

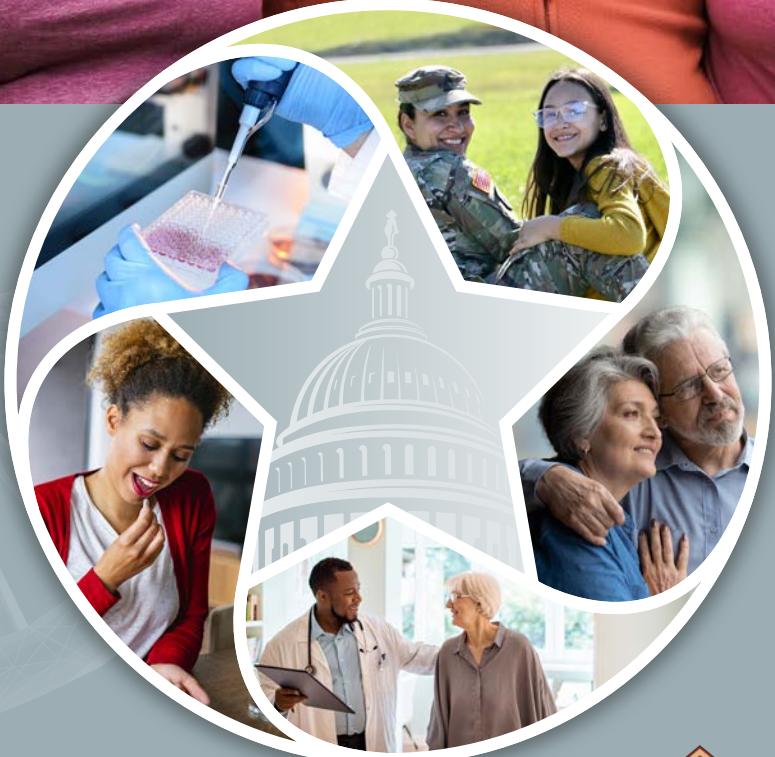
# Breast Cancer Research Stamp Program



Congressionally Directed Medical  
Research Programs

# CDMRP

Department of Defense



U.S. Army Medical Research  
and Development Command



# Congressionally Directed Medical Research Programs

## HISTORY

The Congressionally Directed Medical Research Programs (CDMRP) was created in 1992 from a powerful grassroots effort led by the breast cancer advocacy community that resulted in a congressional appropriation of funds for breast cancer research. This initiated a unique partnership among the public, Congress, and the military. Since then, CDMRP has grown to encompass multiple targeted programs and has managed over \$14.7 billion in Congressional Special Interest funds from its inception through fiscal year 2021 (FY21). Congress provides overarching intent for each individual CDMRP program, such as the Breast Cancer Research Program (BCRP), and specifies the funding amount as part of the annual Department of Defense (DOD) Appropriations Bill.

## APPLICATION REVIEW PROCESS

The CDMRP uses a two-tier review process for evaluating applications that involves dynamic interaction between scientists, consumers from advocacy communities, clinicians, members of the military and other specialists as applicable. The first tier of evaluation is a scientific peer review of the applications, measured against established criteria for determining scientific merit. The second tier is a programmatic review by the Programmatic

Panel, which compares applications to each other and makes recommendations for funding based on scientific merit, potential impact, adherence to the intent of the award mechanism, relevance to program goals, and portfolio composition.



# Breast Cancer Research Stamp Program

## About the Program

As a result of breast cancer advocacy efforts, the Stamp Out Breast Cancer Act (Public Law 105-41) led to the U.S. Postal Service's issuance of a new first-class stamp, the Breast Cancer Research Stamp, in 1998. The Breast Cancer Research Stamp became the first semipostal stamp in U.S. history.



The U.S. Postal Service provides the net revenues from sales of the BCRS, which currently costs 75 cents, to two designated funding agencies, the DOD and the National Institutes of Health (NIH), to support breast cancer research. By law, the U.S. Postal Service allocates 30% of the total amount raised to the DOD and 70% to the NIH. The Breast Cancer Research Stamp Reauthorization Act of 2019 reauthorized the stamp through 2027.

Total Breast Cancer Research  
Stamp proceeds received  
(FY99-FY20)

**\$26,933,362**

- Research \$25,650,624 (95%)
- CDMRP Management Costs \$1,282,738 (5%)

These proceeds  
have been used to  
fully or partially fund  
**71 Awards**



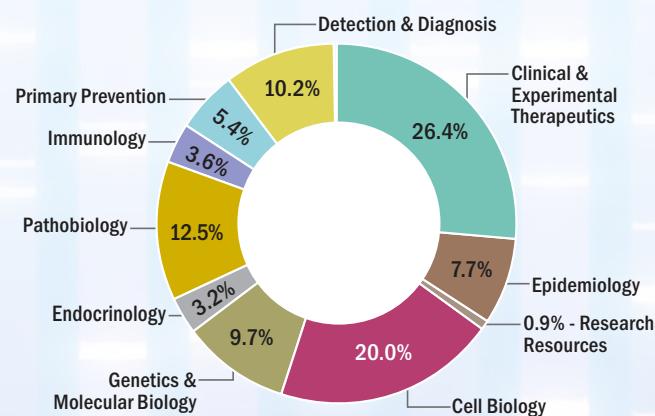
Breast Cancer  
Research  
Stamp Facts



Funded awards encompass a diversity of research areas:



- Detection and Diagnosis
- Clinical and Experimental Therapeutics
- Epidemiology
- Research Resources
- Genetics and Molecular Biology
- Cell Biology
- Endocrinology
- Pathobiology
- Immunology
- Primary Prevention



FY99-FY20 Breast Cancer Research Stamp Award Portfolio  
Composition by Percentage of Funding Invested

# Recent Research Advancements



The research team: Drs. Carl Maki, Ricardo Perez, and Lei Duan.

## *Targeting Prolyl Peptidases in Breast Cancer*

**Carl Maki, Ph.D., Rush University Medical Center**

### **FY15 Breakthrough Award - Funding Level 1**

Triple negative breast cancer (TNBC) is an aggressive type of cancer with limited treatment options and poor prognosis, resulting in an urgent need for new forms of treatment. One potential therapeutic target for TNBC is called prolyl endopeptidase (PREP), an enzyme that is highly expressed in multiple cancers, including breast cancer, and has previously been

shown to play an important role in cancer cell proliferation and survival. With Breast Cancer Research Stamp support, Dr. Carl Maki and his team investigated the effects of a PREP inhibitor, Y-29794, on TNBC cell lines and mouse models in the hope of identifying a novel therapeutic for this aggressive breast cancer subtype.

The research team first confirmed through in vitro studies that Y-29794 inhibits the endopeptidase activity of PREP in TNBC cells. In addition, the team demonstrated that Y-29794 inhibits the survival and proliferation of multiple TNBC cell lines. At low doses, Y-29794 slowed cell cycle progression, whereas high doses induced cell death. Dr. Maki and his team next investigated effects on the IRS1-AKT-mTORC1 survival and growth signaling pathway, which is often upregulated in TNBC. Y-29794 caused a decrease in Insulin Receptor Substrate 1 (IRS1) protein levels, a reduction in activated AKT protein, and a decrease in the mechanistic target of rapamycin complex 1 (mTORC1) protein activity. These findings suggest that IRS1-AKT-mTORC1 is one pathway through which Y-29794 likely inhibits TNBC cell survival and proliferation. Importantly, when studied in mouse models of TNBC, the research team demonstrated that treatment with Y-29794 caused a significant reduction in TNBC tumor growth. Taken together, the findings from Dr. Maki's in vitro and in vivo research support the possibility that Y-29794, or a compound with similar mode of action, may be an effective treatment option for TNBC.

Perez RE, Calhoun S, Shim D, et al. 2020. Prolyl endopeptidase inhibitor Y-29794 blocks the IRS1-AKT-mTORC1 pathway and inhibits survival and in vivo tumor growth of triple-negative breast cancer. *Cancer Biol Ther* 21(11):1033-1040.

## Recently Funded FY20 Awards

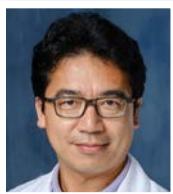


### *Amplification Events Altering Tumor Microenvironment That Drive Metastasis in HER2+ Breast Cancer*

**Eran Andrechek, Ph.D., Michigan State University**

### **Breakthrough Award - Funding Level 1**

In breast cancer, human epidermal growth factor receptor 2 (HER2) is a gene that is associated with having too many copies (amplification), which results in an excess expression of HER2 protein that fuels the cancer's growth. HER2+ breast cancers tend to be more aggressive and, despite the availability of targeted therapy, many HER2+ tumors relapse and metastasize. Dr. Andrechek's research team recently identified a secondary amplification event that is found in 25% of HER2+ patients and is linked to metastasis. With Breast Cancer Research Stamp support, the team will use breast cancer mouse models to characterize the genes in this newly discovered amplified region and determine their role in regulating metastasis. This research has the potential to identify biomarkers for metastatic progression in HER2+ breast cancer, revealing new treatment opportunities for metastatic breast cancer.



Dr. Zhang



Dr. Zheng

### *Developing a Novel PROTAC-Based NR4A1 Degrader for Breast Cancer Therapy*

**Weizhou Zhang, M.D., M.S., University of Florida**

### **Breakthrough Award - Funding Level 1 - Partnering Principal Investigator (PI) Option**

Most cancer drugs are designed to target one cell type, either by directly killing cancer cells or activating the immune system. Identifying an optimal target that will simultaneously kill cancer cells and activate the immune system may be more effective, and the NR4A1 gene may be one such target. NR4A1 is important for cancer cell survival and cancer cell invasion and also plays a critical role in inactivating the immune system, preventing cancer cells from being recognized and destroyed. With Breast Cancer Research Stamp support, Dr. Zhang will work with partnering Principal Investigator, Dr. Guangrong Zheng (University of Florida), to develop a drug using a proteolysis targeting chimera (PROTAC) technology that can inhibit and degrade NR4A1, resulting in the inhibition of cancer cell function and the retention of active immune surveillance. The proposed research could lead to a more effective treatment that targets cancer cells and activates the immune system, ultimately improving patient survival.

# High-Impact Research and Accomplishments Supported by the Breast Cancer Research Stamp

172 Publications   
26 Patents 

- Demonstrated a relationship between breast cancer incidence and outdoor concentrations of hazardous air pollutants, strongly suggesting that environmental exposure could contribute to an increased risk of breast cancer.
- Advanced understanding of the immune-modulated microenvironment of postpartum breast involution that promotes pregnancy-associated breast cancer, revealing new therapeutic strategies to target immunosuppression and enhance the anti-tumor immune response.
- Developed a high-resolution imaging technique, called second harmonic generation, to quantitatively analyze tumor structural changes and predict metastasis of estrogen receptor-positive breast cancer. Harmonigenic™ Corporation has retained the option for a provisional patent for this technology.
- Identified predictive biomarkers for response of triple-negative breast tumors to chemotherapy and radiation therapy, providing the opportunity for new targeted therapeutics to resensitize breast tumors to chemotherapy and radiation treatments and ultimately reduce metastatic burden in patients.

## Recent Publications Resulting from BCRS-Funded Research

Karaayvaz-Yildirim M, Silberman RE, Langenbucher A, et al. 2020. Aneuploidy and a deregulated DNA damage response suggest haploinsufficiency in breast tissues of BRCA2 mutation carriers. *Science Advances* 6(5):eaay2611.

Shivange G, Mondal T, Lyerly E, Gatesman J, Tushir-Singh J. 2020. Analyzing tumor and tissue distribution of target antigen specific therapeutic antibody. *J Vis Exp.* May 16;(159).

Zareei A, Jiang H, Chittiboyina S, et al. 2020. A lab-on-chip ultrasonic platform for real-time and nondestructive assessment of extracellular matrix stiffness. *Lab on a Chip* 20(4):778-788.

Beck AP, Li H, Ervin SM, et al. 2019. Inhibition of microbial beta-glucuronidase does not prevent breast carcinogenesis in the polyoma middle T mouse. *bioRxiv* 746602.

Chhetri A, Chittiboina S, Atrian F, et al. 2019. Cell culture and coculture for oncological research in appropriate microenvironments. *Current Protocols in Chemical Biology* 11(2):e65.

Ervin SM, Li H, Lim L, et al. 2019. Gut microbial beta-glucuronidases reactivate estrogens as components of the estrobolome that reactivate estrogens. *The Journal of Biological Chemistry* 294(49):18586-18599.

Parashar D, Geethadevi A, Aure MR, et al. 2019. miRNA551b-3p activates an oncostatin signaling module for the progression of triple-negative breast cancer. *Cell Reports* 29:4389-4406.

Yin H, Xiong G, Guo S, Xu C, Xu R, Guo P, Shu D. 2019. Delivery of Anti-miRNA for Triple Negative Breast Cancer Therapy Using RNA Nanoparticles Targeting to Stem Cell Marker CD133. *Molecular Therapy*. July; 27(7):1252-1261.

Brenot A, Knolhoff BL, DeNardo DG, and Longmore GD. 2018. SNAIL1 action in tumor cells influences macrophage polarization and metastasis in breast cancer through altered GMCSF secretion. *Oncogenesis* 7(3):32.

Chittiboina S, Bai Y, and Lelièvre SA. 2018. Microenvironment-cell nucleus relationship in the context of oxidative stress. *Frontiers in Cell and Developmental Biology* 6:23.

Lelièvre SA and Chittiboina S. 2018. Microphysiological systems to study microenvironment-cell nucleus interaction: Importance of tissue geometry and heterogeneity. *Microphysiological Systems* 2:12.

Meyer MA, Baer JM, Knolhoff BL, et al. 2018. Breast and pancreatic cancer interrupt IRF8-dependent dendritic cell development to overcome immune surveillance. *Nature Communications* 9(1):1250.

Pennock N, Martinson H, Guo Q, et al. 2018. Ibuprofen supports macrophage differentiation, T cell recruitment, and tumor suppression in a model of postpartum breast cancer. *Journal for the Immunotherapy of Cancer* 6(1):98.

Qi Y, Xu R. 2018. Roles of PLODs in collagen synthesis and cancer progression. *Frontiers in Cell and Developmental Biology*. June; 6:66.

Shang R, Archibald R, Gelb A, and Luke GP. 2018. Sparsity-based photoacoustic image reconstruction with a linear array transducer and direct measurement of the forward model. *Journal of Biomedical Optics* 24(3):1-9.

Shivange G, Urbanek K, Przanowski P, et al. 2018. A single-agent dual-specificity targeting of FOLR1 and DR5 as an effective strategy for ovarian cancer. *Cancer Cell* 34(2):331-345.

Yeung KT and Yang J. 2017. Epithelial-mesenchymal transition in tumor metastasis. *Molecular Oncology* 11(1):28-39.

Xu C, Haque F, Jasinski DL, Binzel DW, Shu D, Guo P. 2017. Favorable biodistribution, specific targeting and conditional endosomal escape of RNA nanoparticles in cancer therapy. *Cancer Letters*. Oct 5;414:57-70.

# Breast Cancer Research Stamp Program

## Funded Awards

FY	PI	Amount	Institution	Log Number	Proposal Title
FY99	Roger Daly	\$283,649	Garvan Institute	BC990035	Identification of Novel Prognostic Indicators for Breast Cancer through Analysis of the EMS1/Cortactin Signaling Pathway
	Thomas Deuel	\$5,000 <sup>1</sup>	Scripps Institute	BC990698	Novel Angiogenic Domains: Use in Identifying Unique Transforming and Tumor-Promoting Pathways in Human Breast Cancer
	Wolf Heyer	\$111,444	University of California, Davis	BC990034	In Vitro Recombination Activities of the Breast Cancer Predisposition Protein BRCA2
	Elizabeth Musgrave	\$222,652	Garvan Institute	BC990037	Role of Cyclin D1 and p27 in Steroidal Control of Cell Cycle Progression in the Mammary Gland in Vivo
	Sudhir Shah	\$279,000	University of Arkansas	BC990024	Role of a Novel Matrix-Degrading Metalloproteinase in Breast Cancer Invasion
	Lihong Wang	\$317,510	Texas A&M University	BC990044	Scanning Microwave-Induced Acoustic Tomography
	Michael White	\$334,094	University of Texas Southwest Medical Center	BC990022	Isolation of Factors that Disrupt Critical Protein/Protein Interactions Within the Telomerase Holoenzyme for Use in Breast Cancer Therapeutics
	Daniel Wreschner	\$225,000	Tel Aviv University	BC990013	Analysis of the Secreted Novel Breast Cancer-Associated MUC1/Zs Cytokine
FY00	Eileen Adamson	\$578,183	Burnham Institute	BC000975	Cripto: A Target for Breast Cancer Treatment
	Emmanuel Akporiaye	\$454,500	University of Arizona	BC000662	Tumor-Mediated Suppression of Dendritic Cell Vaccines
	Linda Penn	\$296,142	University of Toronto	BC000651	Exploiting the Novel Repressed Transactivator Assay to Identify Protein Interactors and Peptide Inhibitors of the Myc Oncoprotein
FY01	Qiuyin Cai	\$560,144	Vanderbilt University	BC010713	Genetic Polymorphisms, Mitochondrial DNA Damage, and Breast Cancer Risk
	Kermit Carraway	\$427,225	University of California, Davis	BC010296	Identification of a Functional Human Homolog of Drosophila Kek1, an Inhibitor of Breast Tumor Cell Growth
	Preet Chaudhary	\$312,000	University of Texas Southwest Medical Center	BC010310	The Role of Ectodysplasin A (EDA) and Its Receptors in the Pathogenesis of Breast Cancer
	Robert Geahlen	\$425,425	Purdue University	BC010725	Characterization of Syk in Breast Carcinoma Cells
	William Rosner	\$454,181	St. Luke's-Roosevelt Hospital Center	BC010710	Autocrine and Paracrine Control of Breast Cancer Growth by Sex Hormone-Binding Globulin
FY02	Q. Ping Dou	\$491,999	Wayne State University	BC020507	Synthetic Beta-Lactam Antibiotics as a Selective Breast Cancer Cell Apoptosis Inducer: Significance in Breast Cancer Prevention and Treatment
	Andrew Godwin	\$504,000	Fox Chase Cancer Center	BC020911	The Nuclear Death Domain Protein p84N5, a Candidate Breast Cancer Susceptibility Gene
	Archibald Perkins	\$490,500	Yale University	BC021042	Rapid Genomic Approach to Cancer Gene Discovery in Breast Cancer
FY03	Gina Chung	\$490,447	Yale University	BC031926	Quantitative In Situ Assessment of the Somatostatin Receptor in Breast Cancer to Assess Response to Targeted Therapy with 111-in-Pentetreotide
	Rudolf Kaaks	\$367,639	German Cancer Research Center (DKFZ)	BC030208	Fatty Acid Synthesis Gene Variants and Breast Cancer Risk: A Study Within the European Prospective Investigation into Cancer and Nutrition (EPIC)
	Paul Yaswen	\$508,790	Lawrence Berkeley National Laboratory	BC030545	Functional Analysis of BORIS, a Novel DNA-Binding Protein
	Elad Ziv	\$767,171	University of California, San Francisco	BC030551	Admixture and Breast Cancer Risk Among Latinas
FY04	Mina Bissell	\$386,569	Lawrence Berkeley National Laboratory	BC044087	Use of HA-Metal Nanoparticles to Identify and Characterize Tumorigenic Progenitor Cell Subsets in Breast Tumors
	Christina Clarke	\$588,738	Northern California Cancer Center	BC044177	The Hygiene Hypothesis and Breast Cancer: A Novel Application of an Etiologic Theory for Allergies, Asthma, and Other Immune Disorders
	Todd Giorgio	\$453,000	Vanderbilt University	BC043908	Surface Functionalized Nanoparticles and Nanocrystals for Proximity-Modulated Early Neoplasia Detection, Imaging, and Treatment of Breast Cancer
	Mark Lemmon	\$475,500	University of Pennsylvania	BC044225	Harnessing Novel Secreted Inhibitors of EGF Receptor Signaling for Breast Cancer Treatment

Continued on next two pages.

# Breast Cancer Research Stamp Program Funded Awards

FY	PI	Amount	Institution	Log Number	Proposal Title
FY05	Kurt Zinn <sup>2</sup>	\$436,500	University of Alabama at Birmingham	BC050034	Novel Screening and Precise Localization of Early-Stage Breast Cancer in Animal Model
	Xin-Yun Huang	\$483,600	Cornell University, Weill Medical College	BC050558	Migrastatin Analogues as Potent Inhibitors of Breast Cancer Metastasis
	Yang Liu	\$448,500	Ohio State University	BC051613	Hunting for Novel X-Linked Breast Cancer Suppressor Genes in Mouse and Human
	Jianghong Rao	\$468,000	Stanford University	BC050909	Ribozyme-Mediated Imaging of Oncogene Expression in Breast Tumor Cells
FY06	Gayathri Devi	\$155,085 <sup>3</sup>	Duke University Medical Center	BC060434	Modulation of Regulatory T Cells as a Novel Adjuvant for Breast Cancer Immunotherapy
	Amy Lee	\$489,000	University of Southern California	BC060145	A New Mechanism for Estrogen-Starvation Resistance in Breast Cancer
	Yi Li	\$438,455	Baylor College of Medicine	BC060332	The ER/PR Status of the Originating Cell of ER-Negative Breast Cancer
	Shaker Mousa	\$377,620	Albany College of Pharmacy	BC061072	Enhancing the Efficacy of Chemotherapeutic Breast Cancer Treatment with Non-Anticoagulant Heparins
	Fraydoon Rastinejad	\$454,500	University of Virginia	BC060108	Structural Characterization of the Interdomain Features of the Estrogen Receptor
FY07	Charlotte Kuperwasser	\$817,500	Tufts University	BC063332	Mechanisms of Breast Cancer Associated with Obesity
	Kimberly Kelly	\$244,450 <sup>4</sup>	University of Virginia	BC063128	Genetically Encoded Targeted, Amplifiable, Imaging Agents for Early Detection of Breast Cancer
	Susan Gerbi	\$155,550 <sup>5</sup>	Brown University	BC063945	Hormonal Involvement in Breast Cancer Gene Amplification
FY08	Chung Park	\$111,663	North Dakota State University	BC084025	In Utero Exposure to Dietary Methyl Nutrients and Breast Cancer Risk in Offspring
	Maciej Radosz	\$528,939	University of Wyoming	BC083821	Breast Cancer-Targeting Nuclear Drug Delivery Overcoming Drug Resistance for Breast Cancer Therapy
	Ann Hill	\$577,500	Oregon Health and Science University	BC084377	Vaccine Vector for Sustained High-Level Antitumor CTL Response
	Youngjae You	\$503,666	University of Oklahoma Health Science Center	BC084623	Targeted Delivery and Remote-Controlled Release of Chemotherapeutic Agents
	Tiffany Seagroves	\$166,667 <sup>6</sup>	University of Tennessee Health Science Center	BC083846	The Role of HIF-1 Alpha in Breast Cancer: A Positive Factor in Cancer Stem Cell Expansion via Notch?
FY09	Peggy Reynolds	\$730,000 <sup>7</sup>	Cancer Prevention Institute of California	BC095145	Hazardous Air Pollutants and Breast Cancer: An Unexplored Area of Risk
	John Wysolmerski	\$620,626	Yale University	BC095546	Effects of Nuclear Parathyroid Hormone-Related Protein Signaling in Breast Cancer
FY10	Pepper Schedin	\$368,125 <sup>8</sup>	University of Colorado, Denver	BC101904	The Immune Modulatory Program of Postpartum Involution Promotes Pregnancy-Associated Breast Cancer
	Anthony Leung	\$556,875 <sup>9</sup>	Johns Hopkins University	BC101881	The Role of Poly(ADP-Ribose) in microRNA Activity in Breast Cancers
FY11	Andy Minn	\$399,942	University of Pennsylvania	BC111503	Regulation of Metastasis and DNA Damage Resistance Pathways by Transposable Elements
	Xiaosong Wang	\$409,693	Baylor College of Medicine	BC111902	Copy Number Signature of Recurrent Gene Fusions Reveals Potential Drug Targets in Invasive Breast Cancer
	Susana Gonzalo Hervas	\$58,975 <sup>10</sup>	St. Louis University	BC110089	Stabilization of 53BP1 in Triple-Negative and BRCA-Deficient Breast Tumors: A Novel Therapeutic Strategy
FY12	Jing Yang	\$465,000	University of California, San Diego	BC121670	Regulation of Breast Cancer Stem Cell by Tissue Rigidity
	Filippo Giancotti	\$174,837 <sup>11</sup>	Memorial Sloan-Kettering Cancer Center	BC121829	Autophagy and TGF-Beta Antagonist Signaling in Breast Cancer Dormancy at Premetastatic Sites
FY13	Seth Rubin	\$457,075	University of California, Santa Cruz	BC131294	Inhibition of Retinoblastoma Protein Inhibition
	Geoffrey Luke	\$96,992 <sup>12</sup>	Dartmouth College	BC133216	Noninvasive Label-Free Detection of Micrometastases in the Lymphatics with Ultrasound-Guided Photoacoustic Imaging

# Breast Cancer Research Stamp Program Funded Awards

FY	PI	Amount	Institution	Log Number	Proposal Title
FY14	Dan Shu	\$364,343	Ohio State University	BC140428	Ultrastable Nontoxic RNA Nanoparticles for Targeting Triple-Negative Breast Cancer Stem Cells
	Leif Ellisen	\$93,050 <sup>13</sup>	Massachusetts General Hospital	BC140903	Defining High-Risk Precursor Signaling to Advance Breast Cancer Risk Assessment and Prevention
	Edward Brown	\$7,457 <sup>14</sup>	University of Rochester	BC140798	Prediction of Metastasis Using Second Harmonic Generation
	David DeNardo	\$7,061 <sup>15</sup>	Washington University	BC141770	Reprogramming the Metastatic Microenvironment to Combat Disease Recurrence
FY15	Ricardo Bonfil	\$254,765 <sup>16</sup>	Wayne State University	BC150621	Discoidin Domain Receptors: Novel Targets in Breast Cancer Bone Metastasis
	Carl Maki	\$254,765 <sup>17</sup>	Rush University Medical Center	BC150340	Targeting Prolyl Peptidases in Triple-Negative Breast Cancer
FY16	Sridhar Mani	\$174,992 <sup>18</sup>	Albert Einstein College of Medicine	BC161093	Inhibition of Microbial Beta-Glucuronidase as a Strategy Toward Breast Cancer Chemoprevention
	Sophie Lelievre	\$353,879 <sup>19</sup>	Purdue University	BC161889	Risk-on-a-Chip for Tailored Primary Prevention of Breast Cancers
FY17	Jogender Tushir-Singh	\$282,378 <sup>20</sup>	University of Virginia	BC170197	A Highly Superior and Selective Cancer Immunotherapy-Based Approach for Triple-Negative Breast Cancers
	Pradeep Chaluvally-Raghavan	\$282,378 <sup>21</sup>	Medical College of Wisconsin	BC170885	Targeting miR551b to Prevent Tumor Formation and Metastasis of Triple-Negative Breast Cancer
FY18	David Potter	\$263,717 <sup>22</sup>	University of Minnesota, Twin Cities	BC180596	Potentiation of Immune Checkpoint Blockade by Inhibition of Epoxyeicosatrienoic Acid-Driven Tumor Respiration
	Abhishek Sharma	\$263,716 <sup>23</sup>	Stevens Institute of Technology	BC180833	A Novel Class of Antagonists for Robust Inhibition of Mutant Estrogen Receptor Action in Endocrine-Resistant Metastatic Breast Cancer
FY19	Jeffrey Frost	\$295,109 <sup>24</sup>	University of Texas Health Science Center at Houston	BC190383	Targeting the Tumor Microenvironment and Metastatic Niche in Breast Cancer
	Hannah Rabinowich	\$295,110 <sup>25</sup>	University of Pittsburgh	BC190622	A New Persistence Mechanism for Drug-Tolerant Breast Cancer Cells
FY20	Weizhou Zhang	\$104,128 <sup>26</sup>	University of Florida	BC200100	Developing a Novel PROTAC-Based NR4A1 Degrader for Breast Cancer Therapy
	Eran Andrechek	\$350,000 <sup>27</sup>	Michigan State University	BC200335	Amplification Events Altering Tumor Microenvironment That Drive Metastasis in HER2+ Breast Cancer

<sup>1</sup> Total award amount was \$404,176; remaining funds were from the FY99 BCRP.

<sup>2</sup> The original Principal Investigator, Dr. Tandra Chaudhuri, is deceased.

<sup>3</sup> Total award amount was \$461,933; remaining funds were from the FY06 BCRP.

<sup>4</sup> Total award amount was \$687,397 remaining funds were from the FY06 BCRP.

<sup>5</sup> Total award amount was \$787,325; remaining funds were from the FY06 and FY07 BCRP.

<sup>6</sup> Total award amount was \$554,987; remaining funds were from the FY08 BCRP.

<sup>7</sup> Total award amount was \$860,883; remaining funds were from the FY09 BCRP.

<sup>8</sup> Total award amount was \$556,028; remaining funds were from the FY10 BCRP.

<sup>9</sup> Total award amount was \$585,652; remaining funds were from the FY10 BCRP.

<sup>10</sup> Total award amount was \$744,661; remaining funds were from the FY11 BCRP.

<sup>11</sup> Total award amount was \$331,449; remaining funds were from the FY12 BCRP.

<sup>12</sup> Total award amount was \$497,288; remaining funds were from the FY13 BCRP.

<sup>13</sup> Total award amount was \$605,208; remaining funds were from the FY14 BCRP.

<sup>14</sup> Total award amount was \$215,628; remaining funds were from the FY14 BCRP.

<sup>15</sup> Total award amount was \$527,797; remaining funds were from the FY14 BCRP.

<sup>16</sup> Total award amount was \$522,715; remaining funds were from the FY15 BCRP.

<sup>17</sup> Total award amount was \$581,250; remaining funds were from the FY15 BCRP.

<sup>18</sup> Total award amount was \$626,252; remaining funds were from the FY16 BCRP.

<sup>19</sup> Total award amount was \$564,673; remaining funds were from the FY16 BCRP.

<sup>20</sup> Total award amount was \$573,784; remaining funds were from the FY17 BCRP.

<sup>21</sup> Total award amount was \$563,272; remaining funds were from the FY17 BCRP.

<sup>22</sup> Total award amount was \$567,344; remaining funds were from the FY18 BCRP.

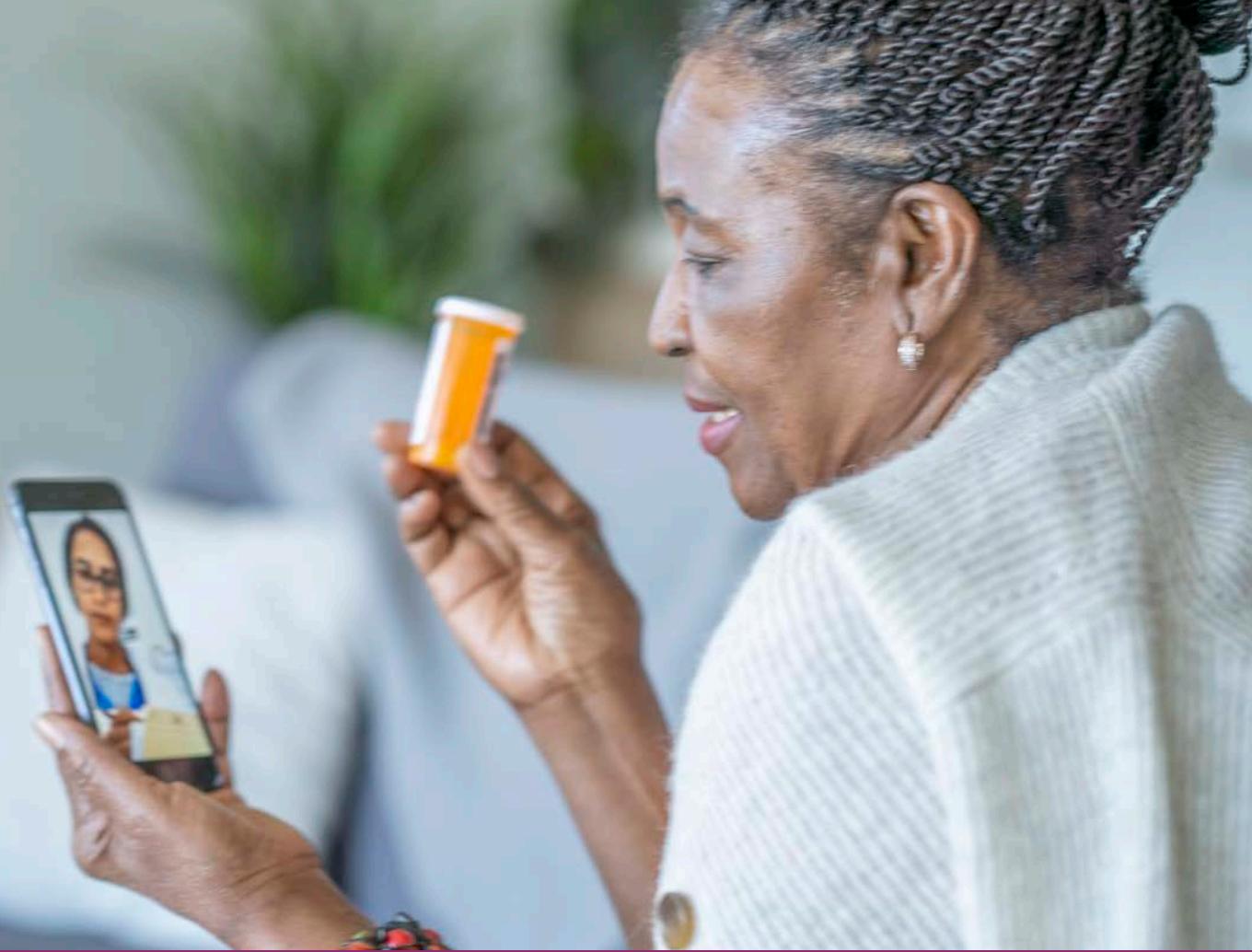
<sup>23</sup> Total award amount was \$471,719; remaining funds were from the FY18 BCRP.

<sup>24</sup> Total award amount was \$693,001; remaining funds were from the FY19 BCRP.

<sup>25</sup> Total award amount was \$704,250; remaining funds were from the FY19 BCRP.

<sup>26</sup> Total award amount was \$551,489; remaining funds were from the FY20 BCRP.

<sup>27</sup> Total award amount was \$635,304; remaining funds were from the FY20 BCRP.



*For more information, visit:*

**<https://cdmrp.army.mil>**

*or contact us at:*

**[usarmy.detrick.medcom-cdmrp.mbx.cdmrp-public-affairs@mail.mil](mailto:usarmy.detrick.medcom-cdmrp.mbx.cdmrp-public-affairs@mail.mil)**

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