APPENDIX C

The Breast Cancer Research Stamp and the Involvement of the Department of Defense Breast Cancer Research Program

The Stamp Out Breast Cancer Act (Public Law 105-41) resulted from the work of breast cancer research advocates. This legislation led to the issuance of a new, first-class semipostal stamp, the Breast Cancer Research Stamp (BCRS), by the U.S. Postal Service. Net revenues from the BCRS are used to support breast cancer research at the National Institutes of Health (NIH) and the Department of Defense (DOD). The DOD Breast Cancer Research Program (BCRP) receives 30 percent of the monies raised from the sale of this stamp. Thus far, the BCRP has received 16 installments totaling $15,099,323.20. Table C-1 provides details on the installments received and the number of awards funded by fiscal year (FY). Table C-2 provides the research and management cost allocation of the funds received by the DOD.

The $13.2 million received by the DOD from the BCRS through FY05 has been used to fully fund 30 BCRP Idea Award proposals and partially fund another Idea Award, as detailed in Table C-3 (located at the end of this appendix). BCRP Idea Awards are intended to encourage innovative approaches to breast cancer research and are a well-

Table C-1. BCRS Installments and Number of Awards Funded by FY

Fiscal Year	Date Received	Amount Received	Awards
1999	January 11, 1999	$802,523.26	
	July 28, 1999	$976,138.04	
	Total	$1,778,661.30	8
2000	April 20, 2000	$795,431.84	
	May 12, 2000	$533,582.20	
	Total	$1,329,014.04	3
2001	November 5, 2001	$1,454,362.25	
	November 5, 2001	$926,877.71	
	Total	$2,381,239.96	5
2002	May 21, 2002	$735,622.20	
	June 20, 2002	$804,929.40	
	Total	$1,540,551.60	3
2003	March 13, 2003	$1,361,684.27	
	June 16, 2003	$856,575.19	
	Total	$2,218,259.46	4
2004	March 18, 2004	$1,075,385.45	
	November 9, 2004	$987,754.90	
	Total	$2,063,140.35	4
2005	January 6, 2005	$922,848.83	
	August 3, 2005	$950,947.55	
	Total	$1,873,796.38	4
2006	March 15, 2006	$1,198,744.96	
	May 22, 2006	$715,915.15	
	Total	$1,914,660.11	*
	GRAND TOTAL	$15,099,323.20	31

*FY06 awards are pending.

Table C-2. BCRS Research and Management Cost Allocation

Total Proceeds from BCRS	$15,099,323.20
Research	$12,647,536.00
Management costs	$537,127.09
Funds yet to be allocated	$1,914,660.11

recognized backbone of the BCRP's portfolio of awards. As with all BCRP awards, submissions funded through the BCRS are reviewed according to the two-tiered review system originally recommended by the Institute of Medicine.

Although investigators have had research funds for a relatively short period, several exciting research accomplishments have occurred. Some of the projects supported by the BCRS are highlighted as follows:

- Dr. Archibald Perkins of Yale University is using new techniques to identify novel genes involved in cancer. He and his team of investigators have identified many genes not previously shown to be associated with mammary tumorigenesis. This work may help with the prognosis of some breast cancers.
- Dr. Kermit Carraway of the University of California, Davis found a new molecule (a human form of Kek1) that inhibits the activity of epidermal growth factor, a molecule that encourages cell growth. This molecule has potential as a new form of therapeutic agent.
- Dr. Michael White of the University of Texas Southwestern Medical Center found that molecules such as short interfering RNA (siRNA) that inhibit telomerase activity (one specific component of DNA replication) can keep breast cancer cells from proliferating. Dr. White and his team are evaluating the use of the siRNA compounds in mouse model systems.
- Dr. Ping Dou of Wayne State University (formerly of the University of South Florida) found synthetic beta-lactam antibiotics (normally used to treat bacterial infections) that cause death in breast cancer cells.
- Dr. Roger Daly of the Garvan Institute studied a protein called cortactin that seems to be involved in the growth and spread of cancer cells. He has applied for patents on work involving protein complexes comprising cortactin and their uses.
- Dr. Robert Geahlen of Purdue University is examining Syk, another cellular protein, which keeps breast cancer cells from adhering to one another and may prevent them from spreading.

- Dr. Xin-Yun Huang of Cornell University will determine if inhibitors of cell migration can be exploited to block tumor spreading. This study focuses on migrastatin analogues, which are potent inhibitors of the migration of metastatic breast tumor cells.
- Dr. Qiuyin Cai of Vanderbilt University is looking at the relationship between the particular forms (polymorphisms) of two oxidative stress-related genes in mitochrondria (the cell's "energy factories") and breast cancer risk. Results of this study suggest that genetic polymorphism in one mitochondrial gene may be a susceptibility factor for breast cancer among women with high levels of oxidative stress or low intake of antioxidants.
- Dr. Andrew Godwin of Fox Chase Cancer Center is examining the role of a different gene—p84N5. Expression of this gene has been shown to correlate with the aggressiveness of a tumor; thus, p84N5 may be valuable as a prognostic marker for breast cancer, and molecules that interfere with the expression of this gene may have therapeutic potential.
- Dr. Rudolf Kaaks of the International Agency for Research on Cancer is examining the links between dietary fat and breast cancer risk. Dr. Kaaks is exploring the variation in key genes that control fat metabolism and the risk of developing breast cancer.
- Dr. Elad Ziv of the University of California, San Francisco, is investigating whether breast cancer susceptibility among Latinas is related to differences in ancestral admixture and/or differences in hormonal, lifestyle, or other nongenetic factors.
- Dr. Mina Bissell of the Lawrence Berkeley National Laboratory is developing nanoparticles to specifically identify and isolate stem cells (tumor-initiating progenitor cells) in breast cancer. She has confirmed that specific nanoparticles are taken up very well by progenitor-like breast cancer cells.
- Dr. Todd Giorgio of Vanderbilt University is making strides in synthesizing different types of nanoparticles for use in the early detection and treatment of breast cancer.

Discoveries in the basic biology of cancer cell development, tumor formation, the role of the immune system, and advances in early detection techniques hold significant promise for

understanding this disease, identifying new drugs and treatments, and assisting the body's natural defenses to fight the spread of disease. These discoveries have resulted in numerous published papers and some patent applications. The DOD will continue to carefully invest the dollars generated by the BCRS to find and fund the best science from among the nation's most innovative, qualified scientists and clinicians.

Table C-3. BCRP Research Funded by the BCRS

Principal Investigator	Amount	Institution	Proposal Title	Research Area
White	$334,094	University of Texas, Southwestern Medical Center	Isolation of Factors That Disrupt Critical Protein/Protein Interactions within the Telomerase Holoenzyme for Use in Breast Cancer Therapeutics	Molecular Biology
Shah	$279,000	University of Arkansas	Role of a Novel Matrix-Degrading Metalloproteinase in Breast Cancer Invasion	Cell Biology
Heyer	$111,444	University of California, Davis	In Vitro Recombination Activities of the Breast Cancer Predisposition Protein Brca2	Molecular Biology
Daly	$283,649	Garvan Institute	Identification of Novel Prognostic Indicators for Breast Cancer through Analysis of the EMS1/Cortactin Signaling Pathway	Cell Biology
Musgrove	$222,652	Garvan Institute	Role of Cyclin D1 and p27 in Steroidal Control of Cell Cycle Progression in the Mammary Gland in Vivo	Cell Biology
Wang	$317,510	Texas A&M University	Scanning Microwave-Induced Acoustic Tomography	Imaging
Deuel	$5,000	Scripps Institute	Novel Angiogenic Domains: Use in Identifying Unique Transforming and Tumor Promoting Pathways in Human Breast Cancer	Molecular Biology
Wreschner	$225,000	Tel Aviv University	Analysis of the Secreted Novel Breast Cancer-Associated MUC1/Zs Cytokine	Cell Biology
Adamson	$578,183	Burnham Institute	Cripto: A Target for Breast Cancer Treatment	Cell Biology
Akporiaye	$454,500	University of Arizona	Tumor-Mediated Suppression of Dendritic Cell Vaccines	Immunology
Penn	$296,142	University of Toronto	Exploiting the Novel Repressed Transactivator Assay to Identify Protein Interactors and Peptide Inhibitors of the Myc Oncoprotein	Molecular Biology
Carraway	$427,225	University of California, Davis	Identification of a Functional Human Homolog of Drosophila Kek1, an Inhibitor of Breast Tumor Cell Growth	Cell Biology
Geahlen	$425,425	Purdue University	Characterization of Syk in Breast Carcinoma Cells	Cell Biology
Rosner	$454,181	St. Luke's-Roosevelt Hospital Center	Autocrine and Paracrine Control of Breast Cancer Growth by Sex Hormone-Binding Globulin	Cell Biology
Chaudhary	$312,434	University of Texas, Southwestern Medical Center	The Role of Ectodysplasin A (EDA) and Its Receptors in the Pathogenesis of Breast Cancer	Cell Biology

Table C-3. BCRP Research Funded by the BCRS (cont.)

Principal Investigator	Amount	Institution	Proposal Title	Research Area
Cai	$560,144	Vanderbilt University	Genetic Polymorphisms, Mitochondrial DNA Damage, and Breast Cancer Risk	Epidemiology/ Genetics
Dou	$491,999	University of South Florida	Synthetic Beta-Lactam Antibiotics as a Selective Breast Cancer Cell Apoptosis Inducer: Significance in Breast Cancer Prevention and Treatment	Therapy
Godwin	$504,000	Fox Chase Cancer Center	The Nuclear Death Domain Protein p84N5; A Candidate Breast Cancer Susceptibility Gene	Genetics
Perkins	$490,500	Yale University	Rapid Genomic Approach to Cancer Gene Discovery in Breast Cancer	Genetics
Kaaks	$367,639	International Agency for Cancer Research	Fatty Acid Synthesis Gene Variants and Breast Cancer Risk; A Study within the European Prospective Investigation into Cancer and Nutrition (EPIC)	Epidemiology/ Genetics
Ziv	$767,171	University of California, San Francisco	Admixture and Breast Cancer Risk among Latinas	Epidemiology/ Genetics
Chung	$490,447	Yale University	Quantitative in Situ Assessment of the Somatostatin Receptor in Breast Cancer to Assess Response to Targeted Therapy with 111-in-Pentetreotide	Diagnostics
Yaswen	$508,790	Lawrence Berkeley National Laboratory	Functional Analysis of BORIS, a Novel DNA-Binding Protein	Molecular Biology
Giorgio	$453,000	Vanderbilt University	Surface Functionalized Nanoparticles and Nanocrystals for Proximity-Modulated, Early Neoplasia Detection, Imaging, and Treatment of Breast Cancer	Diagnosis
Clarke	$588,738	Northern California Cancer Center	The Hygiene Hypothesis and Breast Cancer: A Novel Application of an Etiologic Theory for Allergies, Asthma, and Other Immune Disorders	Epidemiology/ Genetics
Bissell	$386,569	Lawrence Berkeley National Laboratory	Use of HA-Metal Nanoparticles to Identify and Characterize Tumorigenic Progenitor Cell Subsets in Breast Tumors	Cell Biology
Lemmon	$475,500	University of Pennsylvania	Harnessing Novel Secreted Inhibitors of EGF Receptor Signaling for Breast Cancer Treatment	Therapy
Chaudhuri	$436,500	University of Alabama at Birmingham	Novel Screening and Precise Localization of Early Stage Breast Cancer in an Animal Model	Diagnosis
Huang	$483,600	Cornell University, Weill Medical College	Migrastatin Analogues as Potent Inhibitors of Breast Cancer Metastasis	Therapy
Rao	$468,000	Stanford University	Ribozyme-Mediated Imaging of Oncogene Expression in Breast Tumor Cells	Molecular Biology/ Imaging
Liu	$448,500	Ohio State University	Hunting for Novel X-Linked Breast Cancer Suppressor Genes in Mouse and Human	Molecular Biology