the most current findings, the CBCRP commissioned a review of previous research into the environmental links to breast cancer and the reasons why some groups of women bear a greater burden of the disease. A draft of this extensive scientific review, Identifying Gaps in Breast Cancer Research, is posted on the CBCRP web site.

The CBCRP launched the Special Research Initiatives in 2005 because the Program's previous efforts to increase research addressing these questions had not led to enough progress. California is an ideal laboratory for these under-researched questions. The state has varied geography, heavily industrialized areas, and a large agricultural area. It has a mix of urban, suburban, small town, and rural communities. The state's population is ethnically and racially diverse. California also has communities with some of the highest rates of breast cancer in the nation.

During 2009, the CBCRP funded research studies under eight of the Program's Special Research Initiatives:

- **Chemicals Policy and Breast Cancer.** California's government is developing a new policy for the use of chemicals in the state. The policy could lead to better regulations to protect Californians from chemicals that cause breast cancer. However, science does not have all the answers about which chemicals those are. To make breast cancer prevention part of the new chemicals policy, the CBCRP is funding studies to figure out how best to test chemicals for their potential to cause breast cancer.
- **Demographic Questions for California Breast Cancer Research.** The state of California collects data about who gets breast cancer. The CBCRP is funding research into the best way to improve this data. Improving the data can empower researchers better understand why some groups of women are more likely to get, or die from, the disease. Improving the data could also lead to recommendations for ways to lighten the burden on groups of women who suffer disproportionately from breast cancer.

## Funds are being targeted to research that will most quickly lead to major breakthroughs.

- **Understanding Racial and Ethnic Differences in Stage-Specific Breast Cancer Survival.** Women from some racial and ethnic groups are less likely to survive breast cancer than others, even when they are diagnosed at the same stage and with the same kind of cancer. To discover why, the CBCRP is funding studies with the goal of decreasing breast cancer deaths among racial and ethnic groups with the highest death rates. These studies leverage resources found only in California: diverse ethnic and racial groups, plus expert researchers conducting ongoing investigations of breast cancer among a number of those groups.
- **Biological/Ecological Models of Breast Cancer Causation and Prevention.** Up until now, scientists have too often studied only one possible cause of breast cancer at a time. A different approach will be needed to make progress in uncovering the environment's role in breast cancer and in understanding why some groups of women bear a greater burden of the disease. For this reason, the CBCRP is funding research into better tools to investigate—all at once—many factors that may be involved in breast cancer.
- **The Environmental Causes of Breast Cancer Across Generations.** In the first-ever "womb to breast cancer" study in women, rather than in lab animals, the CBCRP is finding out if women exposed to certain chemicals while they were developing in the womb are more likely to get breast cancer. The study is based on growing scientific evidence that women who were exposed to toxic chemicals at critical periods in their lives are more likely to get breast cancer years later.
- **Environmental Exposures and Breast Cancer Across a Large, Diverse Cohort of Women.** To truly see the environment's role in breast cancer, researchers need to study a large diverse population of women over time, and collect information about the women's environments, lifestyles, racial and ethnic backgrounds, immigration histories, sexual orientations, genes, health histories, etc. The CBCRP is funding research that leverages over ten years of data collected by the ongoing California Teachers Study to discover the role of specific chemicals in breast cancer.
- **New Statistical Models to Address Disease Complexity.** It takes complex math to evaluate the impact of

many complex causes leading to breast cancer. New, more powerful computers and software make this complex math possible. The CBCRP is funding research teams to develop new statistical methods that will allow researchers to better measure the many factors that act in combination with each other across a woman's life span, increasing or lowering her risk of getting breast cancer.

An additional initiative will be funded in the future:

- **An Integrated Approach to Understanding Behavioral, Social, and Physical Environment Factors and Breast Cancer Among Immigrants**. Why does moving to the U.S. raise a woman's chances of getting beast cancer? The CBCRP will fund studies among California immigrant communities to answer this important question.

## Special Research Initiatives Award Types

Unlike the procedure used with other CBCRP-funded research studies, and the majority of scientific research funded in the nation today, the scientists involved in the Special Research Initiatives are not selecting the topics to be studied. Using this method of selecting topics has not led to enough good research into the environment's role in breast cancer and the reasons some groups of women bear a greater burden of the disease. The initiatives are the result of a thoughtful, thorough planning process that included analyzing years of nationwide and CBCRP-funded breast cancer research, and collecting feedback from breast cancer advocates, researchers, healthcare providers, policy makers, other funders, and the public. The CBCRP used this process to select topics to be studied. California researchers were then invited to participate through the three following types of award:

- **Requests for Qualifications:** The CBCRP developed specific research questions to be answered. The Program then invited California researchers to submit their qualifications for answering these questions. Grants were awarded to researchers identified as most qualified.
- **Program Directed Awards:** The CBCRP identified and funded crucial research projects that leverage California resources.
- **Requests For Proposals:** The CBCRP identified a relatively narrow area for research, and then invited researchers to propose topics to investigate within those areas. *(See tables which appear on the following page).*

The table below shows Special Research Initiatives funded in 2009 by Award Type.

**Table 3: Special Research Initiative Award Types**

| Award Type | Initiatives |
|---|---|
| Requests for Qualifications | • Demographic Questions for California Breast Cancer Research<br>• Understanding Racial and Ethnic Differences in Stage-Specific Breast Cancer Survival<br>• Biological/Ecological Models of Breast Cancer Causation and Prevention |
| Program Directed Awards | • Environmental Causes of Breast Cancer Across Generations<br>• Environmental Exposures and Breast Cancer Among a Large, Diverse Cohort of Women |
| Requests for Proposals | • New Statistical Models to Address Disease Complexity |

The table below presents statistics of the nine Special Research Initiatives projects in 2009.

**Table 4: Special Research Initiative Funded in 2009**

| Initiative | CBCRP Priority Issues Area | Number of Projects | Amount |
|---|---|---|---|
| Chemicals Policy and Breast Cancer | Community Impact of Breast Cancer | 1 | $159,334 |
| Demographic Questions for `California Breast Cancer Research | Community Impact of Breast Cancer | 1 | $430,988 |
| Understanding Racial and Ethnic Differences in Stage-Specific Breast Cancer Survival | Community Impact of Breast Cancer | 1 | $322,541 |
| Biological/Ecological Models of Breast Cancer Causation and Prevention | Etiology and Prevention | 1 | $229,732 |
| Environmental Causes of Breast Cancer Across Generations | Etiology and Prevention | 1 | $5,000,000 |
| Environmental Exposures and Breast Cancer Among a Large, Diverse Cohort of Women | Etiology and Prevention | 1 | $132,203 |
| New Statistical Models to Address Disease Complexity | Etiology and Prevention<br>Community Impact of Breast Cancer | 2<br>1 | $627,420<br>$442,631 |
| **Totals** | | 9 | $7,344,849 |

## Special Research Initiatives Result in the CBCRP Providing Statewide and National Environmental Leadership

As a result of the CBCRP's leadership in research into the role of the environment in breast cancer, the Program's director, Marion H.E. Kavanaugh-Lynch, has been appointed to the nine-member California Environmental Contaminant Biomonitoring Program Scientific Guidance Panel. The panel assists the Department of Health Services and California Environmental Protection Agency by providing scientific peer reviews and making recommendations regarding the design and implementation of the California Environmental Contaminant Biomonitoring Program. Dr. Kavanaugh-Lynch also serves on the oversight committee of the Breast Cancer and Environment Research Centers (BCERC). BCERC is a network of four national centers, created by the federal National Institute of Environmental Health Sciences and the National Cancer Institute. The network supports research into the impact of prenatal-to-adult environmental exposures that may predispose a woman to breast cancer.

## Current Funding Strategy: Core Funding

After setting aside 30 percent of CBCRP research funds for the Special Research Initiatives, the CBCRP dedicates the remaining 70 percent to challenging investigators to use the funds to maximum effect. During its sixteen-year history, the CBCRP has used this type of funding to stimulate innovative research.

Each core funding research project must qualify as one of the CBCRP types of awards:

- **Community Research Collaboration (CRC) award:** Brings community organizations—such as breast cancer advocacy organizations, community clinics, or organizations serving under-represented women—together with experienced scientists to investigate breast cancer problems that are important to that community, using culturally-appropriate research methods. Pilot CRC awards are funded up to 18 months and up to $150,000 in direct costs. Full CRC awards are funded up to three years for up to $600,000 in direct costs.
- **Innovative Developmental and Exploratory Award (IDEA):** Funds promising high-risk/high-reward research to "road test" innovative concepts. Applicants must show how their project is part of a step-by-step research process that will lead to practical applications, such as breast cancer diagnosis, treatment, or prevention. IDEAs

are funded for up to 18 months and up to $100,000—and for studies using animals or humans, $150,000—in direct costs.

- **IDEA–competitive renewal:** Allows recently-funded recipients of CBCRP IDEA grants to compete for additional funding, if the project has succeeded in meeting key milestones in a research process that will lead to practical applications. IDEA-competitive renewal awards are available for up to two years and up to $200,000—and for studies using animals or humans, $250,000—in direct costs.
- **Postdoctoral Fellowship award:** Funds advanced training under a breast cancer mentor. Total postdoctoral tenure (prior training plus new CBCRP funding) is limited to five years, and the maximum award duration is three years at $45,000 per year.
- **Dissertation award:** Supports the completion of dissertation research by masters or doctoral degree candidates. Dissertations are funded up to $38,000 per year for up to two years.
- **Joining Forces Conference award:** Supports a conference, symposium, retreat, or other meeting to link breast cancer researchers, non-breast cancer investigators, and community members for the purpose of stimulating new ideas and collaborations.
- **Translational Research award:** Funds research that will take basic science findings quickly toward treatment, diagnosis, prevention, or another application that can directly impact breast cancer, either in a medical clinic setting or through a public health measure.

Each Core Funding research project must also qualify under one of the CBCRP's four Priority Issue areas, which are listed in Table 5 on the page following.

## Core Funding by Priority Issue and by Award Type

Below, two tables present statistics on the 44 Core Funding projects funded during 2009 by Priority Issue and by Award Type.

**Table 5. Core Funding Awarded in 2009 by Priority Issue**

| | Number of Projects | Amount | Percentage of Total Core Funding |
|---|---|---|---|
| Community Impact of Breast Cancer | 7 | $1,155,143 | 13.5% |
| Etiology and Prevention | 3 | $1,149,190 | 25.0% |
| Detection, Prognosis and Treatment | 15 | $2,222,312 | 25.8% |
| Biology of the Breast Cell | 19 | $3,072,049 | 35.7% |
| **Totals** | 44 | $8,598,739 | 100% |

**Table 6. Core Funding Awarded in 2009 by Award Type**

| Award Type | Number of Projects | Amount | Percentage of Total Core Funding |
|---|---|---|---|
| Dissertation | 8 | $604,247 | 7.0% |
| Postdoctoral Fellowship | 9 | $809,996 | 9.4% |
| Innovative Developmental and Exploratory (IDEA) | 19 | $3,901,192 | 45.3% |
| IDEA-Competitive Renewal | 2 | $602,500 | 7.1% |
| Community Research Collaboration (CRC) | 2 | $672,614 | 7.8% |
| Joining Forces Conference Award | 2 | $50,000 | 0.6% |
| Translational Research Award | 2 | $1,958,190 | 22.8% |
| **Totals** | 44 | $8,598,739 | 100% |

## Current Funding Strategy: Ten Programmatic Funding Goals

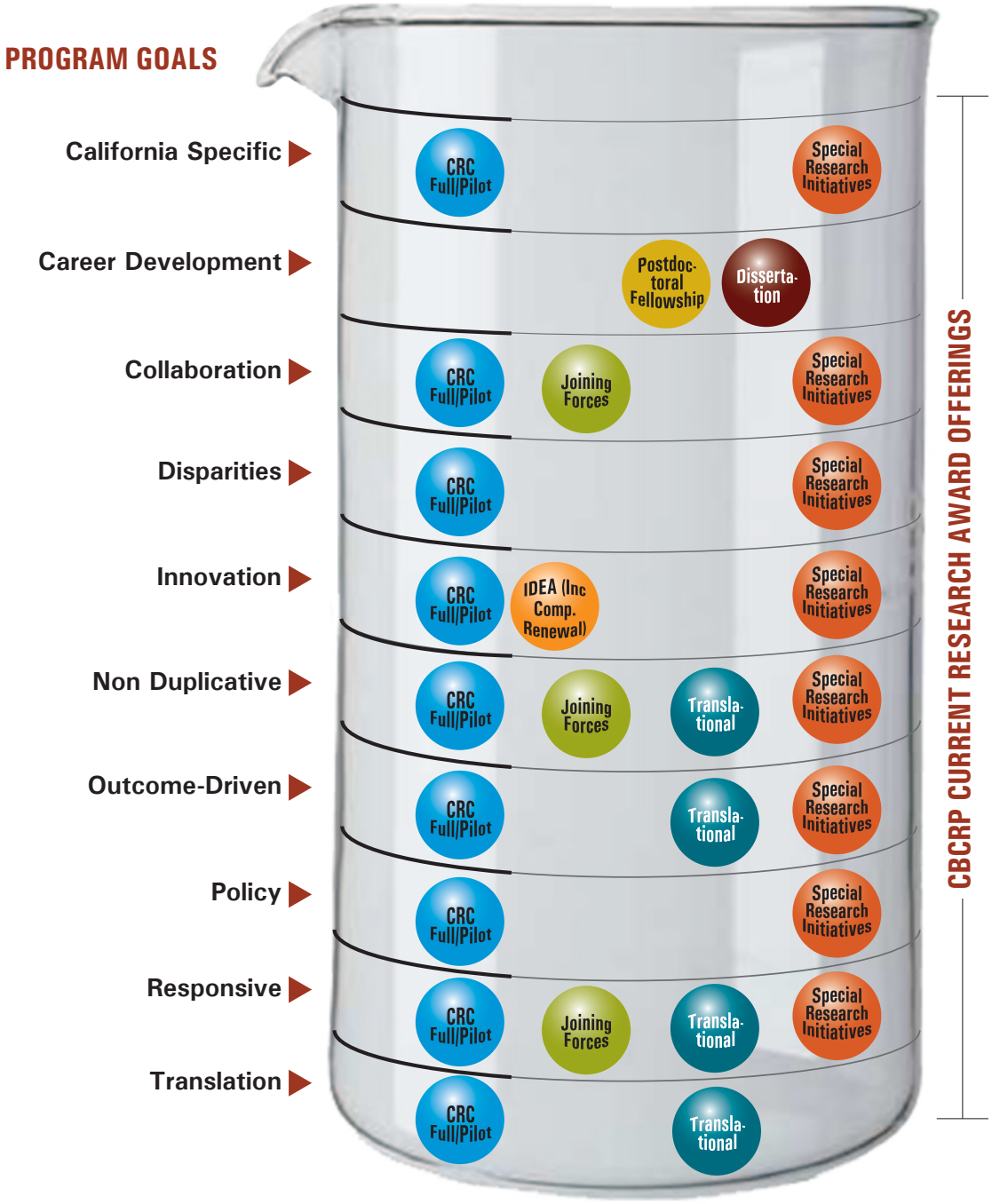
The following ten goals are used to set overall programmatic research priorities and calls for applications.

- **California Specific:** Fund research that utilizes resources particular to California and/or addresses a breast cancer need that is specific but not necessarily unique to the burden of breast cancer in California
- **Career Development:** Fund research that helps recruit, retain, and develop high-quality California-based investigators who engage in breast cancer research
- **Collaboration:** Fund research that uses multidisciplinary approaches and helps fosters collaboration among California scientists, clinicians, advocates, community members, patients, survivors, and others
- **Disparities:** Fund research that addresses disparities, inequalities and/or underserved populations in California
- **Innovation:** Fund innovative research (i.e., new drugs, new strategies, new paradigms, new applications of tested strategies in new populations and contexts)
- **Non-duplicative:** Fund research that complements, builds on, and/or feeds into, but does not duplicate, other research programs
- **Outcome Driven:** Fund research that will improve public health outcomes (e.g. preventing breast cancer, detection of breast cancer, effective treatments and quality of life)
- **Policy:** Fund research and evaluation that will have policy implications for breast cancer in California
- **Responsive:** Fund research that is responsive to the perceived breast cancer research needs, opportunities, and expectations of the CBCRP as identified by scientists and the public in California
- **Translation:** Fund research that is on a critical path for practical application and leads to more effective products, technologies, interventions, or policies and their application/delivery to Californians

The figure on the page following illustrates how the CBCRP's current types of awards address the Program's goals.

Figure 1.

## How Research Awards Address Program Goals



## Future Funding Strategy: The Next Five Years

The CBCRP is in the process of developing the funding strategy for grantmaking for the next five years. The Program has a strong commitment to targeting research funds where they will be most effective toward ending the breast cancer epidemic. To fulfill this commitment, the CBCRP periodically engages in a thoughtful, data-driven process of setting priorities.

To get the data needed to set priorities, the CBCRP evaluates the types of grants the Program makes, to measure whether they meet specified goals. For example, two types of CBCRP awards—Dissertation awards and Post-doctoral Fellowship awards—have a goal of launching scientists into careers in breast cancer research, thus enlarging the pool of scientists working to end the disease. The CBCRP surveys former recipients of these awards to find out what percentage have continued to conduct breast cancer research. (For more on evaluations of CBCRP grants, see the section titled "Improving the CBCRP Through Evaluation" in this annual report.) Setting priorities through this data-driven process has led to the CBCRP improving some types of grants, discontinuing some types of grants, and developing new types of grants. For example, a previous priority-setting process led to the CBCRP setting aside 30 percent of its funds for the Special Research Initiatives—an effort to uncover the environment's role in breast cancer and the reasons why some groups of women bear a greater burden of the disease.

During 2010, the CBCRP council and staff will use a group decision-making process to identify and make decisions for the long term (5 years) and the short term (1 year) and incorporate these decisions into the CBCRP's funding of breast cancer research.

## Influencing the Research System Nationwide

One goal underlying the CBCRP's funding strategy is the leveraging of Program funds to influence the research system nationwide. The CBCRP is part of a much larger research system. The federal government funds breast cancer research through agencies like the National Cancer Institute and the Department of Defense. Nonprofit organizations and for-profit corporations also fund breast cancer research. Although the CBCRP is the largest state funding source for breast cancer research in California, these funds make up only a small part of the funds granted through the larger system. The CBCRP tries to influence this larger research system to move in new, creative directions.

An example is the CBCRP's Innovative, Developmental, and Exploratory Awards (IDEAs). These awards were specifically designed to fund research that has a

high potential for scientific payoff—and also a high potential for failure. When the CBCRP began funding breast cancer research in 1995, less than 10 percent of research proposals submitted to the nation's funding agencies were successful. This led the people who decided what got funded—panels of research experts—to look for proposals that seemed most likely to succeed. Research scientists had to have done a significant portion of the research and have strong preliminary data before they could even get a grant. This made it hard for anyone to get funding in order to try out a high-risk idea. However, high-risk ideas are often the source of scientific breakthroughs. The CBCRP's IDEAs meet a need by funding creative new research approaches.

### Former CBCRP-Funded Researcher Receives Nobel Prize.

If the research funded by an IDEA succeeds, the researcher may well be able to get another research funding agency to fund the next step, or even win a Nobel Prize. During 2009, Elizabeth Blackburn, a scientist who received an IDEA in 1996, was awarded the Nobel Prize for Physiology or Medicine. Dr. Blackburn, along with two other recipients, received the prize for discovering that telomeres, which are specialized DNA "caps" on the ends of chromosomes, protect chromosomes during cell division. The researchers then discovered the enzyme telomerase, which allows cells to continue to divide indefinitely. Most normal cells have little telomerase, but many breast cancers have high levels. In 1996, there was little evidence that telomeres could be targeted to breast cancer. But the CBCRP took a chance and funded Dr. Blackburn's project to explore ways to treat breast cancer cells by using their high telomerase content against them. With subsequent funding, Dr. Blackburn has further developed methods for using "toxic" RNA to trick breast cancer cells into destroying themselves with their own telomerase, without harming normal cells. Because of the chance that Dr. Blackburn and the CBCRP took, a new treatment for breast cancer is emerging. Although the CBCRP's IDEA grants will not always lead to a Nobel Prize, this example illustrates the importance of funding high-risk research.

The CBCRP uses additional methods to get creative new research going. These include encouraging researchers in California to submit exciting new ideas. The CBCRP also developed a new scoring system to help reviewers read proposals with a perspective toward rewarding high-risk research. In addition, the Program's Special Research Initiatives are a multi-year effort to stimulate new research in previously

under-investigated areas that have a high potential to lead to breakthroughs in breast cancer causes and prevention.

### Enlarging the Pool of Breast Cancer Researchers

Another major goal of the CBCRP is to increase the number of talented scientists engaged in breast cancer research. Some of the Program's grants have allowed investigators to specialize in, or concentrate much of their efforts on, breast cancer research. For example, Margaret Fuller, Ph.D., of Stanford University, is an expert in stem cell biology. A CBCRP grant is enabling her to apply findings about stem cells to breast cancer. Dr. Fuller's research project is concerned with the normal process where adult stem cells become specialized cells in the breast. She is testing the hypothesis that certain cell proteins involved in this process may also suppress tumors, and that not having enough of these proteins may allow tumors to get started. Her research, if successful, could lead to a genetic test that could identify women at high risk for breast cancer.

### Leveraging Funds for Promising Research

An additional goal of the CBCRP's research strategy is encouraging and inspiring other research funding agencies to support cutting edge research. For example, the Avon Foundation for Women, which funds breast cancer research nationwide, is joining the CBCRP in supporting the Program's ground-breaking Special Research Initiatives. The foundation, long a funder of breast cancer research, agrees that not enough has been done in the areas of environmental links to breast cancer and the reasons why some groups of women bear a greater burden of the disease. The Avon Foundation for Women awarded the CBCRP a $500,000 grant earmarked for the CBCRP Special Research Initiatives.

In addition, receiving a CBCRP grant to conduct breast cancer research also allows scientists to leverage additional funding. For example, for every $1 the CBCRP invested in the Program's Innovative, Developmental and Exploratory awards (IDEAs), investigators have been able to leverage another $5 for breast cancer research.

# Research Progress and Results

The Research Progress and Results section is organized by the CBCRP's four major Priority Issues:

**The Community Impact of Breast Cancer | Etiology and Prevention | Detection, Prognosis, and Treatment | Biology of the Breast Cell**

## The Community Impact of Breast Cancer

California is comprised of diverse communities differing by multiple characteristics such as ethnicity, culture, language, sexual identity, immigration history, and socioeconomic status. This diversity offers the unique opportunity to investigate disparities and the unequal burden of breast cancer among underserved groups. Critical questions to be addressed include:

- How do poverty, race/ethnicity, and social factors impact incidence and mortality for breast cancer?
- What are the sociocultural, behavioral, and psychological issues faced by women at risk for or diagnosed with breast cancer?
- What services are needed to improve access to care in order to improve quality of life and reduce suffering?

The CBCRP addresses these issues through program initiated research in addition to the research conducted by community academic partnerships and individual investigators.

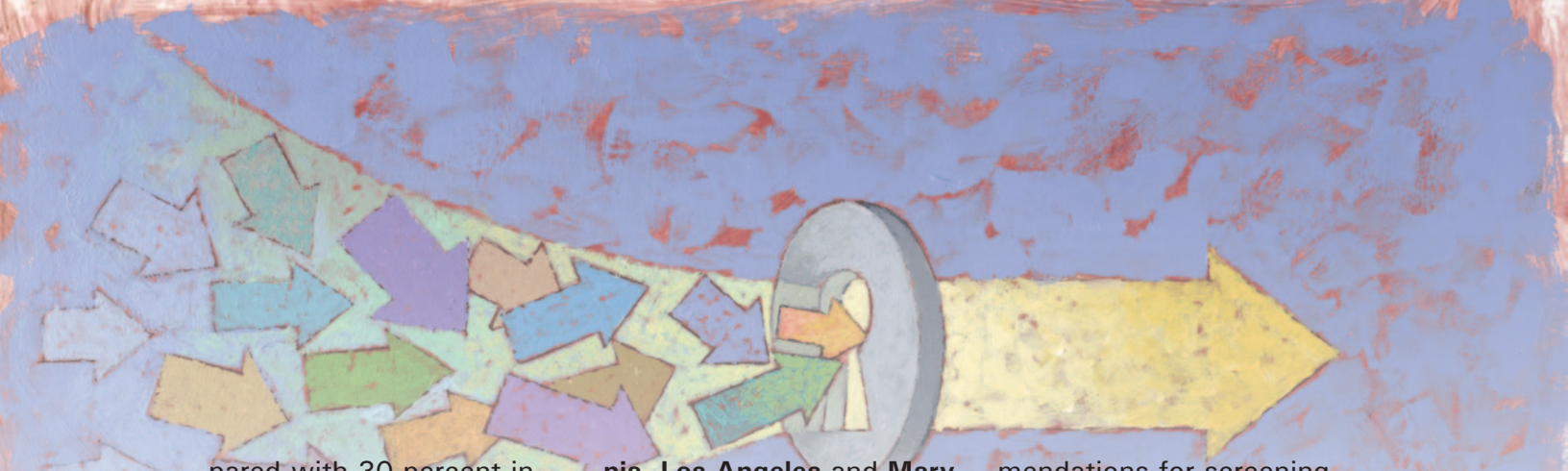
Three research topics are represented in this section:

- Health Policy and Health Services: Better Serving Women's Needs
- Disparities: Eliminating the Unequal Burden of Breast Cancer
- Sociocultural, Behavioral, and Psychological Issues Relevant to Breast Cancer: The Human Side

## Research Completed in 2009

### Increasing Mammography Screening in Latinas with Diabetes

Research shows that Latinas are less likely to get mammography screening than other women. It is even less likely for Latinas with diabetes to get a mammogram, despite more visits to their healthcare provider. **Christine Noguera, M.S.,** of the **Golden Valley Health Centers,** in Merced, and **Stergios Roussos, Ph.D., M.P.H,** at the **San Diego State University Research Foundation,** conducted a pilot study of a systems-level intervention they developed to improve mammography screening for diabetic Latina patients in a primarily farm-working Mexican community. After six months, referrals for mammography screening had increased 41 percent in the study group, com-



pared with 30 percent in the control group. The investigators also conducted a telephone survey that identified a number of barriers to mammography screening in these women. The researchers received another CBCRP grant that will allow them to conduct a more rigorous experimental study of the intervention they developed. This study could lead to the development of a program to increase screening in Latinas that could be duplicated in community settings throughout the state.

### Southeast Asian Breast Health Navigation

Southeast Asian women have the lowest rates of breast cancer screening among Asian and Pacific Islander women. Recently, community health outreach workers or "navigators" have shown success in guiding women through the health care system to access needed health care services such as breast health exams and follow-up care. **Marjorie Kagawa-Singer, Ph.D.,** of the **University of California, Los Angeles** and **Mary Anne Foo, M.P.H.,** of the **Orange County Asian and Pacific Islander Community Alliance, Inc.,** conducted the first-ever study to look at patient navigation in Southeast Asian communities. Their focus groups with 110 Southeast Asian women, 15 providers, and 10 community health navigators allowed them to identify the essential elements of a community-based patient navigation programs that would meet this community's needs. Their next goal is to develop a formal curriculum to better train patient navigators who are helping underserved, low-income, and limited-English speaking women access quality breast health services.

### Addressing Cultural & Tribal Issues in Breast Cancer

American Indian women have the poorest cancer screening rates of any ethnic group. It is estimated that breast cancer deaths could be reduced by more than 30 percent in these women if current recommendations for screening were followed. **Linda Navarro** at the **Turtle Health Foundation,** in Sacramento, and **Marlene von Friederichs-Fitzwater, Ph.D.,** of the **University of California, Davis,** conducted a pilot study that tested an informational/educational DVD called "Mother's Wisdom Breast Health Program" with 161 American Indian women across tribes in California. They also identified more than 175 tribes, tribal organizations, and individual women who are interested in being part of a future longitudinal study on behavior change. The researchers are continuing to investigate whether increasing awareness and knowledge of breast health and breast cancer risk reduction results in changes in lifestyle and screening behaviors in American Indian women.

### Sister Survivor: African American Breast Cancer Coalition

Support groups have been shown to improve breast cancer and quality of life outcomes. However, there

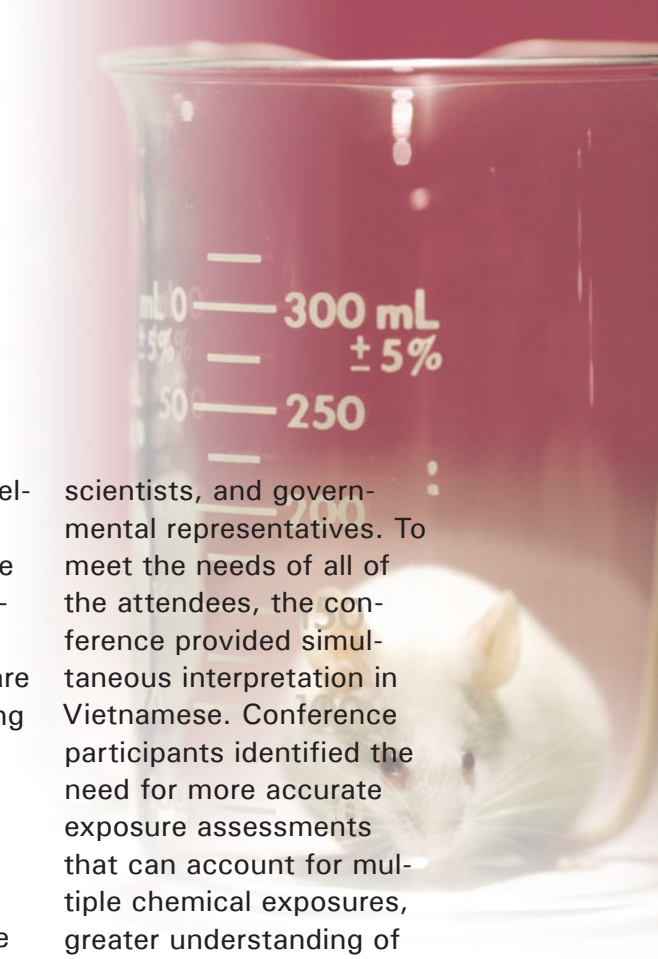
is limited research on the role of support groups among African American breast cancer survivors. **Kimlin Ashing-Giwa, Ph.D.,** at the **Beckman Research Institute of the City of Hope,** in Duarte, and **Gloria Harmon, B.A.,** of **Women of Essence,** in Los Angeles, conducted focus groups with 93 African American breast cancer survivors in the Inland Empire to identify their unmet needs. They then used that information to develop a guidebook for organizing and implementing peer-based support groups specifically tailored to the needs of African American breast cancer survivors. The investigators intend to continue to refine the guidebook and to prospectively assess the efficacy of the peer support groups in improving survivorship outcomes.

### Scientific Literacy & Breast Cancer Clinical Trials Education Program

The Scientific Literacy & Breast Cancer Clinical Trials Education Program (BCCT) is designed to increase scientific literacy, clinical trials participation, and advocacy among African American and Hispanic American women. **Natasha Riley, M.A.,** at the **Vista Community Clinic,** and **Georgia Robins Sadler, Ph.D., M.B.A,** at the **University of California, San Diego,** developed and tested psychosocial surveys and a culturally appropriate BCCT education program in preparation for piloting a randomized controlled trial of the educational program with 60 African American and Hispanic American women. The investigators received additional CBCRP funding so that they could begin testing the effectiveness of the BCCT program.

### Increasing the Voice of African Americans in Research

The CBCRP developed the Joining Forces Conferences Awards to allow individuals to host meetings that bring together breast cancer stakeholders who wouldn't normally cross paths. **Kimlin Ashing-Giwa, Ph.D.,** at the **Beckman Research Institute of the City of Hope,** in Duarte, used this award to sponsor the conference "Increasing the Voice of African Americans in Research: A Dialogue between Advocates and Researchers." The conference was held on Oct. 4, 2008, and brought together the African American advocacy community and scientists interested in addressing the breast cancer needs of African Americans in Los Angeles, Riverside, and San Bernardino Counties. The conference included talks from researchers and health care providers about breast cancer in the African American community and presentations from community advocates about how their groups are providing support for African American women's health. The conference included an intensive networking exercise in which researchers rotated through tables of community advocates to brainstorm about research ideas that would be critical and interesting to both partners. Ideas ranged from new approaches to providing health care to new theories for the causes of breast




cancer in African American women.

### Community Breast Cancer Screening & Prevention Conferences

Genetic cancer risk assessment counseling and testing is the standard of care for helping individuals identify and manage hereditary cancer risks. **Jeffrey Weitzel, M.D.,** at the **Beckman Research Institute of the City of Hope,** in Duarte, and colleagues developed and presented two conferences on breast cancer risk assessment. One of the conferences was conducted in English, and was designed for patients that had health insurance. The other was conducted in Spanish, and was designed for an underserved high-risk population. Patients and families who had received genetic cancer risk assessment at the City of Hope or a collaborating community-based health facility were invited to the conferences and 150 individuals attended. All of the participants completed surveys about, and attended breakout sessions that discussed, genetic counseling and testing. Findings from these surveys will be used to increase the quality of the programs available for individuals who are at higher risk of developing breast cancer.

### Nail Salon Workers: Chemical Exposures in the Workplace

The CBCRP developed the Joining Forces Conferences Awards to allow individuals to host meetings that bring together breast cancer stakeholders that wouldn't normally cross paths. **Linda Okahara,** at **Asian Health Services,** in Oakland, in conjunction with the **California Healthy Nail Salon Collaborative,** organized a two-day conference "Framing a Research Agenda to Advance Worker Health and Safety in the Nail Salon and Cosmetology Communities" in April 2009 in Oakland. More than 120 people attended the conference, 25 percent of who were nail and hair salon workers. Attendees also included community advocates, health researchers, environmental health scientists, and governmental representatives. To meet the needs of all of the attendees, the conference provided simultaneous interpretation in Vietnamese. Conference participants identified the need for more accurate exposure assessments that can account for multiple chemical exposures, greater understanding of potential linkages between nail product chemical exposure and adverse reproductive outcomes, and better surveillance programs for tracking health impacts in the workforce. The Collaborative intends to convene a scientific advisory committee to address these gaps and to develop and advance a research agenda.

### Neighborhood Environment and Obesity in Preadolescent Girls

Women who are obese are at higher risk for developing breast cancer. Girls who are overweight or obese are more likely to become overweight or obese women. In addition, childhood obesity may lead to early pubertal develop-

ment and menarche, which is also a risk factor for adult breast cancer. Obesity is generally understood to be the result of eating poorly and not exercising. However, girls' eating and exercise habits are very much influenced by their home and school environments. **Irene Yen, Ph.D.,** at the **University of California, San Francisco,** studied the neighborhoods of 215 girls who were recruited into an ongoing study called the Community Study of Young Girls' Nutrition, Environment, and Transitions to investigate the association between city planning policies, neighborhood environment (food stores, fast food chains, parks, traffic conditions) and girls' diet, physical activity, and growth patterns. Findings from this research could identify the types of city planning policies and neighborhood services and conditions that can improve girls' diet and physical activity, influence their growth patterns and pubertal changes, and, potentially, decrease their breast cancer risk as adults. The researchers were awarded a competitive renewal IDEA award in 2009 to continue pursuing these questions.

### Breast Health Behaviors of Immigrant Afghan Women

Muslim immigrant women are less likely to use breast care health services and are more likely to die from breast cancer than other women. The Bay Area is home to the largest Afghan community in the U.S. with an estimate of more than 30,000 individuals. Research conducted outside of U.S. indicates that Afghan immigrant women are more likely to be diagnosed with breast cancer at a young age and at a more advanced stage. **Joan Bloom, Ph.D.,** at the **University of California, Berkeley,** and **Aida Shirazi** of the **Afghan Coalition,** in Fremont, conducted interviews with 53 first-generation immigrant Afghan women with limited English proficiency to learn more about their knowledge of breast cancer, attitudes toward screening, and religious, cultural, and economic barriers to receiving breast health services. Their findings will be used to develop and test a breast health education program for Afghan women.

### Networking Breast Cancer Navigator Programs in Northern California

Assisting women with breast cancer through the myriad systems involved in obtaining medical care has become known as "navigation." Various individuals and agencies in Northern California provide different types of navigation services. **Lisa Bailey, M.D.,** at the **Alta Bates Summit Medical Foundation,** in Berkeley, and colleagues held a full-day Breast Cancer Navigation Conference that provided an opportunity for physicians, breast cancer advocates and representatives of community hospitals and public health departments in Northern California to learn about the program models currently being utilized, create a network for geographical resource

## California's diversity offers the unique opportunity to investigate disparities and the unequal burden of breast cancer among underserved groups.

sharing, and discuss the current issues facing breast cancer navigation programs. Conference participants reported that the meeting expanded their informational and support networks and helped them to identify areas for program collaboration.

### APOS 5th Annual Conference

The American Psychosocial Oncology Society (APOS) 5th Annual Conference was held in Irvine from February 28 to March 2, 2008. The main focus of this conference was the dissemination of the Institute of Medicine report "Cancer Care for the Whole Patient: Meeting Psychosocial Health Needs," which mandates changes in the delivery of quality cancer care to include psychosocial services. Much of the evidence cited in the report was based on studies in women with breast cancer. **Patricia Ganz, M.D.,** at the **University of California, Los Angeles,** used this CBCRP grant to provide 14 conference scholarships to psychosocial oncologists throughout California. The scholarship recipients were able to attended the entire conference as well as take part in pre- and post-conference workshops on topics such as "Cancer Navigator: How to Build a Successful Program" and "Complex Communication Challenges in Oncology." Each participant also received copies of the two comprehensive handbooks the APOS has published on psychosocial oncology.

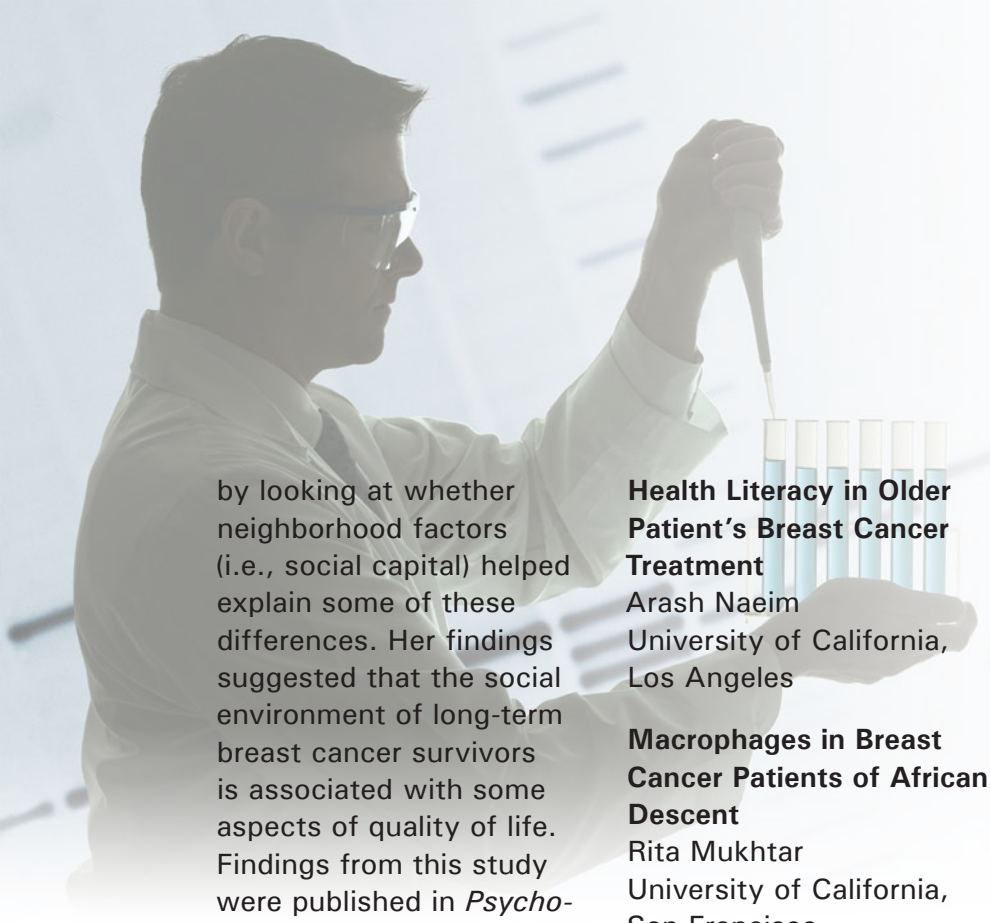
### Young Breast Cancer Survivors: Ten Years Later

About 23 percent of women diagnosed with breast cancer in the U.S. are age 50 or under.

**Joan Bloom, Ph.D.,** at the **University of California, Berkeley,** and colleagues interviewed a population-based sample of 448 women and 395 of their friends who had never had breast cancer about their quality of life. Building on a previous award that interviewed young, 5-year breast cancer survivors, the team also asked the survivors to rate their quality of life at 10 years compared to 5 years, to determine how long problems persist. They found that young breast cancer survivors are aging prematurely with respect to certain treatment related problems. However, in general, at 10 years of survival, their quality of life was comparable to that of women without cancer. The researchers intend to follow these women and interview them again when they have been cancer-free 15 years so that they can continue to evaluate long-term effects of cancer treatment on quality of life. Findings from this research were published in *Psycho-oncology* 16(2007)691.

### Social Capital, Social Support and Long-Term Quality of Life

Why do some long-term breast cancer survivors experience high levels of quality of life while others report physical and mental concerns long after treatment? **Dana Petersen, M.A., M.P.H.,** at the **University of California, Berkeley,** explored this question



by looking at whether neighborhood factors (i.e., social capital) helped explain some of these differences. Her findings suggested that the social environment of long-term breast cancer survivors is associated with some aspects of quality of life. Findings from this study were published in *Psycho-oncology* 6(2007)691.

## Research Initiated in 2009

**CA Chemicals Policy & Breast Cancer**
John Balmes
University of California, Berkeley

**Demographic Questions for California BC Research**
Scarlet Lin Gomez
Northern California Cancer Center

**Health Anxiety as a Risk for Insomnia in Breast Cancer**
Michelle Rissling
University of California, San Diego

**Health Literacy in Older Patient's Breast Cancer Treatment**
Arash Naeim
University of California, Los Angeles

**Macrophages in Breast Cancer Patients of African Descent**
Rita Mukhtar
University of California, San Francisco

**New Methods for Genomic Studies in African American Women**
Daniel Stram
University of Southern California

***Nuevo Amanecer:* Promoting the Psychosocial Health of Latinas**
Carmen Ortiz and Anna Napoles-Springer
Circulo de Vida Cancer Support and Resource Center and University of California, San Francisco

**Patient and Clinician Knowledge of Breast Cancer Lymphedema**
Marilyn Kwan
Kaiser Foundation Research Institute

**Race & Ethnicity in Stage-specific Breast Cancer Survival**
Leslie Bernstein, Katherine Henderson, Esther John, Marilyn Kwan, Kristine Monroe and Anna Wu
Beckman Research Institute of the City of Hope, Northern California Cancer Center, Kaiser Foundation Research Institute and University of Southern California

**Risk Factors and Breast Cancer Survival in Black/White Women**
Yani Lu
Beckman Research Institute of the City of Hope

**Sister Survivor: Evaluating Best Practices in Social Support**
Carolyn Tapp and Kimlin Ashing-Giwa
Women of Color Breast Cancer Survivors Support Project and City of Hope National Medical Center

## Research in Progress

**Adapting a Breast Cancer Education Program for South Asians**
Zul Surani, Roshan Bastani, and Beth Glenn
South Asian Cancer Foundation and University of California, Los Angeles

**A Blueprint for Advancing Quality in Breast Cancer**
Laura Esserman
University of California, San Francisco

**Breast Health Behaviors of Immigrant Afghan Women**
Aida Shirazi and Joan Bloom
Afghan Coalition and University of California, Berkeley

**Breast Cancer Clinical Trials Education Program**
Natasha Riley, Vanessa Malcarne, and Georgia Sadler
Vista Community Clinic, San Diego State University Research Foundation, and University of California, San Diego

**Breast Cancer Education for Deaf and Hard-of-Hearing Women**
Heidi Kleiger and Barbara Berman
Greater Los Angeles Council on Deafness, Inc. and University of California, Los Angeles

**Breast Cancer Risk Reduction in American Indian Women**
Linda Navarro and Marlene von Friederichs-Fitzwater
Turtle Health Foundation and University of California, Davis

**An Ecological Study of Quality of Life in Low-income Women**
Yoshiko Umezawa
University of California, Los Angeles

**Expanding Rural Access: Distance Delivery of Support Groups**
Jim Perkins, Mary Anne Kreshka, and Cheryl Koopman
Northern Sierra Rural Health Network and Stanford University

**Increasing Mammography Screening in Latinas with Diabetes**
Christine Noguera and Steve Roussos
Golden Valley Health Centers and San Diego State Research Foundation

**Latina Breast Cancer Survivors…Our Experience**
Brian Montaño and Diana Tisnado
Partnered for Progress and University of California, Los Angeles

**Mindful Movement Program for Breast Cancer Survivors**
Holly Kiger and Rebecca Crane-Okada
WISE and Healthy Aging and Beckman Research Institute of the City of Hope

**Neighborhoods and Obesity in Pre-adolescent Girls: Part II**
Irene Yen
University of California, San Francisco

**Provider Communication and Health in Breast Cancer Survivors**
Sara Fernandes-Taylor
University of California, Berkeley

**Quality of Mammography Facilities Serving Vulnerable Women**
Lauren Goldman
University of California, San Francisco

**Reproductive Concerns and Depression among Younger Survivors**
Jessica Gorman
University of California, San Diego

**Telephone-based Decision Support for Rural Patients**
Sara O'Donnell and Jeff Belkora
Mendocino Cancer Resource Center and University of California, San Francisco

**Underserved Women with Breast Cancer at End of Life**
Beverly Burns and Shelley Adler
Charlotte Maxwell Complementary Clinic and University of California, San Francisco

## Etiology and Prevention

Although our foundation of knowledge for the basic science aspects of breast cancer (tumor biology) has expanded greatly over the past decade, there still remains a gap in our strategies for large-scale prevention due to uncertainties over the underlying causes of the disease and their relative importance. There is an extensive list of factors associated with increased or decreased risk for breast cancer. However, some of these factors (such as diet) remain controversial; how others affect breast cancer (such as socioeconomic status) remains a mystery, and true causes are yet to be discovered.

The two research topics represented in this section are:

- Etiology: The Role of the Environment and Lifestyle
- Prevention and Risk Reduction: Ending the Danger of Breast Cancer

## Research Concluded in 2009

**Breast Cancer Lymphedema: Role of Insulin Resistance/FOXC2**
Breast cancer treatments can put survivors at risk of developing lymphedema, which is characterized by chronic swelling of the arm, pain, and loss of mobility. It is difficult to identify which women are at highest risk for lymphedema, and current treatment options are limited and not highly successful. To identify genetic variations that may increase lymphedema risk, **Stanley Rockson, M.D.,** at **Stanford University,** and colleagues analyzed blood samples from women who developed lymphedema after their breast cancer treatment and women who did not. They were specifically interested in a gene, called FOXC, which is associated with insulin resistance and may play a role in lymphatic development. Their studies showed that insulin sensitivity was inversely correlated with lymphedema risk, which suggested

that elevated levels of circulating insulin might help repair the lymph system and reduce lymphedema risk. Dr. Rockson intends to continue to investigate the relationship between insulin and lymphedema. Findings from these studies could lead to new ways of determining which women are at increased risk of developing lymphedema, or even prevent it from occurring.

**Tea, Genes and Their Interactions on Breast Cancer**
Studies have suggested that soy and green tea may reduce breast cancer risk. **Anna Wu, Ph.D.,** at the **University of Southern California,** in Los Angeles, and colleagues conducted a population-based, case-control study of breast cancer in Asian American women in Los Angeles County to investigate the relationship between consumption of these foods and breast cancer incidence. Dr. Wu and her colleagues found a 50 percent reduction in breast cancer risk among daily green tea users. They also found that breast cancer risk was significantly inversely associated with soy food intake during adolescence and adult life, with significant risk reductions seen in women who ate a lot of soy only as adults. These findings advance our understanding of the role that soy and green tea may play in breast cancer risk reduction. Findings from this research were published in *International Journal of Cancer* 120(2006)844; *Nutrition and Cancer* 56(2006)128; *Carcinogenesis* 28(2007)1561; *Journal of Clinical Oncology* 25(2007)3024; *Human Molecular Genetics* 17(2008)825; *Nature Genetics* 40(2008)259; and *American Journal of Clinical Nutrition* 89(2009)1145.

## Research Initiated in 2009

**Breast Cancer Risk Reduction: A Patient-Doctor Intervention**
Celia Kaplan
University of California, San Francisco

**Cancer Mapping: Making Spatial Models Work for Communities**
Eric Roberts
Public Health Institute

**Environmental Causes of Breast Cancer Across Generations**
Barbara Cohn
Public Health Institute

**Exploring Disparities, Environmental Risk Factors in Teachers**
Susan Hurley and Peggy Reynolds
Northern California Cancer Center

**Mammary Gland Evaluation and Risk Assessment**
Lawrence Kushi
Kaiser Foundation Research Institute

**Model-building with Complex, High-dimensional Exposures**
David Nelson
Northern California Cancer Center

**New Paradigm of Breast Cancer Causation and Prevention**
Robert Hiatt
University of California, San Francisco

**Soy Treatment for High-risk Women and DCIS Patients**
Anna Wu
University of Southern California

## Research in Progress

**Antidepressant and Breast Cancer Drug Interactions**
Reina Haque
Kaiser Foundation Research Institute

**Breast Cancer Risks in California Nail Salon Workers**
Peggy Reynolds and Linda Okahara
Northern California Cancer Center and Asian Health Services

**Circuit Training to Lower Breast Cancer Risk in Latina Teens**
Jaimie Davis
University of Southern California

**FGFR2 Signaling in Human Breast Cancer Cells**
Daniel Donoghue
University of California, San Diego

**Folate, DNA Methylation and Breast Cancer Metastasis**
Teresa Marple
University of California, Davis

**Genes in Hormone Metabolism Pathway and Breast Cancer**
Eunjung Lee
University of Southern California

**Grapefruit, Hormones, and Postmenopausal Breast Cancer Risk**
Kristine Monroe
University of Southern California

**Pesticide and Gene Interactions in Latina Farm Workers**
Paul Mills
University of California, San Francisco

**Prognostic Implications of DNA Glycation in Breast Cancer**
Daniel Tamae
Beckman Research Institute of the City of Hope

**Structural Characterization of Aromatase**
Yanyan Hong
Beckman Research Institute of the City of Hope

## ▶Detection, Prognosis, and Treatment

Until we learn how to prevent all breast cancers, detection, prognosis and treatment are research areas that need to be pursued. The detection, prognosis, and treatment topics funded by the CBCRP continue to change as novel technologies and approaches come under investigation. Breast cancer detection technology is moving past traditional mammography; diagnosis is depending on understanding the genetic profile of tumors rather than the anatomy; and treatment is moving toward more tailored and personalized approaches. Alternative therapies and drugs, especially those derived from plants, engender intriguing areas of investigation. Taken together these advances are leading to patient care that treats women appropriately and spares them unnecessary side effects.

Two research topics are represented in this section:

- Imaging, Biomarkers, and Molecular Pathol-

ogy: Improving Detection and Diagnosis

- Innovative Treatment Modalities: Search for a Cure

## Research Concluded in 2009

**Multinuclear MRI of Breast Tumors**

Earlier and more accurate diagnosis, as well as better selection and assessment of treatments, could dramatically improve breast cancer survival. **Brian Hargreaves, Ph.D.,** at **Stanford University,** in Palo Alto, and colleagues investigated whether using simultaneous multinuclear magnetic resonance imaging (MRI) of both protons and sodium would make it easier to accurately diagnose breast tumors. They built two different sets of MRI hardware appropriate for combining sodium MRI with standard proton MRI. Both sets of hardware allow acquisition of sodium and proton MR images without moving the subject. This permits the higher-resolution proton image to be used as an anatomic reference for sodium images, and also allows direct comparison between different imaging techniques. They are now investigating the relationship between levels of sodium MRI and tumor malignancy. This research has the potential to lead to new ways to detect breast tumors as well as advance our understanding of how the environment that surrounds cancer cells contributes to their growth.

**Factors Influencing Breast Cancer Screening Among Older Thai**

The lower incidence of breast cancer seen in Asian women in the U.S. may be due, in part, to their having a lower rate of participation in mammography screening **Mary Jo Clark, Ph.D., R.N.,** at the **University of San Diego,** and **Bulaporn Natipagon-Shah, Ph.D., R.N,** of the **Thai Health and Information Service,** in Los Angeles, conducted focus groups with Thai women to learn why they do, or do not, get a mammogram. They then used this information to develop a questionnaire for telephone interviews they conducted with 360 Thai women between the ages of 40 and 81 living in Los Angeles, Riverside, Orange, San Bernardino, and San Diego counties. They found that although a majority of the women (84%) had had a mammogram at some time, almost half (44%) did not get a mammogram annually, as is recommended by the American Cancer Society. This was due to a lack of health insurance, the cost of screening, language difficulties, and a lack of time. The investigators intend to use this information to develop an educational intervention that could be used to increase mammography screening in Thai women.

**Intraoperative Assessment of Surgical Lumpectomy Margins**

Approximately 20 to 30 percent of patients who have a lumpectomy require a second surgery because tumor cells were found at the edges of the tissue (the margin) that was removed during their first surgery.

Currently, there is no good way to determine during surgery whether the margin is free of cancer cells. **Armando Giuliano, M.D.,** at the **John Wayne Cancer Institute,** in Santa Monica, and colleagues, developed a probe for assessing these margins during surgery. After they found that the probe did not work well, they developed a second probe and then a camera. None of the techniques was found to be sensitive enough to detect small numbers of cancer cells at the margin. They were, however, able to identify two molecular markers that might be effective in detecting breast cancer cells in breast tissue. They are now studying whether these markers could be used during surgery to determine if the surgical margins are cancer-free.

**Modulation of Breast Cancer Stem Cell Response to Radiation**

Breast cancer stem cells make up only 1 to 2 percent of the total tumor cell population. However, it may be these cells that are responsible for a cancer recurrence or metastases. **Frank Pajonk, M.D., Ph.D.,** at the **University of California, Los Angeles,** and colleagues, used breast cancer cell lines to investigate how breast cancer stem cells respond to radiation treatments. They successfully verified that these cells were less likely to respond to radiation, and demonstrated that they do not experience as much damage from radiation. Dr. Pajonk and his team also discovered a new breast cancer stem cell marker that can be used to identify, track, and target breast cancer stems cells in vitro and in vivo. In 2009, Dr. Pajonk was awarded two additional years of CBCRP funding to continue this research, which has the potential to identify a way to make breast cancer stem cells more responsive to radiation. Findings from this research were published in the *Journal of Cellular Biochemistry* 108(2009)339 and the *Journal of the National Cancer Institute* 101(2009)350.

**An Approach to Anti-estrogen Resistance in Breast Cancer**

Many patients who start on anti-estrogen treatments, like tamoxifen or the aromatase inhibitors, ultimately develop tumors that are resistant to these drugs. To learn more about why this resistance occurs, **Oksana Tyurina, Ph.D.,** at the **University of California, San Diego,** and colleagues, studied a novel hormonal signaling pathway in which ER, its cofactors and N-CoR transcriptional machinery interact in order to mediate the inhibitory effects of estrogen receptor (ER) responsive genes. They are now conducting studies aimed at identifying the mechanisms of ER regulation on an epigenetic level. Dr. Tyurina intends to continue pursuing this line of research using zebrafish or mouse model systems. This work has the potential to help explain why some tumors do not respond to anti-estrogen treatments or develop resistance to these treatments, and could lead to the development of new anti-estrogen therapies.

**Sulforaphane: Its Potential for Treatment of Breast Cancer**

Epidemiological data suggests that a diet rich in cruciferous vegetables, such as broccoli, cabbage, and cauliflower, provides better protection against breast cancer than a diet containing other fruits and vegetables. This may be because cruciferous vegetables contain an anticancer compound called sulforaphane (SFN). **Olga Azarenko, M.A.,** at the **University of California, Santa Barbara,** and colleagues analyzed the anticancer activities of SFN to determine how it kills cancer cells. They discovered that a protein, called tubulin, that makes up the microtubules (the hollow structure inside cells that help them to divide) is one of the SFN's important cellular targets. The chemotherapy drug paclitaxel works by binding to the microtubules in cancer cells, and the research team conducted additional laboratory studies that showed that combining SFN with paclitaxel enhanced its effectiveness. Ms. Azarenko intends to continue to study how SFN affects human breast cancer cells. This work has the potential to lead to new methods of treating breast cancer or reducing breast cancer risk. Findings from this research appeared in *Carcinogenesis* 29(2008)2360.

**Determinants of Response to Microtubule Stabilizing Drugs**

The taxane compounds paclitaxel (Taxol) and docetaxel (Taxotere) are important components of breast cancer chemotherapy regimens. These drugs work by binding to microtubules (the hollow structures inside cells that help them to divide). However, tumors may not respond to or can eventually become resistant to these drugs. **Tatana Spicakova, Ph.D.,** at **Stanford University,** in Palo Alto, and colleagues used breast cancer cell lines to investigate whether mutations in or altered expression levels of two microtubule-associated proteins, MAP-Tau and MAP4, contributed to taxane resistance by altering the drugs' ability to successfully target the microtubules. They found that Tau levels may be associated with taxane response, that taxane-resistant cell lines express substantially higher levels of MAP-Tau compared to the parental cell line, and that knocking down Tau activity did not result in increased sensitivity to paclitaxel. Their work could lead to the development of a way to predict which tumors are not likely to respond to taxane therapy.

**Topoisomerase-IIa as a Predictor of Anthracycline Response**

About 25 percent of women diagnosed with breast cancer have tumors that have extra copies of a gene called HER2. These tumors are referred to as HER2-positive. The HER2 gene is located close to a second gene known as TOP2A. About 30 to 40 percent of women with HER2-positive tumors also have tumors that have extra copies of the TOP2A gene. HER2-positive tumors have been

## The detection, prognosis, and treatment topics funded by the CBCRP continue to change as novel technologies and approaches come under investigation.

shown to respond to anthracycline chemotherapy drugs. However, it may be a tumor's TOP2A status that actually predicts whether it will respond to an anthracycline. **Michael Press, M.D., Ph.D.,** at the **University of Southern California,** in Los Angeles, is using tumor tissue from women enrolled in the Breast Cancer International Research Group-006 clinical trial, which is evaluating three different treatment regimens in women with HER2-positive tumors, to assess whether a relationship exists between the amount of TOP2A protein and various levels of TOP2A gene amplification. These findings could lead to new ways of determining which tumors are most likely to respond to an anthracycline. Dr. Press was awarded a IDEA renewal grant to continue this investigation.

**Novel Cytokine Immunotherapy for Breast Cancer**
Conventional chemotherapy drugs are usually accompanied by severe side effects because they kill normal cells along with cancer cells. Immunotherapy is new type of treatment that, like a vaccine, harnesses the body's natural defenses to recognize and kill cancer cells. **Amanda Goldrath, Ph.D.,** at the **University of California, San Diego,** and colleagues, used a new mouse breast cancer model both to determine whether a new immune-stimulatory agent called IL-15 complexes could reduce tumor size and to characterize the type of immune response it initiates. Their studies demonstrated, for the first time, that an IL-15 cytokine complex could stop tumor growth in a mouse model that typically does not respond to immunotherapy. These findings could lead to the development of an immunotherapy agent that could be used to treat breast cancer. Findings from this research appeared in *Blood* 112(2008)3704.

**Exploring the Role of PARP Inhibitors in Breast Cancer**
About 5 to 10 percent of breast cancer cases occur in women with a BRCA1 or BRAC2 genetic mutation. PARP is an enzyme that is needed to repair DNA that has become damaged. A new class of drugs called PARP inhibitors selectively kills breast cancer cells that have a BRCA1 or BRCA2 genetic mutation, and are currently being studied in clinical trials. **Karlene Cimprich, Ph.D.,** at **Stanford University,** in Palo Alto, and colleagues developed a method of detecting genes the might be needed to keep cells alive when PARP inhibitors are present. To date, their assay has identified three genes that may predict sensitivity to PARP inhibitors. Dr. Cimprich and her team are now working with their collaborator to determine if these are mutated in breast cancer cells known to respond to PARP inhibitors. This work could lead to the identification of other types of tumors that may be responsive to PARP inhibitors.

**Nur77-derived Peptides as a Novel Breast Cancer Therapy**

The protein Bcl-2, which plays a role in cell death, is often elevated in breast cancer cells. As a result, it helps to keep these cells alive as well as protect them from cancer drugs and radiation therapy. **Xiao-Kun Zhang, Ph.D.,** at **The Burnham Institute for Medical Research,** in La Jolla, and colleagues recently discovered that another protein, called Nur77, could be stimulated to convert Bcl-2 from a protector to a killer of cancer cells. Proteins are typically too big to get past cell membranes, which makes them unsuitable for use as drugs. So, Dr. Zhang and his team tried to identify the active region of the Nur77 protein so that they could mimic it with smaller protein fragments or peptides. They were able to identify a peptide that could convert Bcl-2 from a protector to a killer of breast cancer cells, in a similar manner as the parent protein, Nur77, and their studies showed that this peptide was not only active against breast cancer tumors grown in animals, but left normal cells unaffected. They also identified an enantiomer (a structural mirror image) of this peptide that is more stable and active than the original peptide. These findings raise the possibility that small molecule Bcl-2 converters could eventually be used as a new breast cancer treatment. Findings from this research were published in *Expert Opinion on Therapeutic Targets* 11(2007)69; *Oncogene* 25(2006)4725; *Free Radical Biology and Medicine* 44(2008)1334; *Cancer Cell* 14(2008)285; and *Cancer Research* 68(2008) 8871.

## Research Initiated in 2009

**6th Symposium on the Intraductal Approach to Breast Cancer**
Dixie Mills
Dr. Susan Love Research Foundation

**Antibody-based Targeting of Breast Cancer Stem Cells**
Claudia Gottstein
University of California, Santa Barbara

**Chemerin as an Immunotherapeutic Agent in Breast Cancer**
Russell Pachynski
Palo Alto Institute for Research & Education

**Combating Breast Cancer with the Wellderly Immune Repertoire**
Brunhilde Felding-Habermann
Scripps Research Institute

**Compounds Blocking Assembly of LRH-1 in Breast Cancer**
Cindy Benod
University of California, San Francisco

**Diffusion-weighted MRI in Monitoring Breast Cancer Treatment**
Lisa Singer
University of California, San Francisco

**Inhibitors of Condensin I as Chemotherapy for Breast Cancer**
Kyoko Yokomori
University of California, Irvine

**Membrane-associated Estrogen Receptors in Breast Cancer**
Richard Pietras
University of California, Los Angeles

**Metabolite Imaging to Identify Drug Resistant Breast Cancer**
Trent Northen
Lawrence Berkeley National Laboratory

**Modulation of Breast Cancer Stem Cell Response to Radiation**
Frank Pajonk
University of California, Los Angeles

**A Predictive Factor for Eribulin Treatment of Breast Cancer**
Jennifer Smith
University of California, San Francisco

**Reducing Surgical Morbidity of Breast Cancer Staging**
Steven Chen
University of California, Davis

**Sound Speed Tomography for Early Breast Cancer Detection**
Jakob Nebeker
University of California, San Diego

**Survival in *de novo* and Recurrent Metastatic Breast Cancer**
Sumanta Pal
Beckman Research Institute of the City of Hope

**Targeting DNA Repair Function of Breast Cancer Stem Cells**
Xiaohua Wu
Scripps Research Institute

## Research in Progress

**Breast Cancer Treatment Monitoring Combining MRI and Optics**
Catherine Klifa
University of California, San Francisco

**Chemical Inhibitors of Hsp70 for Breast Cancer**
Chung-Wai Shiau
The Burnham Institute of Medical Research

**Differential Optical Mammography**
Gregory Faris and Christopher Comstock
SRI International and University of California, San Diego

**Engineering EGFR Antagonists for Breast Tumor Targeting**
Jennifer Lahti
Stanford University

**ID4: A Prognostic Factor of Breast Cancer Metastasis**
Dave Hoon
John Wayne Cancer Institute

**Inhibition of Brain Metastases in Breast Cancer**
Brunhilde Felding-Habermann
Scripps Research Institute

**Intraductal Therapy of DCIS: a Presurgery Study**
Susan Love
Dr. Susan Love Research Foundation

**Mechanisms of HSP90 Inhibitor Action in Breast Cancer**
Cynthie Wong
Beckman Research Institute of the City of Hope

**Molecular Imaging of Breast Cancer Using Breast PET/CT**
John Boone
University of California, Davis

**Molecular Imaging of Metastatic Lymph Nodes in Breast Cancer**
Ella Jones
University of California, San Francisco

**Neural Stem Cell Therapy for Breast Cancer Brain Metastases**
Brunhilde Felding-Habermann
Scripps Research Institute

**Polyamide HIF Inhibitors to Block Breast Cancer Metastasis**
John Phillips
California Institute of Technology

**Real-Time 3D Ultrasound Image-Guidance for Breast Surgery**
Michael Bax
Stanford University

**Development of a Breast MRI Computer-aided Diagnosis System**
Ke Nie
University of California, Irvine

**Functional Breast MRI with BOLD Contrast**
Rebecca Rakow-Penner
Stanford University

**Genetics of Tamoxifen Response**
Elad Ziv
University of California, San Francisco

**Imaging of Novel Stem Cell Therapy Targeting Breast Cancer**
Joseph Wu, M.D.
Stanford University

**Inhibition of TF Signaling as Novel Breast Cancer Therapy**
Wolfram Ruf
The Scripps Research Institute

**Nanotherapy for Breast Cancer Targeting Tumor Macrophages**
Gaurav Sarma
The Burnham Institute for Medical Research

**Novel Anti-HER2 Fragments for Better Detection and Therapy**
Shannon Sirk
University of California, Los Angeles

**Novel Small Proteins for PET Imaging of Breast Cancer**
Zhen Cheng
Stanford University

**Stratifying DCIS Biopsies for Risk of Future Tumor Formation**
Thea Tlsty
University of California, San Francisco

**Topoisomerase-IIa as a Predictor of Anthracycline Response**
Michael Press
University of Southern California

**Treating BC Brain Metastasis with Cytotoxic Lymphocytes**
Barbara Mueller
Sidney Kimmel Cancer Center

## Biology of the Breast Cell

To understand the origin of breast cancers, more research is needed on the

pre-cancerous, causative events in the normal breast. In breast development, cell populations must coordinate migration, proliferation, and apoptosis (cell death) over space and time. In cancer progression, these processes become deregulated, initially at the genetic level that leads to the physiological changes associated with malignancy. An inability to recognize and properly repair damage to DNA that occurs in normal cell physiology and enhanced by environmental factors is recognized as driving force of cancer progression. An emerging paradigm identifies progenitor stem cells as the key to the origin of tumors. Stem cell populations reside in body organs to provide the raw material for tissue regeneration, repair, and for the cyclic proliferation of breast cells in response to hormones and pregnancy. If this paradigm proves correct, then only a small fraction (1-2%) of cells in a tumor mass retain stem/progenitor cell properties, and these "cancer stem cells" must be selectively targeted to achieve an effective eradication of the disease. Important basic science topics represented in CBCRP's portfolio include: exploring the role of stem cells in normal and tumor breast; cell proliferation control mechanisms through the estrogen receptor and growth factor receptors (e.g., Her-2); alterations in DNA repair processes that permit genetic damage to accumulate in cancer cells; cell cycle changes that permit division under conditions where normal cells would undergo programmed cell death (apoptosis); novel biomarkers to distinguish pre-cancerous and cancerous cells from normal breast epithelium and their validation as potential new detection and therapy targets; and developing methods for accounting for the complexity of the interplay of all of these factors in breast cancer.

Two of the CBCRP's research areas are presented in this section.

- Biology of the Normal Breast: The Starting Point
- Pathogenesis: Understanding the Disease

## Research Concluded in 2009

**Regulation of Mammary Epithelial Invasion by MMPs and FGFs**

The mature mammary gland does not develop until the end of puberty, and its structure changes extensively during the hormonal cycles that accompany pregnancy, lactation, and involution. **Andrew Ewald, Ph.D.,** at the **University of California, San Francisco,** and colleagues studied the underlying cellular mechanisms of normal mammary tissue invasion in animal cells in order to learn how the epithelial cells turn into invasive cancer cells. Using advanced electron microscopy techniques, they identified a new mechanism of cellular growth and invasion in breast tissue. They also showed that this process was markedly similar to that seen in human cancer cells. Dr. Ewald used this study to establish his own laboratory at Johns Hop-

kins Medical School, where he now using these techniques to study how the stromal cells in connective tissue and the proteins in the extracellular matrix (the environment that surrounds a cell) regulate breast tumor invasion. This work has the potential to lead to new breast cancer therapies. Findings from this research were published in: *Developmental Biology* 306(2007)193; *Nature Reviews, Molecular Cellular Biology* 8(2007)221; *Molecular Biology of the Cell* 18(2007)1693; *Cancer Cell* 13(2008)141; *Developmental Cell* 14(2008)570; *Current Biology* 18(2008)507; *Developmental Biology* 321(2008)77; *Disease Models and Mechanisms* 1(2008)155.

**Cytoskeletal Regulation of Invading Breast Cells**

In many early stage breast cancers, the cells that are in the acini, the milk producing glands of the breast, not only look unusual but have started to spread into the surrounding tissue. These changes are precursors to metastatic breast cancer. **Catherine Jacobson, Ph.D.,** at the **University of California, San Francisco,** used a mouse mammary epithelial cell line called EpH4 to investigate and identify precisely how breast cells begin to migrate away from the acini and invade the surrounding tissue. This work will contribute to our understanding of the how cancer cells metastasize.

**Telomerase, Mammary Stem Cells, and Breast Cancer**

Telomeres are the special caps that protect each end of the four arms of a chromosome. The telomeres get shorter each time the cell divides. When they get too short to do their work, they send the cell a message telling it to stop dividing. Telomerase is an enzyme that can add more DNA to the telomeres. In cancer cells, telomerase keeps the telomeres from becoming shorter, enabling these cells to reproduce endlessly. Previous work by **Steven Artandi, M.D., Ph.D.,** at **Stanford University,** in Palo Alto, and colleagues suggested that telomerase might also play a role in breast cancer development by stimulating tissue stem cells. Their new studies found that telomerase is a cofactor in the Wnt pathway, which is one of the most important circuits in cancers and stem cells. It was already known that Wnt signaling was important in both breast development and breast cancer, but these findings provide the first evidence that Wnt and telomerase are intimately linked. These studies could lead to the development of new breast cancer treatments that work by inhibiting telomerase. Findings from this research were published in *Nature* 240(2009)66.

**Competition for ADA2 and 3 to Inhibit p53 in Breast Cancer**

Breast cancers are characterized by the abnormal behavior of proteins, called transcription factors, which determine which genes are used in a particular cell. A tumor suppressor gene called p53 is a transcrip-

## To understand the origin of breast cancers, more research is needed on the pre-cancerous, causative events in the normal breast.

tion factor that is inactivated in about one-fourth of breast cancer cases. However, it's not clear how p53 is inactivated in breast cancers that do not have a p53 genetic mutation. To investigate this question, **Min Yang, M.D, M.S.,** at the **University of California, Irvine,** and colleagues, used molecular biology techniques to study interactions that occur between the proteins beta-catenin and p53 in breast cancer cell lines. Their studies showed that two other proteins, called ADA2a and ADA3, are required for these proteins to be fully active. This information could lead to new breast cancer treatments that simultaneously target different gene regulation pathways. Findings from this research were published in *Cancer Biology and Therapy* 7(2008)120.

**Targeting Tissue Factor in Breast Cancer**

Tissue factor (TF) works along with factor VII to initiate the blood clotting that is necessary to prevent excessive bleeding and initiate wound healing. TF is also expressed on tumor cells, and studies have found that it is associated with more aggressive cancers. **Florence Shaffner, Ph.D.,** at the **Scripps Research Institute,** in La Jolla, used two different antibodies that block different components of TF activity in mouse models to learn more about its different biological functions. Dr. Shaffner and her team showed that blocking TF signaling reduced tumor growth and spontaneous metastasis and resulted in tumors with fewer blood vessels. This suggests that TF signaling plays an important role in breast cancer development by regulating how a tumor develops blood vessels and gains the ability to metastasize. Dr. Shaffner and her team are continuing to study TF signaling, and are now trying to determine if it influences other breast cancer pathways. These studies could lead to the development of new breast cancer therapies that target and block TF signaling. Findings from these studies were published in *Arteriosclerosis, Thrombosis, and Vascular Biology* Aug. 6, 2009 Epub and *Cancer Research* 68(2009)7219.

**Breast Tumor Responses to Novel TGF-beta Inhibitors**

There is strong evidence that increased TGF-β signaling can contribute to tumor progression. Furthermore, anti-TGF-β therapy has been shown to reduce both the size and aggressiveness of breast tumors. However, there is concern that anti-TGF-β therapy may have adverse effects in some patient populations. **Kelly Harradine, Ph.D.**, at the **University of California, San Francisco,** and colleagues investigated how different types of breast tumors respond to TGF-β inhibition. Her team's preliminary findings suggest that breast tumor subtypes have different TGF-β dependence, which, in turn, causes differences in response to anti-TGF-β therapy. These findings could help investigators predict which patients are most likely to benefit from anti-TGFß therapy, and

spare patients whose tumors will not respond well to treatment.

**Trask, a Candidate Breast Cancer Metastasis Protein**
Trask is a protein that is active in normal cells only when the cell is dividing. However, in cancer cells, Trask is active all of the time. This suggests that Trask may play a role in tumor metastasis. **Ching Hang Wong, Ph.D.,** at the **University of California, San Francisco,** and colleagues previously showed that when the amount of Trask that is present in breast cancer cells increases, the cells detach and separate. This is similar to what happens in metastasis. Dr. Wong and his team are developing breast cancer cell lines that can be used to study the role Trask plays in cancer progression. They are also using a cell culture model to study the interaction between Trask and beta-catenin, a protein that regulates cell-cell adhesion. This work could lead to the development of new breast cancer treatments that target Trask. Findings from these studies appeared in *Clinical Cancer Research*15(2009) 2311.

**Determination of Stromal Gene Expression in Breast Cancer**
Cancer cells are surrounded by a complex mixture of blood vessels, inflammatory cells, and different types of connective tissue (stromal) cells. These stromal cells are not cancerous, but they have been shown to play a crucial role in cancer development and progression. **Robert West, M.D., Ph.D.,** at the **Palo Alto Institute for Research & Education,** and colleagues are investigating whether it is possible to develop cancer therapies that target these stromal cells by studying low-grade soft tissue tumors. Dr. West received two additional years of CBCRP support to continue this project, which will involve developing clinically useful biomarkers of stromal expression patterns in invasive cancer and identifying stromal response patterns associated with pre-invasive breast cancer. This work could lead to new ways of treating breast cancer. Findings from this research appeared in *Laboratory Investigations* 88(2008)591 and *Clinical Cancer Research* 15(2009)778.

**Profiling Drug Metabolism (P450) Proteins in Breast Cancer**
The cytochrome P450 family plays a role in normal breast cell regulation. One P450 enzymes, called aromatase, is necessary for the body to make estrogen, and is the target of a class of anti-estrogen breast cancer drugs called aromatase inhibitors. **Aaron Wright, Ph.D.,** at the **Scripps Research Institute** in La Jolla, and colleagues developed a new chemical probe that can analyze human P450 activity. They then used it to evaluate how two anti-estrogen breast cancer therapies impact P450 activity. These probes provide a new way to analyze the effect of new breast cancer drugs on P450 activities, and could lead to the develop-

ment of new breast cancer treatments that inhibit and regulate the P450 enzyme. Findings from this research were published in *Chemistry and Biology* 14(2007)1043 and the *Annual Review of Biochemistry* 22(2008)383.

**The Role of Chk1 in Breast Cancer DNA Damage Repair**

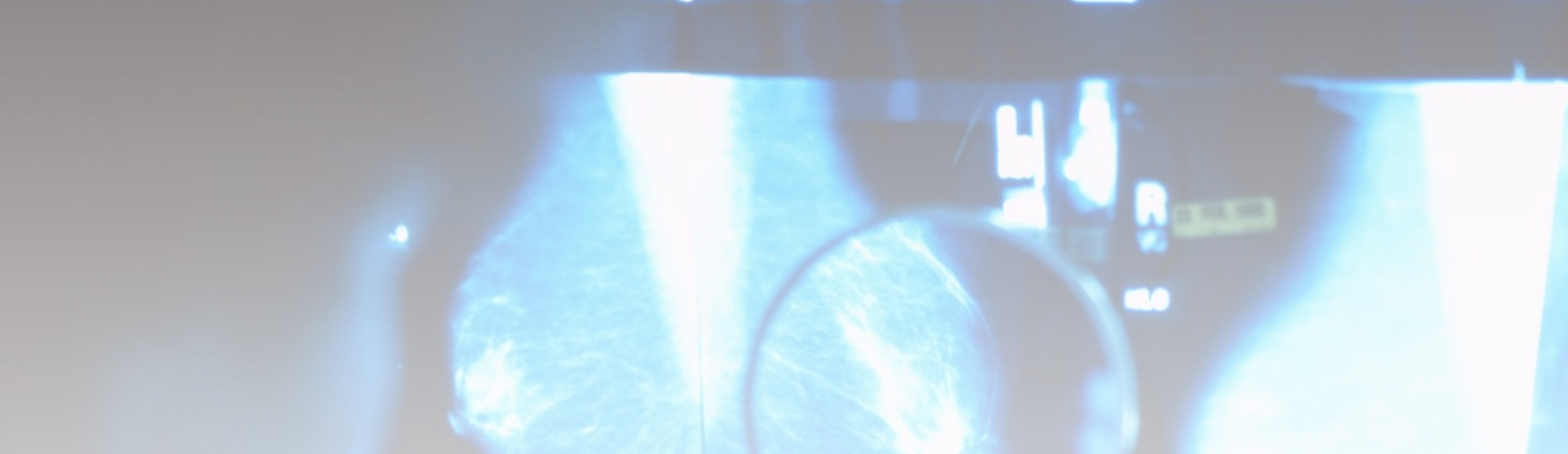
Cells duplicate their DNA during every cell cycle. Chk1 and Claspin are two genes that work at the DNA damage checkpoints that operate during cell division. Their job is to prevent errors from being passed on when the cell divides. **Jennifer Scorah, Ph.D.,** at the **Scripps Research Institute,** in La Jolla, and colleagues used DNA fiber technology, which can analyze DNA replication at the level of individual molecules, rather than the whole genome, to learn more about these two genes. Their findings provided the first detailed analysis of these genes' replication functions, and suggested that although Claspin is required to activate Chk1 at the cell cycle checkpoint, its role in replication is actually independent of Chk1. This work could lead to the development of new breast cancer drugs that target Chk1 or Claspin. Findings from this research were published in the *Journal of Biological Chemistry* 283(2008)17250.

**Inflammation Alters Transcription by ER in Breast Cancer**

Estrogen acts through the estrogen receptor (ER), a powerful regulator of cell behavior that can switch specific genes on or off. Most research on ER function has focused on its ability to activate genes. **Eliot Bourk, B.A.,** at the **University of California, San Diego**, and colleagues used gene expression profiling experiments and genome wide location analyses to investigate which genes are shut off by ER in response to estrogen, and how some of these genes are then reactivated by inflammation. Their work showed that in the presence of inflammation, repression of certain genes by estrogen could be reversed in ER-alpha expressing cells but not in ER-beta expressing cells. This was a previously unknown difference between these two estrogen receptors. Mr. Bourk intends to continue to conduct studies on the impact that inflammation has on genes shut off by ER. These findings could advance our understanding of the estrogen receptor and its effects on gene expression.

**A New Mouse Model of PI3-Kinase Induced Breast Cancer**

Some breast cancers are caused by genetic mutation. One gene, called PIK-3CA, is mutated in about 30 percent of breast cancer patients. **Jun Zhang, Ph.D., M.D.,** at the **University of California, San Francisco,** and colleagues are trying to develop a mouse model with a PIK3CA mutation that could be conditionally activated in animal tissue to model breast cancer in humans. This research may lead to the development of a mouse model that could



be used to develop new breast cancer therapies that target PIK3CA.

**Lipid Raft Composition in Deregulated ERBB2 Signaling**

About 25 to 30 percent of all breast cancer cells have extra ERBB2/HER2 receptors. The ways in which these receptors interact with the cells in the microenvironment that surround them are not well known. **Ralf Landgraf, Ph.D.**, at the **University of California, Los Angeles,** and colleagues investigated whether changes that occur in the microenvironment that surrounds the ERBB2/HER2 receptor might help to explain why some HER2-positive cancers stop responding to the drug Herceptin. Their studies indicated that both HER2/ERBB2 and ERBB3 localize preferentially to certain lipid rafts in the cell's membrane. (Lipid rafts are an area of the cell membrane that creates a favorable environment for saturated fatty acids and other proteins.) Dr. Landgraf and his team are continuing to investigate whether changes in the ratio of saturated and unsaturated fatty acids affects these rafts in ways that, in turn, impacts ERBB2 recruitment. This work could lead to new treatments for HER2-positive tumors.

**MicroRNA Expression in Breast Cancer Stem Cells**

Current evidence suggests that breast cancer stem cells are more resistant to standard therapies than other breast cancer cells. MicroRNAs (miRNAs) are short RNA molecules that regulate gene expression and control a variety of cell functions, including cell proliferation and stem cell maintenance. Abnormal expression of certain miRNAs in human cancers is associated with cancer progression and a patient's prognosis. **Yohei Shimono, M.D., Ph.D.,** at **Stanford University,** in Palo Alto, and colleagues, investigated whether miRNAs are important regulators of breast cancer stem cells. They identified 37 miRNAs that were expressed at different levels in human breast cancer stem cells and normal breast stem cells. They found that one of the down-regulated miRNAs, called miR-200c, controlled expression of BMI1, a known regulator of stem cell self-renewal. It also suppressed the ability of human breast cancer stem cells to form tumors *in vivo* and the ability of normal breast stem cells to form breast ducts. These findings provide evidence that cancer stem cells and normal stem cells share molecular mechanisms that regulate cell growth, and may help explain, in part, how cancer stem cells encourage breast cancer growth. These findings could lead to new breast cancer treatments that target breast cancer stem cells. Findings from this research were published in the *Annual Review of Cell and Developmental Biology* 23(2007)675 and *Cell* 138(2009)592.

**The Relationship of BRCA1 and HMGA2 in Breast Cancer**

Mutations in a gene called BRCA1 account for 50 percent of all hereditary breast

cancer cases. BRCA1 is known to play an essential role in maintaining genomic integrity by repairing damaged DNA and monitoring cell growth. However, it's not precisely clear why a BRCA1 mutation increases breast cancer risk. **Connie Tsai, B.S.,** at the **University of California, Irvine,** and colleagues used an array of laboratory techniques to study the relationship between BRCA1 and a gene called HMGA2 that promotes cell proliferation. Their findings suggest that the BRCAI/CtIP/ZBRK1 repressor complex mediates HMGA2. However, they were not able to establish a specific relationship between BRCA1 and HMGA2. This led them to conclude that HMGA2 is regulated by ZBRK1, independent of BRCA1. These findings add to our understanding of how BRCA1 genetic mutations increase breast cancer risk.

## Research Initiated in 2009

**Breast Cancer Tumor-Stroma Interactions in an *In Vivo* Model**
Per Borgstrom
Vaccine Research Institute of San Diego

**A Molecular Strategy to Inhibit Breast Cancer Metastasis**
Frances Brodsky
University of California, San Francisco

**Podocalyxin as a Basal-like Breast Cancer Stem Cell Marker**
Graham Casey
University of Southern California

**The Role of Estrogen Receptor in Endocrine Resistance**
Hei Chan
Beckman Research Institute of the City of Hope

**Understanding the Role of GATA3 in Breast Cancer**
Jonathan Chou
University of California, San Francisco

**Finding BRCA1 Ubiquitinated Substrates in Breast Cancer**
Sonia del Rincon
The Burnham Institute for Medical Research

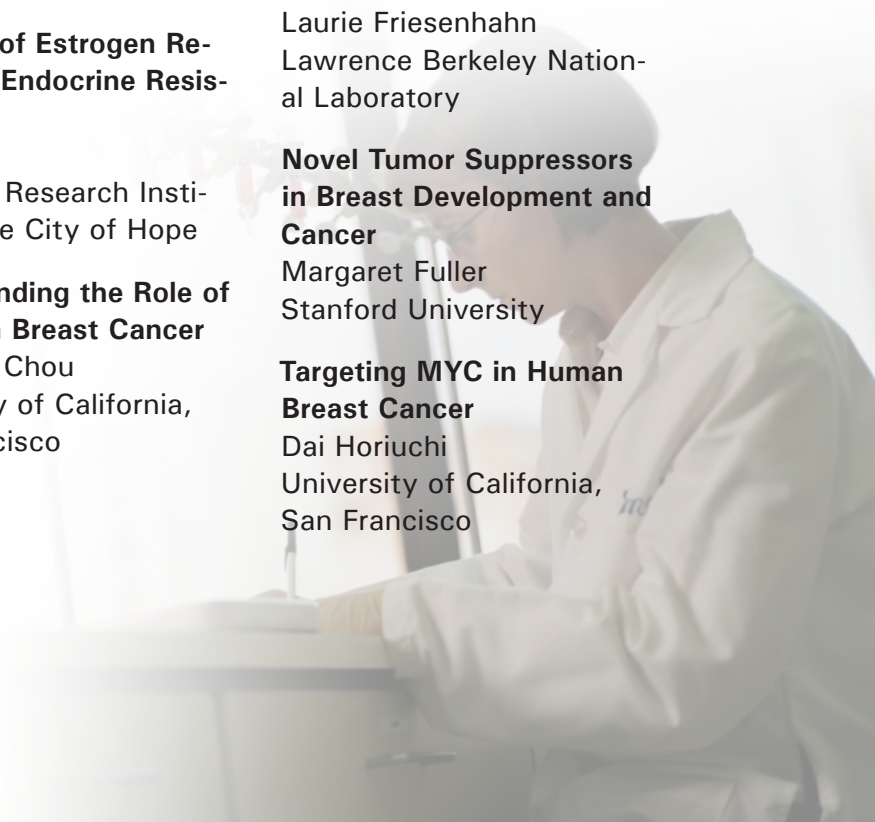
**Substrate Profiling of Breast Cancer Related Proteases**
Melissa Dix
Scripps Research Institute

**A Genetic System for Identification of Mammary Stem Cells**
Dannielle Engle
Salk Institute for Biological Studies

**The Regulation of SATB1 in Metastatic Breast Cancer**
Laurie Friesenhahn
Lawrence Berkeley National Laboratory

**Novel Tumor Suppressors in Breast Development and Cancer**
Margaret Fuller
Stanford University

**Targeting MYC in Human Breast Cancer**
Dai Horiuchi
University of California, San Francisco



**Role of Circadian Rhythm Gene Homolog PER3 in Breast Cancer**
Kuang-Yu Jen
University of California, San Francisco

**Control of BRCA2-mediated Homologous Recombination**
Damon Meyer
University of California, Davis

**Discovery of Fusion Genes in Breast Cancer**
Jonathan Pollack
Stanford University

**Proline Metabolism in Metastatic Breast Cancer**
Adam Richardson
The Burnham Institute for Medical Research

**P32: New Functional Target in Breast Cancer Brain Metastasis**
Karin Staflin
Scripps Research Institute

**Role of p68 in Breast Cancer**
Daojing Wang
Lawrence Berkeley National Laboratory

**Novel Akt Regulatory Factor PHLPP in Breast Cancer**
Noel Warfel
University of California, San Diego

**Stroma Expression Patterns in Breast Cancer**
Robert West
Palo Alto Institute for Research & Education

**The Role of EGF Variant mLEEK and Grp78 in Breast Cancer**
Albert Wong
Stanford University

## Research in Progress

**Breast Cancer Studies in a 3-D Cell Culture System**
Robert Abraham
The Burnham Institute of Medical Research

**Defining Mammary Cancer Origins in a Mouse Model of DCIS**
Alexander Borowski
University of California, Davis

**Functional Analysis of BORIS, A Novel DNA-binding Protein**
Paul Yaswen
Lawrence Berkeley National Laboratory

**Indole (I3C) Control of Breast Cancer by ER Downregulation**
Crystal Marconett
University of California, Berkeley

**Mechanisms of Daxx-mediated Apoptosis in Breast Cancer**
Lorena Puto
The Burnham Institute for Medical Research

**Novel Approach to Analyze Estrogen Action in Breast Cancer**
Brian Elicieri
La Jolla Institute for Molecular Medicine

**Novel Regulation of the Rb Pathway in Breast Epithelium**
Deborah Burkhart
Stanford University

**Reactivation of the Inactive X Chromosome and Breast Cancer**
Angela Anderson
University of California, San Francisco

**The Role of Podosomes in Breast Cancer Metastasis**
Barbara Blouw
The Burnham Institute of Medical Research

**Stem Cells in Breast Cancer Metastasis**
Brunhilde Felding-Habermann, John Yates & Evan Snyder
Scripps Research Institute and The Burnham Institute of Medical Research

**Structural Analysis of Cancer-Relevant BCRA2 Mutations**
Henning Stahlberg
University of California, Davis

**Chemokine Receptor Signaling in Breast Cancer**
Morgan O'Hayre
University of California, San Diego

**Dietary Metabolite Inhibition of Breast Cancer Cell Survival**
Holly Hantz
University of California, Berkeley

**Dissecting the Role of Twist in Breast Cancer Metastasis**
Janine Low-Marchelli
University of California, San Diego

**Global Analysis of Protein Ubiquitination in Breast Cancer**
Stefan Grotegut
Sidney Kimmel Cancer Center

**Maternal Embryonic Leucine Zipper Kinase in Mammary Tumors**
Robert Oshima
The Burnham Institute for Medical Research

**Nanolipoproteins to Study Breast Cancer Growth Receptors**
Paul Henderson
University of California, Davis

**Regulation of Breast Stem-Progenitor Cell Chromatin by Pygo2**
Bingnan Gu
University of California, Irvine

**Role of Estrogen-modulated Protein AGR2 in Breast Cancer**
Mikhail Geyfman
University of California, Irvine

**Tumor Suppressor 14-3-3sigma in Breast Cancer Progression**
Aaron Boudreau
Lawrence Berkeley National Laboratory

# Improving the CBCRP through Evaluation

California taxpayers deserve to have the funds they provide for breast cancer research spent wisely. That's why the California Breast Cancer Research Program is conducting a multi-year, formal evaluation of the entire program. Evaluation helps the Program target research dollars where they will do the most to reduce and end the suffering caused by breast cancer. Over the past several years, the CBCRP has evaluated several of its award types: the Community Research Collaboration awards, the Postdoctoral Fellowship awards, the Dissertation awards, and the Innovative, Developmental, Exploratory Awards (IDEAs). The results of these evaluations were used by the CBCRP's Breast Cancer Research Council to set priorities. These evaluations are available in print to the public and can also be viewed on the Program Web site.

**Postdoctoral Awards Evaluation**

During 2009, the CBCRP published the second evaluation of the Program's Postdoctoral Fellowship Awards. These fellows—including graduates having recently completed their Ph.D.s, physicians continuing research activity, and individuals in transition to breast cancer research from another field—receive CBCRP financial support to obtain their postdoctoral training under a designated mentor experienced in breast cancer research. The evaluation found that these awards are meeting important goals set by the CBCRP, including increasing the pool of scientists engaged in breast cancer research. The Postdoctoral awards also allowed the fellows to leverage millions in additional funding for breast cancer research, assuring that the lines of inquiry they are pursuing will go forward in the future. The evaluation suggested possible ways to improve the Postdoctoral awards, including requiring the mentor to have documented expertise in breast cancer research.

## Evaluation Leading to Improvement

The results from this evaluation and previous evaluations are contributing to the CBCRP's current three-year priority setting process, which will be completed in 2010. Previous priority-setting evaluation processes have led to major improvements in the type of research the CBCRP funds. Examples include:

- Three evaluations of the CBCRP's Community Research Collaboration awards led to the Program making several improvements. The CBCRP conducted a multi-year outreach and training effort that increased the number of community organizations and scientific researchers collaborating on breast cancer research questions of interest to communities of California women. Grant amounts have been increased and the application pro-

## Evaluation helps the Program target research dollars where they will do the most to reduce and end the suffering caused by breast cancer.

cess has been made more user-friendly. For more on the CBCRP's Community Research Collaborations, see the section of this annual report titled "Collaborating with Breast Cancer Activists and California Communities."

- A previous three-year priority-setting process led the CBCRP to invest 30 percent of its funds in the Program's Special Research Initiatives. The initiatives are designed to answer crucial questions about the role of the environment in breast cancer, and to uncover the reasons why some groups in California bear a greater burden of the disease. For more on the CBCRP's Special Research Initiatives, see the previous section of this report titled, "The CBCRP's Strategy for Allocating Research Funds."
- The CBCRP council used results from an evaluation of the Program's Innovative, Developmental and Exploratory (IDEA) awards to make these grants more effective at meeting the goal of jump-starting research that may not succeed, but has high potential to lead to breakthroughs. Researchers now apply for a smaller initial IDEA grant to test their hypothesis. If they succeed, they can apply for a larger grant to push the research forward. This change means the CBCRP is able to fund research to test more new ideas and provide additional support if they show promise.
- A past evaluation of the Program's Translational Research Collaborations found that offering this type of award was not leading to the kind of research the CBCRP had envisioned. This award required two scientists from two different research disciplines to collaborate on moving a proven discovery from basic research toward a practical application to improve breast cancer treatment, detection, or prevention. Since requiring the collaboration was not leading to projects that actually translated research findings into practical applications, the CBCRP focused instead on clarifying its definition of "translational research" in a way that is meaningful to researchers in diverse disciplines engaged in breast cancer research. Applicants for these awards are now required to identify the practical outcome of their research, describe how they are resolving barriers that have kept the research concept from being turned into a practical application, and ensure that previous research has laid the groundwork for putting the concept to practical use.

- CBCRP staff and the Program's council informally evaluated how CBCRP-funded research gets translated into new medications, new detection methods, new programs to support patients, policy changes, or other actions that have an impact on breast cancer. As a result, applicants for CBCRP research grants are now required to describe the steps necessary to translate their research project into action that impacts the disease. This has enabled the CBCRP to target its limited funds toward research most likely to lead to progress against breast cancer.

# Relationship between Federal and State Funding for Breast Cancer Research

The California Breast Cancer Research Program is distinct from research programs funded by the federal government in both the CBCRP's sources of funding and in the types of research funded.

## The CBCRP's Source of Funding: Unique Among The Nation's Breast Cancer Research Agencies

The primary source of funding for the CBCRP is a 45 percent share of revenue from a two-cent State tax on cigarettes. This source of funding is unique among agencies that fund breast cancer research across the nation.

In contrast, funding for breast cancer research at other programs in the U.S. comes from a variety of different sources:

- Federal Agencies (National Institutes of Health, Department of Defense) receive funding through Congress from the national budget and from the public's voluntary purchase of more expensive postage stamps.
- National Voluntary Health Organizations (such as the American Cancer Society, Komen Foundation, Breast Cancer Research Foundation, Avon Foundation) receive funding through charitable contributions from individuals, corporations, and foundations.
- Regional Nonprofit Organizations (such as the Entertainment Industry Foundation, The Wellness Foundation) also receive funding through charitable contributions.
- State Agencies (such as the New Jersey Breast Cancer Research Fund, Illinois Ticket for the Cure State Lottery, and the Cancer Prevention and Research Institute of Texas, the latter a new program that includes breast cancer) receive funding from state general funds, auto license fees, lottery ticket sales and voluntary donations on individual state income tax returns.

The California Breast Cancer Research Program's primary source of funds, from a State tax on cigarettes, is declining and temporary. In the past, measures were proposed in the California State Legislature that would have had the indirect effect of decreasing funding for the CBCRP by $5 million; similar measures may be proposed, and may pass, in the future.

During 2009, the State of California went through a severe budget crisis. An executive order from the Governor cut off funding for contracts issued by state agencies and departments, beginning in March. However, the budget crisis and the executive order did not impact the CBCRP's ability to fund new research grants or disburse funds for existing grants. The executive order did not

apply to the CBCRP, because the Program's funds do not depend on allocations from the general fund.

The CBCRP also receives some funding from the income tax checkoff program, which allows individuals the opportunity to make voluntary donations on state income tax returns. Voluntary tax contribution funding is a result of legislation passed by the California State Legislature that authorizes donations for five years. During 2007, AB28, a bill authored by Assembly Member Jared Huffman, became law. This legislation provides individuals the opportunity to make donations to the CBCRP via voluntary tax contributions through 2012.

To increase these sources of revenue, the CBCRP conducts a public outreach and fundraising effort, the Community Partners Program. This effort, begun in 2002, has led to an increase in donations to the CBCRP from individuals, businesses, and foundations. The CBCRP's Community Partners Program is discussed more fully in the section of this report titled "Increasing Funding for and Awareness of Breast Cancer Research."

## Types of Research Funded by the CBCRP: Complementing, Not Duplicating, Federal Efforts

The CBCRP has a deep commitment to using the funds provided by the State of California in the most efficient and cost-effective manner, and to adhering to the Program's mandate as defined by the California Legislature. One of the CBCRP's mandates is to "fund innovative and creative research, with a special emphasis on research that complements, rather than duplicates, the research funded by the federal government." The CBCRP fulfills this mandate in four ways:

1. By funding breast cancer research areas that could have a major impact on breast cancer— including leading to prevention and cure—that are not getting sufficient attention from the federal government;

2. By having expert reviewers from across the U.S. review grant applications for their innovation and impact;

3. Before funding a grant application, reviewing it for overlap with current and pending funding from other agencies;

4. By taking leadership to reduce barriers and waste in state, federal, and international breast cancer research funding.

## Funding Promising Areas of Research That Have Not Received Sufficient Attention

The federal government's method for funding research has led to some promising areas of breast cancer research being under-funded. The federal government funds most health-related research through the National Insti-

**One of the CBCRP's mandates is to "fund innovative and creative research that complements, rather than duplicates, the research funded by the federal government."**

tutes of Health (NIH). The NIH view is on "capitalizing…investigator-initiated research." The primary basis on which the NIH chooses grants for funding is their scientific merit, not their relevance to a particular disease. As a result, most research proposals submitted to the NIH address scientific questions in which the investigators have theoretical and empirical interest, even though there may be no clear relevance to particular diseases.

Only a small percentage of NIH funds go to research in issues the NIH has identified as particularly important to specified diseases (i.e., Requests for Applications). The majority of NIH funds support the most scientifically meritorious research, regardless of the applicability of the research to particular diseases.

In contrast, a fundamental priority for the CBCRP is to fund research that will speed progress in preventing and curing breast cancer. The CBCRP's Breast Cancer Research Council sets the Program's funding priorities, taking into account:

- Opinions from national breast cancer experts
- Opinions from California advocates and activists, healthcare providers, public health practitioners, community leaders, biotechnology scientists, and academic researchers
- Current literature on breast cancer and current gaps in knowledge

The council attempts to identify and fill important gaps in knowledge about breast cancer and reviews priorities yearly in light of changes in the research field, successes and failures of previous funding initiatives, and the results of previous funding. The CBCRP is conducting a program initiative begun in 2005 to fill a significant gap in breast cancer research. The Special Research Initiatives addresses two overlapping research questions that California is uniquely positioned to address. They are the environment's role in breast cancer and the reasons for the unequal burden of breast cancer among various populations of women. More information on these Special Research Initiatives may be found in a previous section of this report, "The CBCRP Strategy for Allocating Research Funds."

## Choosing Research for Innovation and Impact

The CBCRP created its own scoring system to allow the Program's expert reviewers to differentiate applications that are especially innovative and that have the most potential impact on breast cancer. The scoring system has improved the Program's ability to choose the most innovative and creative research for funding.

In the past, the majority of research funding agencies scored funding proposals with a single score based solely on scientific merit.

With this method, an application with an excellent research plan to test an idea that wasn't particularly novel could receive the same score as an application with a flawed research plan to test a novel idea. The CBCRP's scoring method, based on the recommendations of an NIH Advisory Committee, can distinguish these two applications. The CBCRP scores applications separately for innovation, impact, approach, and feasibility. The CBCRP's Breast Cancer Research Council uses these separate scores to inform their funding recommendations. For example, under the CBCRP's "impact" criterion, researchers are required to describe the steps necessary to turn their research into products, technologies, or interventions that will have an impact on breast cancer, and describe where their study fits into this critical path.

## Reviewing Grant Proposals for Overlap with Federal Funding

As a final step to ensure that CBCRP-funded research doesn't duplicate federally-funded research, breast cancer science experts in other states and Program staff scientists review all grants recommended for funding for overlap with current and pending federal grants. If overlap with federal funding is found, the overlapping grant (or portion of the grant) is not funded.

## Taking Leadership to Reduce Duplication and Waste In Federal, State, and International Funding

The CBCRP is part of an international effort to reduce duplication and waste in research toward the goal of ending breast cancer. This fast-growing effort, the International Cancer Research Portfolio (ICRP), includes 50 of the largest government and charitable research funding agencies in the U.S., United Kingdom, Canada, the Netherlands, and France. The number of participating organizations is expected to further expand during 2010. The organizations that make up the ICRP are working to speed progress by increasing communication and avoiding duplication among agencies that fund breast cancer research.

One way the ICRP pursues these goals is by developing a research classification system to encourage agencies to report their funding in a way that is more accessible and meaningful to other agencies and the public. The ICRP also has a Web site (www.cancerportfolio.org) that includes research abstracts from more than 15,000 current and past research projects. The online database is searchable by cancer type, scientific area, funding organization, and other selected criteria. The Web site allows scientists to identify possible collaborators, plan their research based on current research, and facilitate dialogues

among cancer researchers. Access to this information about ongoing research also aids research funding organizations in strategic planning for future spending. In addition, the Web site is a useful tool for other groups. Policy makers may use the database during the formulation of new health care and service delivery policies. Healthcare professionals, patients, survivors, and advocates may review the current status of funded research.

The CBCRP and the Program's partners in this effort are dedicated to making current research information available to funding agencies and the public, and to promoting scientific collaboration. To extend coordination further, the ICRP partners invite representatives from the other organizations to attend their scientific meetings and review in person their funded research.

During 2009, the ICRP took international coordination to a higher level by publishing the results of an evaluation of the career development funding trends in the U.S.,U.K and Canada. The evaluation found that providing funds for recent Ph.D. or M.D. graduates to conduct breast cancer research enabled a large majority of these researchers to stay in breast cancer research and to leverage additional funding for their investigations. In 2009, the ICRP also conducted and published the results of an online survey of its member organizations on strategies for peer review. Peer review is the process of a funding agency having research proposals reviewed by scientific experts, with the goal of selecting the best research to be funded. The survey identified several successful methods for costs savings in the peer review process, In the future, the ICRP will publish a review of cancer research funding patterns in the U.S., U.K., and Canada that will point to gaps in research and make recommendations for research priorities to fill those gaps.

# Increasing Funding for and Awareness of Breast Cancer Research

Vital action is needed to ensure the CBCRP's present funding sources and increase funds from new sources. CBCRP funding from the State cigarette tax decreases every year. Moreover, current funds are not sufficient to do all that needs to be done. During 2009, the CBCRP turned down grant applications requesting a total of $8,707,564 that were rated by expert reviewers as having sufficient scientific merit for funding.

To increase its revenue, the CBCRP began its Community Partners Program in 2002. The Community Partners Program pursues two goals:

- Increasing donations to the CBCRP through the California income tax voluntary contribution program and new sources;
- Increasing public awareness of breast cancer, breast cancer research, and the California Breast Cancer Research Program.

## Community Partners: Increasing Voluntary Donations to the CBCRP

The Community Partners Program has led to growth and diversification in donations to the CBCRP. During 2009, the CBCRP received major funding from the California state income tax checkoff program and from private foundations. In addition, the public took a number of other opportunities to donate to the CBCRP.

**California State Income Tax Checkoff Program.** More than 42,300 individuals donated over $565,000 to the CBCRP during 2009 through the state income tax checkoff program. This made the CBCRP one of the checkoff program's top beneficiary organizations for the year.

The following grants were funded in part through voluntary tax contributions in 2009:

- **Risk Factors and Breast Cancer Survival in Black/White Women** Yani Lu, M.D., Beckman Research Institute of the City of Hope
- **Health Literacy in Older Patient's Breast Cancer Treatment** Arash Nasim, M.D., Ph.D., University of California, Los Angeles
- **P32: New Functional Target in Breast Cancer Brain Metastasis** Karin Staflin, Ph.D., Scripps Research Institute

**Foundations.** Two foundations are signaling their approval of the CBCRP's pioneering efforts by joining with the Program to support our leading-edge research.

- The Avon Foundation for Women is contributing $500,000 to support the CBCRP's groundbreaking Special Research Initiatives. The funds help support a study examining long-term environmental exposures and breast cancer in a large, diverse population group and a study investigating why women from some minority groups, once they are diagnosed with breast cancer, are less likely than oth-

ers to be successfully treated.

- The California Community Foundation is contributing $31,000 to support a CBCRP-funded study that explores emerging concerns about whether grapefruit increases breast cancer risk for post-menopausal women.

**United Way.** The CBCRP is a participant organization in the Community Campaign of the United Way of California, which allows residents of the state to make donations at their place of work. During 2009, the CBCRP received donations from the United Way of the Bay Area, United Way of the Capitol Region, United Way Silicon Valley, United Way Southeastern Philadelphia, and the United Way State Employees Charitable Campaign.

**Individual, Business, and Community Group Efforts.** This year, the public demonstrated continued enthusiasm for the CBCRP's research.

- On Catalina Island, the Las Caballeras women's horseback organization turned their annual 5-day ride into "Cowgirls for the Cure." The women dressed in pink and outfitted their horses with pink harnesses and ribbons. When the dust cleared after the September 30-October 4 ride, Las Caballeras had raised $10,000, which they donated to the CBCRP.
- The organizers of the San Francisco Marathon again selected the CBCRP as a beneficiary of their Cause to Run program. On July 26, 2009, 25 runners raised $22,780 to support the CBCRP's efforts to eradicate breast cancer. The top fundraiser was Sudha Venkataraman, at $3,341. Four staff members from Gitane Restaurant formed a running team and together raised $2,314. Team CBCRP volunteers also registered racers, handed out supplies, and helped with other behind-the-scenes details.
- Businesses and community groups that made donations to the CBCRP included the Avon Foundation for Women, Spectrum Clubs Inc., and the Crescent City Lighthouse Quilt Guild.
- Businesses donated over $14,000 to the CBCRP during 2009, and individuals (in addition to those who donated through the California State Tax Checkoff program) contributed over $52,000.

**Business and Employee Giving Campaigns.** Businesses that made the CBCRP the beneficiary of their community or employee fundraising efforts included: California State Employees Contribution Program, AT&T Employee Giving Program, Amgen Corporation Matching Gift

## CBCRP funding from the State cigarette tax decreases every year. Moreover, current funds are not sufficient to do all that needs to be done.

Program, and Wells Fargo Community Support Campaign. In addition, the CBCRP received contributions from the Kaiser Permanente Community Giving Campaign.

**Web-based Giving.** The public has also responded to the opportunity to make donations via the Program's Web site, www.CABreastCancer.org.

### Community Partners: Increasing Awareness of Breast Cancer Research and of the CBCRP's Work

During 2009, the CBCRP's outreach campaign focused on raising awareness of breast cancer research results and the Program's work. The campaign also concentrated on increasing citizen contributions via their state income tax forms.

The CBCRP conducted a combined outreach effort in 2009, named Checkoff California, with other California nonprofit organizations who receive state tax return contributions. Together, the CBCRP and these nonprofit organizations created a radio and Internet marketing campaign to alert the public to the income tax checkoff program. The campaign was conducted in partnership with the tax preparation firm Jackson Hewitt and over 140 California radio stations, member stations of the Northern California Broadcasters Association, Southern California Broadcasters Association, and San Diego Radio Broadcasters Association. Campaign activities included more than 3,000 radio public service announcements in English and Spanish, a presence on Facebook and Twitter, and a Web site highlighting all nonprofit organizations included in the income tax checkoff program.

The CBCRP's special Web site dedicated to the income tax checkoff, www.endbreastcancer.org, informed stakeholders about fundraising progress. It also summarized progress researchers achieved with the grants funded via contributions made on state income tax returns.

Governor Arnold Schwarzenegger further boosted California's awareness of the opportunity to make donations through the tax checkoff by issuing an official proclamation declaring March 2009 as Checkoff California Month.

### Faith Fancher Research Award

Faith Fancher was a long-time television news anchor and personality with KTVU (Oakland) who waged a very public battle against breast cancer. She also was the founding member of the CBCRP Executive Team, which formed in 2001 to help raise the visibility and fundraising profile of the Program. Faith passed away in October 2003 after a six-year struggle with breast cancer. In Faith's honor, the CBCRP has created the annual Faith Fancher Research Award. The award is presented each year to a researcher

or research team embarking on a CBCRP-funded breast cancer study that reflects the values that Faith held most closely and extends the work that Faith did for all women facing breast cancer. The recipients of the 2009 Faith Fancher Research Award are Anna Nápoles-Springer (University of California, San Francisco) and Carmen Ortiz (Círculo de Vida) for their community collaborative project, *Nuevo Amanecer:* Promoting the Psychosocial Health of Latinas.

©2004, Brandy Brune

*Sarah Null (left) and Brandy Brune trekked through 3 days and 54 miles of back-country terrain in the Sierras to raise nearly double their anticipated goal for the CBCRP.* Circa 2004

©2004, Leanne Proud

*The Proud family decided to actively support breast cancer research by throwing a party celebrating Leann's recovery from breast cancer surgery. Friend Darlene Cain (foreground) pulls a ticket in the raffle that was hosted to raise funds for the CBCRP.* Circa 2004

# Research on Women and Minorities

Forty-three percent (23 of 53) of the research projects that the CBCRP funded in 2009 studied either women or tissues from women. The remaining 57 percent were laboratory studies that did not directly involve women or tissues from women.

Of the 23 research projects that involved women or tissues from women, 91 percent (21) had women as participants in the study.

Out of the (21) studies that included women:

- Ninety percent, (19) research projects include minority women in the study.
- Thirty-three percent, (7) are focused on minority women.
- Thirty-eight percent, (8) are focused on underserved women.

A total of eight projects were funded with a primary emphasis on minority and/or underserved women:

**Sister Survivor: Evaluating Best Practices in Social Support**
Kimlin Ashing-Giwa, Ph.D., Beckman Research Institute of the City of Hope and Carolyn Tapp, Women of Color Breast Cancer Survivors Support Project

***Nuevo Amanecer:* Promoting the Psychosocial Health of Latinas**
Anna Napoles-Springer, Ph.D., M.PH., University of California, San Francisco and Carmen Ortiz, Ph.D., Circulo de Vida Cancer Support and Resource Center

**Risk Factors and Breast Cancer Survival in Black/White Women**
Yani Lu, M.D., Beckman Research Institute of the City of Hope

**Macrophages in Breast Cancer Patients of African Descent**
Rita Mukhtar, Ph.D., University of California, San Francisco

**Health Literacy in Older Patient's Breast Cancer Treatment**
Arash Naeim, M.D., Ph.D., University of California, Los Angeles

**Breast Cancer Risk Reduction: A Patient-Doctor Intervention**
Celia Kaplan, Dr.P.H., University of California, San Francisco

**Demographic Questions for California Breast Cancer Research**
Scarlett Lin Gomez, Ph.D., Northern California Cancer Center

**Race & Ethnicity in Stage-Specific Breast Cancer Survival**
Leslie Bernstein,, Ph.D., Beckman Research Institute of the City of Hope; Katherine Henderson, Ph.D., Beckman Research Institute of the City of Hope; Esther John, Ph.D., Northern California Cancer Center; Marilyn Kwan, Ph.D., Kaiser Foundation Research Institute; Kristine Monroe, Ph.D., University of Southern California; and Anna Wu, Ph.D., University of Southern California

# California Breast Cancer Research Program Council (2009)

**Chair**
Klaus Porzig (2008-2009)
Jim Ford (2009-2010)

**Vice-Chairs**
Catherine Quinn (2008-2009)
Barbara Brenner (2009-2010)

**Advocates**
Susan Braun, Commonweal (2009-2012)
Barbara Brenner, J.D., Breast Cancer Action (2008-2011)
Angela Lucia Padilla, Esq., Bay Area Young Survivors (BAYS) (2005-2009)
Karren Ganstwig, Los Angeles Breast Cancer Alliance (2007-2010)
Jeanne Rizzo, Breast Cancer Fund (2008-2011)
Donna Sanderson, Susan G. Komen Foundation (2009-2012)

**Scientists/Clinicians**
Lisa Barcellos, Ph.D., University of California, Berkeley (2009-2012)
Moon Chen, Ph.D., University of California, Davis (2008-2011)
Laura Fenster, Ph.D., California Department of Public Health (2007-2010)
Jim Ford, M.D., Stanford University (2008-2009)
Larry Green, Dr.P.H., University of California, San Francisco (2008-2009)
Shelley Hwang, M.D., University of California, San Francisco Comprehensive Cancer Center (2007-2010)
Mary Alice Yund, Ph.D., University of California, Berkeley Extension (2007-2010)

**Industry Representatives**
Chris Bowden , Ph.D., Genentech (2007-2010)
Teresa Burgess, Ph.D., Amgen, Inc. (2008-2011)

**Non-Profit Health Representatives**
Roxanna Bautista, M.P.H, Asian & Pacific Islander American Health Forum (2007-2010)
Crystal D. Crawford, Esq., California Black Women's Health Project (2006-2009)
Carlina Hansen, San Francisco's Women's Community Clinic (2009-2012)
Catherine Quinn, California Health Collaborative (2006-2009)

**Medical Specialist**
Klaus Porzig, M.D., South Bay Oncology Hematology (2006-2010)

**Ex Officio Member**
Sherie Smalley, M.D., California Department of Public Health (ongoing)

# California Breast Cancer Research Program Staff (2009)

**Marion H. E. Kavanaugh-Lynch M.D., M.P.H.** – Director

**Laurence Fitzgerald, Ph.D.** – Manager: Core Funding; Biomedical Research Administrator

**Katherine McKenzie, Ph.D.** – Manager: External Relations; Biomedical Research Administrator

**Catherine Thomsen, M.P.H.** – Project Lead, Special Research Initiatives

DeShawn Boyd – **External Relations Assistant**

Sharon Cooper, M.P.A. – **Research Analyst**

Mary Daughtry – **Core Funding Assistant**

Elizabeth Day – **Program Assistant**

Brenda Dixon-Coby – **Community Outreach & Special Events Coordinator**

Lyn Dunagan – **Communications Project Coordinator**

Stella Gonzales – **Administrative Assistant**

Claudia Grossmann, Ph.D. – **Program Evaluator**

Lisa Minniefield – **Assistant to the Director**

Eric Noguchi – **Senior Designer**

# Appendix A: CBCRP 2009 Research Review Committees

Expert committees review for scientific merit all research applications submitted to the CBCRP. To minimize conflicts of interest, review committees are composed of experts from outside California. These experts include scientists highly knowledgeable about the broad topic of the applications they consider. Each review committee also has advocate reviewers. These are women and men active in breast cancer advocacy organizations, many of them also living with the disease. The review committees for 2009 are listed below.

## Special Research Initiatives: Chemicals Policy Review Committee

### Chair:

**Suzanne Fenton, Ph.D.**
Research Biologist. Developmental Biology Branch
United States Environmental Protection Agency
Reproductive Toxicology Division (MD-67)
Research Triangle Park, NC

### Scientific Reviewers:

**Daryl Ditz, Ph.D.**
Senior Policy Advisor, Chemicals Program
Center for International Environmental Law
Washington, DC

**Ronald Melnick, Ph.D.**
Senior Toxicologist & Director of Special Programs
National Institute of Environmental Health Sciences
RTP, NC

**Ruthann A. Rudel, M.S.**
Senior Scientist
Silent Spring Institute
Newton, MA

### Advocate Reviewer:

**Anna Cluxton, MBA**
Vice President, Young Survival Coalition/
Ohio State Univ. Comprehensive Cancer Center
Columbus, OH

## Special Research Initiatives: Demographic Questions Review Committee

### Chair:

**Charmaine D.M. Royal, Ph.D.**
Associate Research Professor
Center for Genome Ethics, Law & Policy
Duke University
Durham, NC

### Scientific Reviewers:

**Hector G. Balcazar, Ph.D.**
Regional Dean, El Paso Regional Campus
UT School of Public Health at Houston
El Paso, TX

**Judy Bradford, Ph.D.**
Director, Community Health Research Initiative
Virginia Commonwealth University
Richmond, VA

### Advocate Reviewer:

**Vernal H. Branch**
Member, Board of Directors
The Virginia Breast Cancer Foundation
Richmond, VA

## Special Research Initiatives: Survival Review Committee

**Chair:**

**Blase Polite, MD, MPP**
Associate Professor
University of Chicago
Department of Medicine
Chicago, IL

**Stephanie Smith-Warner, Ph.D.**
Assistant Professor
Harvard University
School of Public Health
Boston, MA

**Scientific Reviewers:**

**Dawn L. Hershman, M.D., M.S.**
Assistant Professor
Columbia University Medical Center
Medicine Hematology/Oncology
New York, NY

**Advocate Reviewers:**

**Jacquelin Holland**
Columbus Black Women's Health Project
Westerville, OH

## Special Research Initiatives: Biological/Ecological Model Review Committee

**Chair:**

**Sarah Gehlert, Ph.D.**
Director, Center for Interdisciplinary Health Disparities Research
Professor, School of Social Service Administration
University of Chicago
Chicago, IL

**Scientific Reviewers:**

**Anthony C. Gatrell, Ph.D.**
Dean-Designate of the School of Health and Medicine
Lancaster University
Institute for Health Research
Lancaster, UK

**Neil Theise, M.D.**
Professor, Depts. of Pathology and Medicine
Beth Israel Medical Center
New York, NY

**Advocate Reviewer:**

**Vernal Branch**
Vice President, Board of Directors
Virginia Breast Cancer Foundation
Richmond, VA

## Special Research Initiatives: Statistical Models Review Committee

### Chair:

**Julia G. Brody, Ph.D.**
Executive Director
Silent Spring Institute
Newton, MA

### Scientific Reviewers:

**Mousumi Banerjee, Ph.D.**
Research Associate Professor
Department of Biostatistics
University of Michigan, Cancer Center
Ann Arbor, MI

**Aedin Culhane, Ph.D.**
Research Associate, Dept of Biostatistics
Harvard School of Public Health
Dana-Farber Cancer Institute
Boston, MA

**Richard D. Day, Ph.D.**
Associate Professor, Biostatistics
University of Pittsburgh
Pittsburgh, PA

**Edwin S. Iversen, Ph.D.**
Associate Research Professor
Inst. of Statistics & Decision Sciences
Duke University
Durham, NC

### Advocate Reviewer:

**Susan Pelletier**
Vermont Breast Cancer Coalition
Stockbridge, VT

## Core Funding: Community Research Collaborations/Sociocultural/ Health Policy Review Committee

### Chair:

**Shiraz Mishra, M.B.B.S., Ph.D.**
Associate Professor
Dept. Epidemiology & Preventive Medicine
University of Maryland, Baltimore - School of Medicine
Baltimore, MD

### Scientific Reviewers:

**Deborah Bowen, Ph.D..**
Member and Professor
Boston University
Social and Behavioral Sciences
Boston, MA

**Patricia Carney, Ph.D.**
Professor of Family Medicine
Oregon Health and Science University
Portland, OR

**Lori Crane, Ph.D., M.P.H.**
Professor
University of Colorado, Denver Community & Behavioral Health
Denver, CO

**Alecia Fair, Dr.PH**
Assistant Professor
Meharry Medical College
Nashville, TN

**Laura Linnan, Sc.D., CHES**
Associate Professor
Department of Health Behavior & Health Education
UNC Chapel Hill School of Public Health
Chapel Hill, NC

**Armin Weinberg, Ph.D.**
Professor
Chronic Disease Prevention and Control Research Ctr.
Baylor College of Medicine
Houston, TX

**Mayumi Willgerodt, Ph.D.**
Associate Professor
University of Washington
Seattle, WA

### Advocate Reviewers:

**Christine Carpenter**
Iowa Breast Cancer Edu-action
Cedar Falls, IA

**Maryellen Delapine**
Linda Creed Breast Cancer Foundation
Gilbertsville, PA

*Continued next page following*

## Core Funding: Community Research Collaborations/Sociocultural/ Health Policy Review Committee

### California Advocate Observer:

**Linda Cady**
Between Women Breast Cancer Organization
Brawley, CA

### Ad-Hoc Reviewer:

**Gary Morrow, Ph.D.**
Professor
School of Dentistry Medicine and Dentistry
University of Rochester
Rochester, NY

## Core Funding: Innovative Treatments/Earlier Detection Review Committee

**Chair:**

**Patricia LoRusso, D.O.**
Professor of Medicine
Karmanos Cancer Institute
Wayne State University
Detroit, MI

**Scientific Reviewers:**

**Ralph Bernacki, Ph.D.**
Professor; Cancer Research Scientist
Department of Pharmacology & Therapeutics
Roswell Park Cancer Institute
Buffalo, NY

**Ulrich Bierbach, Ph.D.**
Associate Professor
Wake Forest University
Chemistry Department
Winston-Salem, NC

**David Boothman, Ph.D.**
Professor
Department of Oncology, Pharmacology and Radiation
University of Texas, Southwestern Medical Center
Dallas, TX

**Sandra Demaria, M.D.**
Assistant Professor
Department of Pathology
NYU School of Medicine
New York, NY

**Leisha Emens, M.D., Ph.D.**
Associate Professor
Associate Professor of Oncology
Johns Hopkins University, School of Medicine
Baltimore, MD

**Silvia Formenti, M.D.**
Professor of Medicine
NYU School of Medicine
New York, NY

**Andrew Karellas, Ph.D.**
Director of Radiologic Physics
University of Massachusetts Medical School
Worcester, MA

**Paul Kinahan, Ph.D.**
Professor of Radiology
University of Washington
Department of Radiology
Seattle, WA

**Keith Knutson, Ph.D.**
Assistant Professor of Immunology
Mayo Clinic College of Medicine
Department of Immunology
Rochester, MN

*Continued next page following*

## Core Funding: Innovative Treatments/Earlier Detection Review Committee

**Mark Pagel, Ph.D.**
Associate Professor
University of Arizona
Arizona Cancer Center
Tucson, AZ

**Eva Sevick-Muraca, Ph.D.**
Professor and Director
The University of Texas
Brown Institute of Molecular Medicine
Houston, TX

**Nancy Templeton, Ph.D.**
Assistant Professor
Center for Cell and Gene Therapy
Baylor College of Medicine
Houston, TX

**Lily Yang, M.D., Ph.D.**
Nancy Panoz Chair of Surgery in Cancer Research
Emory University School of Medicine
Department of Surgery and Winship Cancer Institute
Atlanta, GA

### Advocate Reviewers:

**David Baker**
National Breast Cancer Coalition
Houston, TX

**Beverly Canin**
Breast Cancer Option, Inc.
Rhinebeck, NY

**Marjorie Gallece**
Breast Cancer Resource Centers of Texas
Austin, TX

**Roberta Gelb**
SHARE
New York, NY

### California Advocate Observer:

**Diane Heditsian**
Breast Cancer Connections
Redwood City, CA

### Ad-Hoc Reviewers:

**Julie Lang, M.D.**
Assistant Professor of Surgery
Arizona Health Sciences Center
University of Arizona
Tucson, AZ

**Abenaa Brewster, M.D., M.H.S.**
Assistant Professor of Medicine
The University of Texas MD Anderson Cancer Center
Department of Clinical Cancer Prevention
Houston, TX

## Core Funding: Pathogenesis Review Committee

### Chair:

**Danny Welch, Ph.D.**
Leonard H. Robinson Professor of Pathology
Department of Pathology
University of Alabama - Birmingham
Birmingham, AL

### Scientific Reviewers:

**Hava Avraham, Ph.D.**
Associate Professor of Medicine
Beth Israel Deaconess Medical Center
Harvard Medical School
Boston, MA

**Geoffrey Clark, Ph.D.**
Associate Professor
University of Louisville
J.G. Brown Cancer Center, Molecular Targets Group

**Qihong Huang, Ph.D.**
Assistant Professor
Molecular and Cellular Oncogenesis Program
The Wistar Institute
Philadelphia, PA

**Cheryl Jorcyk, Ph.D.**
Associate Professor
Department of Biology
Boise State University
Boise, ID

**James McCarthy, Ph.D.**
Professor
Lab Medicine and Pathology
University of Minnesota
Minneapolis, MN

**Harikrishna Nakshatri, Ph.D.**
Associate Professor
Walther Oncology Center
Indiana University School of Medicine
Indianapolis, IN

**Susan Pories, M.D., FACS**
Assistant Professor of Surgery
Beth Israel Deaconess Medical Center
Cambridge, MA

**Pranela Rameshwar, Ph.D.**
Associate Professor
UMDNJ-New Jersey Medical School
Department of Medicine-Hematology/Oncology
Newark, NJ

**Jasti Rao, Ph.D.**
Director, Program of Cancer Biology
University of Illinois College of Medicine
Dept. of Cancer Biology and Pharmacology
Peoria, IL

**Patricia Schoenlein, Ph.D.**
Associate Professor
Cellular Biology & Anatomy
Medical College of Georgia
Augusta, GA

**Joyce Schroeder, Ph.D.**
Associate Professor
University of Arizona, Arizona Cancer Center
Department of Molecular & Cellular Biology
Tucson, AZ

### Advocate Reviewers:

**Jessica Henderson, Ph.D.**
Oregon Breast and Cervical Cancer Coalition
Western Oregon University
Corvallis, OR

**Beverly Parker, Ph.D.**
Breast Cancer Network of Strength
Naperville, IL

**Diane Roth**
Breast Cancer Network of Strength
Oak Lawn, IL

**Sandra Stanford**
Alamo Breast Cancer Foundation
San Antonio, TX

### California Advocate Observer:

**Karen Huyser, Ph.D.**
Breast Cancer Connections
Sunnyvale, CA

## Core Funding: Etiology, Prevention & Progression Review Committee

### Chair:

**Peggy Porter, M.D.**
Head, Breast Cancer Research Program
Divisions of Human Biology and Public Health Sciences
Fred Hutchinson Cancer Research Center
Seattle, WA

### Scientific Reviewers:

**Rajesh Agarwal, Ph.D.**
Professor
Department of Pharmaceutical Sciences
University of Colorado Health Sciences Center
Denver, CO

**Stephen Barnes, Ph.D.**
Professor
Department of Pharmacology & Toxicology
University of Alabama, School of Medicine
Birmingham, AL

**Abenaa Brewster, M.D., M.H.S.**
Assistant Professor of Medicine
The University of Texas MD Anderson Cancer Center
Department of Clinical Cancer Prevention
Houston, TX

**James DiRenzo, Ph.D.**
Associate Professor of Pharmacology
Department of Pharmacology
Dartmouth Medical School
Hanover, NH

**Stephen Grant, Ph.D.**
Associate Professor
Dept. of Environmental and Occupational Health
University of Pittsburgh Cancer Institute
Pittsburgh, PA

**Julie Lang, M.D.**
Assistant Professor of Surgery
Arizona Health Sciences Center Cancer Center
Tucson, AZ

*Continued next page following*

**Joan Lewis-Wambi, Ph.D.**
Assistant Member
Fox Chase Cancer Center
Philadelphia, PA

**Thomas Ludwig, Ph.D.**
Assistant Professor
Columbia University, Institute for Cancer Genetics
Department of Pathology
New York, NY

**Mark Pegram, M.D.**
Professor of Medicine
Division of Hematology/Oncology
Sylvester Comprehensive Cancer Center
University of Miami
Miami, FL

**Indira Poola, Ph.D.**
Professor
Biochemistry and Molecular Biology
Howard University College of Medicine
Washington, DC

**Weston Porter, Ph.D.**
Associate Professor
Texas A&M University
Department of Veterinary Integrative Biosciences
College Station, TX

**Carla Van Den Berg, Pharm.D.**
Associate Professor
University of Texas, Austin
College of Pharmacy
Austin, TX

## Advocate Reviewers:

**Kimberly Newman-McCown**
Thomas Jefferson University
Kimmel Cancer Center
Philadelphia, PA

**Nancy Singleton**
SHARE
Hoboken, NJ

**Maria Wetzel**
Michigan Breast Cancer Coalition
Baldwin, MI

**Kimberly Wright**
Susan G. Komen Breast Cancer Foundation
Baltimore, MD

## California Advocate Observer

**Jeannette Morrow**
Breast Cancer Solutions
Huntington Beach, CA

# Appendix B: Fiscal Overview of the CBCRP (2004-2010)

## CBCRP Income 2004-2010

| FISCAL YEAR | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 |
|---|---|---|---|---|---|
| CYCLE | XI | XII | XIII | XIV | XV |
| STATE FUNDS ALLOCATED | $15,847,000 | $13,249,000 | $13,249,000 | $13,554,000 | $13,554,000 |
| EXTERNAL FUNDING* | $91,770 | $97,925 | | $40,000 | $500,000 |
| PRIVATE DONATIONS | $25,019 | $14,972 | $19,877 | $34,385 | $77,033 |
| TOTAL FUNDS | $15,963,789 | $13,361,897 | $13,268,877 | $13,628,385 | $14,131,033 |

**2004-2005, California Endowment; 2007-2008 California Community Foundation ; 2008-2009 Avon Foundation for Women*

## Grant and Contract Funding

| FISCAL YEAR | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 |
|---|---|---|---|---|---|
| CYCLE | XI | XII | XIII | XIV | XV |
| CORE GRANTS AWARDED | 53 projects | 53 projects | 35 projects | 42 projects | 44 projects |
| Direct Cost Total | $6,177,885 | $7,288,931 | $5,873,318 | $6,854,984 | $6,693,999 |
| Indirect Cost Total | $1,562,957 | $2,540,198 | $1,240,833 | $1,232,410 | $1,904,740 |
| Total Grant Costs | $7,740,842 | $9,829,129 | $7,114,351 | $8,087,394 | $8,598,739 |
| SRI GRANT/CON-TRACTS AWARDED | | | | | 9 projects |
| Direct Cost Total | | | | | $6,323,325 |
| Indirect Cost Total | | | | | $1,021,524 |
| Total Grant Costs | | | | | $7,344,849 |
| Reserve | $4,106,045 | $3,168,495 | $2,967,701 | $3,376,296 | $4,115,088 |
| Balance | $4,106,045 | $7,274,540 | $10,242,241 | $13,618,537 | $10,388,776 |
| TOTAL GRANT FUNDS | $7,740,842 | $9,829,129 | $7,114,351 | $8,087,394 | $15,943,588 |

*Continued next page following*

## Non-Grant Expenditures

| FISCAL YEAR | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 |
|---|---|---|---|---|---|
| CYCLE | XI | XII | XIII | XIV | XV |
| Administration | $566,449 | $684,795 | $745,043 | $702,079 | $420,612 |
| % of total | 3.55% | 5.13% | 5.62% | 5.16% | 2.99% |
| Research Support and Evaluation | $1,587,075 | $2,463,055 | $2,378,164 | $2,259,317 | $1,397,751 |
| % of total | 9.96% | 18.45% | 17.95% | 16.62% | 9.95% |

# GET INVOLVED

✓**YES,** I want to help eliminate breast cancer by supporting the work of the California Breast Cancer Research Program. Enclosed is my contribution.

Please make your contribution check payable to The Regents of the University of California and, on the check memo line, please write: "Breast Cancer Research Program." **All contributions are tax-deductible and will be acknowledged with a return letter.**

Please provide us with your contact information:

NAME:

STREET ADDRESS:

CITY, STATE, ZIP:

PHONE: EMAIL:

- ○ I prefer to remain anonymous, so the CBCRP should not acknowledge my gift in its publications.
- ○ You may acknowledge my gift (name only) in CBCRP publications.

This gift is: ○ in memory of ○ in honor of

NAME:

Please send an additional acknowledgement card to:

NAME:

STREET ADDRESS:

CITY, STATE, ZIP:

- ○ I cannot make a contribution at this time but would like to be included in your mailing list.

Return to:

California Breast Cancer Research Program
University of California, Office of the President
300 Lakeside Drive, 6th Floor
Oakland, CA 94612

I prefer to donate online by going to www.cbcrp.org/support and clicking on the "Donate online" link, or by clicking here.

**Thank you for your support!**