DANA-FARBER MARATHON CHALLENGE

TO BENEFIT THE CLAUDIA ADAMS BARR PROGRAM IN INNOVATIVE BASIC CANCER RESEARCH

BARR PROGRAM IMPACT STATEMENTS

Here are brief descriptions of 16 selected projects supported by the Barr Program. These research investigations illustrate some of the most significant impacts to date of the Barr Program.

Computational Analysis of Gene Expression: Shirley Liu, PhD, created complex statistical tools that are having enormous impact on the work of scientists around the world. These tools, which she makes available to other scientists, enable descriptions of the precise manner in which gene expression is regulated in several cancers, especially breast and prostate, and could eventually help lead to exciting new methods for normalizing abnormal cell growth. *Key impact areas: breast and prostate cancers; personalized medicine*

Controlling Cancer Growth: William Sellers, MD, and his colleagues identified genetic abnormalities in proteins that control cell growth in cancers. These major discoveries led directly to the development of targeted drugs used by patients worldwide for the treatment of multiple cancers, including lung cancer, leukemia, and melanoma. This work has become the model for personalized medicine in cancer treatment and is widely credited for helping transform the approach that pharmaceutical companies use for drug development. *Key impact areas: colon, leukemia, lung, melanoma, and prostate cancers; new drug development; personalized medicine*

Controlling Growth of Breast Cancer: Peter Sicinski, MD, PhD, discovered that the proteins that control cell division, called Cell Cycle Control proteins, behave abnormally in breast cancer. This discovery could lead to groundbreaking treatments in breast cancer and is being heavily invested in by drug companies and other research organizations. *Key impact areas: breast cancer; new drug development*

Enabling Immune Systems to Fight Cancers: Shannon Turley, PhD, is determining the fundamental reasons why human immune systems do not reject cancers and has discovered a new class of cells that can suppress immune responses against cancer. Dr. Turley's discoveries are focusing on some of the toughest cancers to treat, such as pancreatic, and will lead to new therapies that can help the immune system to reject these cancers. *Key impact areas: pancreatic and prostate cancers; vaccines*

Linkages Between Cancer and Obesity: Bruce Spiegelman, PhD, is one of the world leaders in understanding the molecular basis for obesity. His research is explaining why obesity is such a major risk factor for human cancers. Determining the link between obesity and these cancers could be important to inhibiting cancer development in both obese and non-obese people. *Key impact area: new drug development*

Mapping Genes to Control Breast Cancer: Myles Brown, MD, discovered the way estrogen works in normal tissues and breast cancers, resulting in the first genome-wide map of all genes that estrogen controls. His research is leading to new drugs specifically targeting this pathway in breast cancer. *Key impact areas: breast cancer; personalized medicine*

Molecular Classification of Cancers: Todd Golub, MD, discovered unique molecular characteristics of cancers, completely changing the way oncologists treat their patients by enabling them to target treatments toward those who are most likely to benefit. This breakthrough led, for example, to a commonly-used test that tells physicians which of the 30–40 percent of early-stage breast cancer patients should receive chemotherapy, sparing the rest from unnecessary treatment. *Key impact areas: breast cancer and lymphoma; personalized medicine*

Molecular Control of Cancer Pain: Qiufu Ma, PhD. created a new biological understanding of pain syndromes in cancer patients. This discovery could lead to new drugs that would improve both quality of

life and treatment outcomes by enabling the continuation of specific therapies that might otherwise have been stopped due to painful side effects. *Key impact area: new drug development*

New Treatment for Neuroblastoma in Children: Rani George, MD, PhD, discovered a new mutation in neuroblastoma, the most common solid tumor in children. It is a cancer with poor prognosis that is very difficult to treat. Dr. George is now testing drugs that have already proven successful in treating other cancers that have this same mutation, with the exciting potential to translate these therapies into treatments for children with neuroblastoma. *Key impact areas: neuroblastoma; new drug use; pediatric; personalized medicine*

New Understanding of Lung Cancer: Matthew Meyerson, MD, PhD, and his colleagues discovered specific mutations that led to the successful use of new drugs and increased survival for 10−20 percent of lung cancer patients worldwide. Previously, these patients' cancers were largely untreatable. *Key impact areas: lung cancer; new drug development; personalized medicine*

New Uses for Existing Cancer Drugs: Kim Stegmaier, MD, developed a novel approach to discovering how drugs currently used for one cancer might be highly effective for other cancers in completely unanticipated ways. This research led to the discovery that the drug Gefitnib, initially only used for treating lung cancer, might be effective for acute leukemias. The discovery also led directly to a promising new clinical trial at DFCI. *Key impact areas: leukemia and sarcoma; new drug use*

Overcoming Drug-Resistant Cancers: Michael Eck, MD, PhD, and Nathanael Gray, PhD, used Barr funding to invent new compounds that block the growth of some drug-resistant tumors. These compounds are now under development by major drug companies, and may be the next "super drugs" to treat several of the most resistant cancers, including lung and colon. *Key impact areas: colon and lung cancer, sarcoma; new drug development*

Telomerase in Cancer Cells: William Hahn, MD, PhD, is conducting exciting new work focused on understanding the role that telomerase, an enzyme required for normal chromosome function, has in promoting the survival of cancer cells. This work provides entirely new ways of attacking nearly all types of cancers. *Key impact areas: new drug development*

Triggering Death of Cancer Cells: Loren Walensky, MD, PhD, developed a novel method for creating compounds that block the effects of formerly "untargetable" proteins in cancers, triggering the death of these cancer cells. This method has already led to the development of potential new drugs for lymphoma and several other cancers. Additional clinical trials are planned that could result in other new treatments. *Key impact areas: lymphoma new drug development*

Uncovering Cancer Causing Molecules: Jean J. Zhao, PhD, and her colleagues developed a breakthrough technology that can tell when genetic abnormalities will likely lead to human cancers. This technology is currently being used in clinical trials for multiple cancers, including breast and colon, and could result in new and exciting ways to limit cell growth in cancers with these abnormalities. *Key impact areas: breast, colon, and prostate cancers; new drug development, personalized medicine*

Use of Vaccines to Control Cancer: Glenn Dranoff, MD, discovered regulatory pathways in the immune system that have enabled the development of new vaccines for multiple types of cancer. His work is a crucial part of the bright future for immune therapies to fight cancer including vaccines and immune stimulators for many cancers including melanomas. *Key impact areas: melanoma, ovarian, and prostate cancer; vaccines*