

MISSION STATEMENT

The National Foundation for Cancer Research (NFCR) was founded in 1973 to support cancer research and public education relating to prevention, early diagnosis, better treatments and, ultimately, a cure for cancer. NFCR promotes and facilitates collaboration among scientists to accelerate the pace of discovery from bench to bedside. NFCR is committed to Research for a Cure — cures for *all* types of cancer.

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RESEARCH CURES CANCER

Dear Friends and Donors,

The National Foundation for Cancer Research funds efforts to cure cancer. We support research which has led to breakthroughs that are revolutionizing ways doctors diagnose and treat the disease. This isn't just concept or theory. NFCR researchers have identified molecules, pathways and conditions involved in cancer initiation, development and arrestment. Patients and their families are seeing the positive results.

The development of new treatments is a long and complex process. But NFCR scientists are unyieldingly revealing cancer's mysteries and translating these findings into therapies which hold real hope for cures. Progress is being made only through support of novel ideas, validated in the lab and demonstrated in patients' lives.

But these discoveries don't just happen. Rather, it is through grassroots giving from Americans confident and trusting in NFCR's singular focus of 45 years - an absolute and immutable commitment to revolutionary cancer research - that impact is being made. Through sustained funding and by engagement with partners sharing our commitment to new and better means of cancer prevention, diagnosis and treatment, NFCR-backed science will continue to undergird and advance cancer medicine.

This is what NFCR means by *Research* for a Cure.

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Thank you and sincerely,

Franklin C. Salisbury, Jr. Chief Executive Officer



Angiogenesis is the formation of new blood vessels. A normal and vital process in human growth and development, it also plays a role in several diseases, especially cancer. A blood supply is necessary for tumors to grow in size and transition from a benign state to a malignant one. Angiogenesis is a cause for concern with cancer because this progression feeds and sustains tumors. Scientists are aiming to better understand the process so as to be able to, in effect, design, implement and enforce blockades of tumors. At the forefront of this cancer-fighting approach is **Rakesh Jain, Ph.D.**, of Massachusetts General Hospital, whose NFCR-funded research is yielding benefits of anti-angiogenic therapies for patients.

But to Be Normal

A mile-high observation of cancer treatment options reveals basic characteristics allowing for rough categorization: Tumors can be cut, poisoned, burned or, more recently, targeted cellularly. But if NFCR Fellow Rakesh Jain, Ph.D., continues to succeed in his research, another option to fight tumors will become more widespread: Starving them out.

"Tumors need blood vessels to grow and to spread to other organs," says Dr. Jain. "If we could 'normalize' tumor vessels, we should slow down the growth of tumors and make various therapies more effective. Indeed, we have developed multiple strategies to normalize the tumor microenvironment and have successfully tested them in animal models and cancer patients."

Dr. Jain, an NFCR-funded scientist since 1998, is speaking of angiogenesis, a natural bodily process whereby new blood vessels are created. Cancer co-opts that process, creating a tangle of abnormal veins, arteries and intermediaries, all of which channel or abet tumor growth, invasion, metastasis, immunosuppression and resistance to many treatments. A primary aim of his is to develop a therapy that targets cancer-influenced angiogenesis only, while leaving normal vessel formation to continue unabated.

Currently a professor and laboratory director at Massachusetts General Hospital, and one of only 21 individuals to be admitted to each of the National Academies of Sciences, Medicine and Engineering, Dr. Jain did not start his career with cancer in mind. He is, by training, a chemical engineer.



NFCR CEO Franklin Salisbury, Jr. and Dr. Jain in the latter's lab.

While studying for his M.S. and Ph.D., Dr. Jain saw that engineering principles could be applied to understand why drugs do not penetrate a tumor uniformly. Moreover, he was among the first scientists to theorize a tumor not as a conglomerate of cancer cells, but as a distinct organ determined to survive. A paradigm shift in the understanding of cancer resulted from this viewpoint, one which he played an essential role in generating.

Normalization of blood vessels already shows promise. In 2014, Dr. Jain's work led to the approval of the first medical treatment for patients suffering hearing degradation due to a rare and otherwise benign tumor type known as a schwannoma, which develops on a cranial nerve.

Dr. Jain now sets his sights on glioblastoma multiforme (GBM), the deadliest form of brain cancer and one for which, to date, there is no cure. Ironically, many of the most stubborn characteristics of the disease also make it one for which anti-angiogenic therapies are particularly suited. Because GBM invades healthy tissues near the tumor, he is currently testing inhibitors that could prevent such, identifying the genes and pathways facilitating vessel co-option in order to prevent invasion.

"Research is to see what everybody has seen, and think what nobody has thought."

NFCR Co-founder & Nobel Laureate
 Albert Szent-Györgyi, Ph.D.

"We employ this knowledge to develop novel strategies to improve cancer treatment," Dr. Jain says. "We then take the lessons from clinical trials to the laboratory to refine our strategies, and this 'bench-to-bedside and back' approach is a hallmark of our research."

The words are a fitting summation of a model of cancer research progress which NFCR has long engendered and believed in.

NFCR RESEARCH HIGHLIGHTS



For more than 45 years, NFCR has provided outstanding researchers with the vital seed funding they need to pursue the next advancement in cancer research. NFCR is committed to fostering scientific creativity, investing in basic research and helping scientists translate these promising cancer discoveries into cures.

From life-saving breakthroughs in immunotherapy to advances in metastasis research, cancer genetics, precision medicine, anti-angiogeneic therapies and more, NFCR-funded scientists have led the way into a new era of cancer prevention, detection and treatment.

This is what NFCR means by *Research* for a Cure.

IMMUNOTHERAPY



Wayne Marasco, M.D., Ph.D.

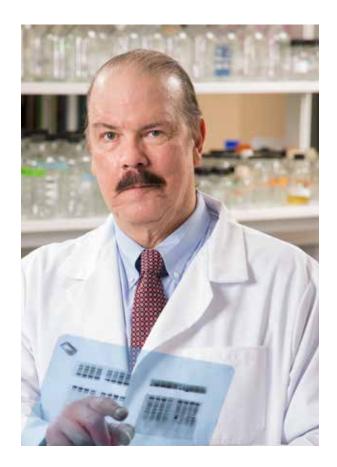
NFCR Center for Therapeutic Antibody Engineering Dana-Farber Cancer Institute, Boston, MA Research Focus: Monoclonal Antibody Engineering

Dr. Wayne Marasco is a world-renowned antibody engineering expert whose work is focused on infectious diseases and cancer immunotherapies. His laboratory developed one of the largest human antibody phage display libraries ever made. Focused on metastatic kidney cancer, which is uniformly fatal for patients, his team is developing an innovative and promising CAR-T cell therapy. A patient's own immune T cells are collected, then engineered to express two types of antibodies — overcoming barriers to standard CAR-T cells for solid tumors — and finally reintroduced to the patient. One antibody for CAIX growth-promoting proteins on the kidney cancer cell surface directs CAR-T cells to home in to the tumor. The second antibody is for PD-L1 proteins which are also on the cancer cell. Antibodies binding PD-L1 proteins allow the CAR-T cells to mount a full-blown rigorous T cell attack on the cancer. Dr. Marasco has now developed new complex models that best mimic the human immune system to test and understand the actions of his cancer therapies. Moreover, his CAR-T cell therapy could be adapted for other difficult-to-treat solid tumors that have not responded positively to other immunotherapies.

Paul Fisher, M.Ph., Ph.D.

Virginia Commonwealth University School of Medicine, Richmond, VA; Research Focus: Cancer Terminator Viruses

Dr. Paul Fisher is developing several new immunotherapy approaches to treat cancer. His lab has engineered a genetically modified virus that infects only cancer cells via specific genes discovered by Dr. Fisher, labeling it the Cancer Terminator Virus (CTV). The CTVs are engineered to also produce immune-modulating proteins (cytokines), including one he discovered called MDA-7/IL-24 that destroys primary and metastatic tumor cells in prostate and other cancers through selectively inducing apoptosis (cell suicide). MDA-7/ IL-24 may even prevent development of bone metastasis. By adding additional "imaging genes" to the backbone of CTVs, Dr. Fisher is developing Tripartite Cancer Theranostic (TCT) viruses. Upon scanning a tumor site with advanced imaging approaches, such as bioluminescence imaging (BLI) and single-Photon Emission Computed Tomography (SPECT), TCTs could allow for the noninvasive monitoring of the therapeutic response to MDA-7/IL-24 or other payloads incorporated into the virus. He and his team's research is translating MDA-7/IL-24, alone and in combination with other therapies, from "bench-to-bedside," to treat patients with advanced prostate, brain, pancreatic, ovarian, breast, liver, skin, colon and other cancers.



GENOMICS

Daniel Haber, M.D., Ph.D.

Massachusetts General Hospital Cancer Center, Boston, MA Research Focus: Circulating Tumor Cells

Dr. Daniel Haber's laboratory focuses on understanding the genetic abnormalities of cancer — from inherited mutations and predispositions to mutations that are acquired by tumors themselves — and its research aims to guide targeted drug therapies and early, precise and accurate cancer detection. Circulating tumor cells (CTCs) are tumor cells that have become detached from the primary tumor or metastatic sites and enter blood circulation. Dr. Haber's team previously developed the most advanced CTC collection device, the CTC-iChip, allowing viable CTCs to be collected for profiling and culturing. His research reported that cultured CTCs from women with advanced breast cancer can switch on and off the expression of a key tumor promoting gene, HER2, which makes them resistant to many drugs. His team has also established an enhanced sensitivity measurement of CTCs from the blood to detect hepatocellular cancer (HCC). A new detection method being pursued by Dr. Haber may greatly increase the ability to diagnose early-stage cancers, increasing the likelihood of successful treatment. He and his lab are now developing strategies for high-sensitivity detection of various cancers in blood samples from high risk individuals.



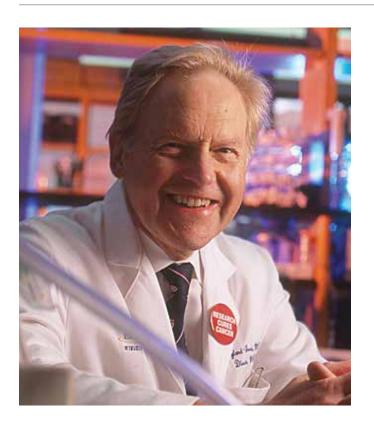
CANCER Wei Zhang, Ph. D. Bancer Senamics Sone

Wei Zhang, Ph.D.

Wake Forest Baptist Medical Center, Winston-Salem, NC Research Focus: Cancer Genomics and Personalized Medicine

Dr. Wei Zhang has devoted his entire career to the pursuit of precision oncology — specifically, the key molecular and genomic events that drive the development and progression of cancer. His recent focus is on the detection, diagnosis and underlying mechanisms of tumor aggression and drug resistance through molecular profiling of cancer. His team has found that tumor cells which enter or shed DNA into circulation create a pathway allowing for the identification of cancer aggression. These liquid biopsy studies can also be a robust predictor of survival, as the Zhang team found patients with higher mutation rates had significantly higher mortality rates. In a study of racial differences in genetic alterations in smoking-related cancers, next-generation sequencing of tumor biopsy revealed that African Americans had a significantly increased mutation rate in the TP53 gene (a tumor suppressor) and genes that repair DNA damage. These results provide strong evidence that genomic instability is a fundamental hallmark of cancer and that events underlying regulation of genome stability are centered on interactions with environmental factors andlifestyle, such as smoking. Overall, molecular profiling of cancer provides a powerful tool to support improved diagnosis, treatment and preventive measurers; thus, improving outcome for cancer patients.

GENOMICS



Brian Leyland-Jones, M.B., B.S., Ph.D.

Avera Cancer Institute, Center for Precision Oncology, Sioux Falls, SD; Research Focus: Translating Genetic and Other Biomarkers into Optimal Patient Care

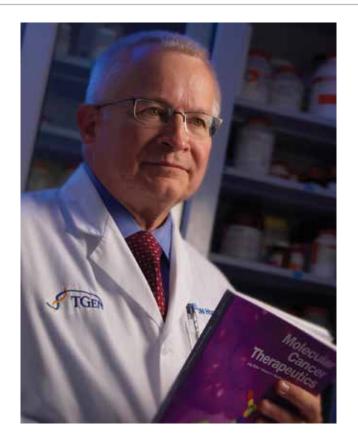
Dr. Brian Leyland-Jones, a leading breast cancer researcher, is focusing on how genomics play a vital role in the fight against all cancers. Throughout his career, he helped develop drugs that are now mainstays of oncologic breast cancer treatment, such as the anthracycline, antimetabolite and platin families of medicines, as well as the targeted therapies trastuzumab (Herceptin®) and bevacizumab (Avastin®). His focus now is on making more widespread the practice and availability of genetic and other profiling and validation diagnoses and tools across a wide spectrum of cancer research and treatment. At the Avera Center for Precision Oncology, Dr. Leyland-Jones is tapping into the power of biomarkers and creating a Genomically Guided Therapy Network to enable cancer patients treated in community practices across America access to the genomic and immunologic targeted therapies which are precisely suited for a particular patient's particular cancer.

TARGETED THERAPIES

Daniel Von Hoff, M.D.

NFCR Center for Targeted Cancer Therapies Translational Genomics Research Institute, Phoenix, AZ Research Focus: Personalized Treatments and Genomics

At the NFCR Center for Targeted Cancer Therapies, Director Dr. Daniel Von Hoff, in collaboration with former NFCR scientist Laurence Hurley, Ph.D., continues his innovative approach to treating cancer with G-quadruplex drugs that block "super enhancers" - newly recognized DNA structures that are regulatory elements controlling the expression of a host of genes. One drug candidate reduced expression of oncogenic driver gene C-Myc, which plays a critical role in pancreatic cancer. It also interacted and disrupted signaling of super-enhancers in both pancreatic cancer cells and cancer-associated fibroblasts, inhibiting their growth. The G-quadruplex drug candidates could have anti-tumor activity in pancreatic cancer and are being further developed for clinical application. Dr. Von Hoff has also developed a method to dissociate pancreatic cancer tissue and, via a single cell based RNA-sequencing platform, identify cancer cells, stroma cells and cancer cells undergoing epithelial-mesenchymal transition. In this era of precision oncology, he and his team are further applying this technology in drug discovery and individual patient care.



COMBATING METASTASIS

Danny Welch, Ph.D.

NFCR Center for Metastasis Research University of Kansas Cancer Center, Kansas City, KS Research Focus: Cancer Metastasis

Metastatic cancer (any cancer that has spread from its original site to other areas of the body) is responsible for 90% of all cancer-related deaths. Dr. Danny Welch has devoted his career to finding out what causes cancer to metastasize, and how the spread of cancer can be prevented or predicted. Two new metastasis suppressor genes for pancreatic cancer, recently discovered by his lab, may provide insight into how pancreatic cancers develop and spread. Their discovery may also lead to the better design of molecules which either prevent metastasis from happening or arrest metastatic tumors in a dormant state. Dr. Welch's team has also identified genetic changes which can help predict whether patients will develop metastasis, a breakthrough that may also explain why there are racial disparities in cancer susceptibility. His lab has also discovered that DNA in a cellular organelle — the mitochondrion modifies how cancer-causing genes affect cancer behavior. Present in every cell, this DNA can be rapidly analyzed. A potential test from a simple blood draw and analysis of mitochondrial DNA could help doctors craft treatment strategies likely to be more effective for their patients.



PREVENTION & EARLY DETECTION

James Basilion, Ph.D.

NFCR Center for Molecular Imaging Case Western Reserve University, Cleveland, OH Research Focus: Highly Sensitive Molecular Imaging for Early Detection of Cancer

Dr. James Basilion and his team at the NFCR Center for Molecular Imaging are developing new tools that can truly change the way cancer is detected. Center researchers are now adapting one of their imaging probes for use with a PET scan for early detection of liver cancer — a disease which is increasing in frequency and mortality as more people develop fatty liver, chronic hepatitis C and cirrhosis. Detection limits with current clinical tests cannot distinguish benign lesions from cancer. Dr. Basilion's PMSA probe would fill the gap, improving accuracy of detection and also reducing invasive painful needle biopsies. This new probe would help provide personalized medicine, with each liver cancer case being characterized so as to facilitate treatment planning and monitored so as to spare normal liver tissues — achieving maximal treatment effects.



PREVENTION & EARLY DETECTION



Paul Schimmel, Ph.D.

The Scripps Research Institute, San Diego, CA and Jupiter, FL Research Focus: New Avenues for Cancer Treatment

One of the most fundamental questions facing scientists today is how seemingly normal cells become cancerous. To better understand how this happens, Dr. Paul Schimmel has dedicated more than 40 years to examining the intricate functions of molecular biology. His laboratory identified the operational RNA code for amino acids — enzymes known as Aminoacyl-tRNA synthetases, which are used to build proteins and are essential for all forms of life. With recent focus on the tRNA synthetase for amino acid serine, SerRS, his lab has also discovered it is a potent suppressor of cancer cell migration in tumor models and may be a new tumor suppressor. SerRS inhibits C-Myc — a regulator gene found often to be upregulated in many types of cancer. Inhibition of C-Myc subsequently turns off the downstream genes C-Myc controls, including the gene for VEGF, whose function is required for tumor survival. This new role of SerRS to suppress cancer is currently under close investigation and may lead to potential therapeutic applications. Dr. Schimmel's laboratory has also found that resveratrol, a natural ingredient found in foods such as cacao and grape skins, may have potent cancer preventative effects when combined with tRNA synthetases and a key protein — PARP-1.

Robert Bast, M.D.

MD Anderson Cancer Center, Houston, TX Research Focus: Early Detection of Ovarian Cancer

Ovarian cancer is a notorious "silent killer," with only about 15% of cases being diagnosed at an early stage. There is currently no reliable routine screening for the disease and symptoms often mimic common digestive issues, making misdiagnosis a common problem. Dr. Robert Bast co-discovered CA-125 — the first useful biomarker for monitoring the course of patients with epithelial ovarian cancer. But 20% of ovarian cancers do make CA-125, and so his team is seeking other blood biomarkers to detect all cases when combined with ultrasound of the ovaries. They have shown that 20% of patients can make "autoantibodies" against mutant tumor suppressor protein TP53 nine months earlier than CA-125 and almost 2 years before the cancer can be detected in patients who do not produce CA-125. Other autoantibodies are needed to detect a larger fraction of patients with ovarian cancer. Four candidates have been identified from an early detection proteomics platform that are undergoing testing in a large blood sample set from early stage patients. Dr. Bast's promising early detection research continues to progress in its goal to find the right combination of blood tests to detect this "silent killer" in all patients with the disease.

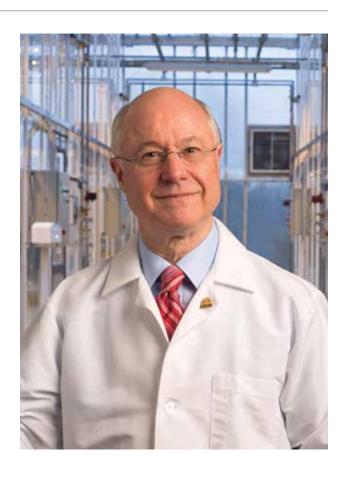


INNOVATIVE TREATMENTS

Curt Civin, M.D.

University of Maryland School of Medicine, Baltimore, MD Research Focus: Repurposing Drugs to Advance Leukemia Treatment

Leukemia is a great success story for cancer research — one in which Dr. Curt Civin played an important role. His early work on bone marrow stem cell transplantation was partially responsible for the dramatic increase in the five-year survival rate for all types of leukemia over the past 20 years. For patients still suffering from certain leukemias that are difficult to treat and waiting for a cure, Dr. Civin's current research may once again hold the key. Acute myeloid leukemia (AML) is the deadliest form of leukemia, and Dr. Civin recently discovered that artemisinins — a class of drugs with low toxicity used to successfully treat malaria — are also effective in killing AML cancer cells. Through research, he identified ART-838 — a specific artemisinin compound that shows remarkable effectiveness against leukemia cells and works well in combination with established anti-leukemia drugs. In addition to its low toxicity, the compound can be given orally and stays active in the bloodstream for an extended period. Moreover, it doesn't appear to harm normal bone marrow cells. ART-838 may prove to be an effective new treatment for patients with resistant AML and other acute leukemias and myelodysplastic syndromes.

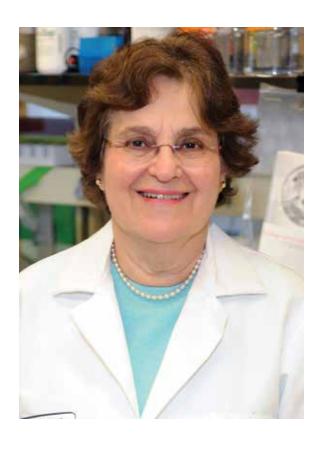


Yung-Chi Cheng, Ph.D.

Yale University School of Medicine, New Haven, CT Research Focus: Using Traditional Chinese Medicine to Treat Cancer

While the therapeutic benefits of Traditional Chinese Medicine (TCM) have been recognized anecdotally for centuries, they have often been discounted as "alternative therapies" because there was little scientific proof of effectiveness. Dr. Yung-Chi Cheng's laboratory is working to bring TCM into mainstream Western medicine, with hopes of reducing the side effects of chemotherapy, while enhancing the benefits. Since the late 1990s, Dr. Cheng's team has been exploring the therapeutic properties of PHY906, a Chinese herbal medicine formula of four herbs. With standardized preparations of the formula, they have discovered that cancer treatment with PHY906, combined with chemotherapy, alleviates the unpleasant gastrointestinal side effects of chemotherapy for colon, rectal, pancreatic and liver cancer patients. Moreover, their research demonstrated that PHY906 also has its own anti-tumor attributes. If there is continued success in two ongoing clinical trials for advanced liver and rectal cancers, PHY906 could become one of the first oral herbal medicines for anti-cancer treatment approved by the U.S. Food and Drug Administration. Additionally, Dr. Cheng's team is exploring the use of anti-viral drugs in preventing or delaying the onset of viruses such as Hepatitis B and C and HIV that can lead to liver and other cancers.

OVERCOMING DRUG RESISTANCE



Susan Horwitz, Ph.D.

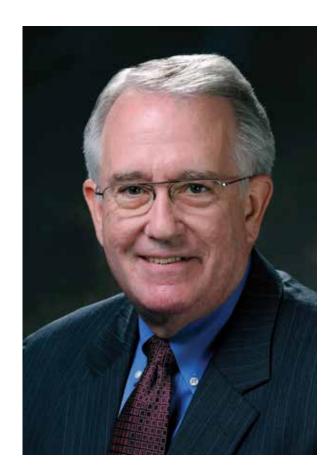
Albert Einstein College of Medicine, New York, NY Research Focus: Naturally-Derived Drug Development to Overcome Drug Resistance

Dr. Susan Horwitz is a molecular pharmacologist studying how drugs work in the body. She has been instrumental in the development of Taxol®, an anti-cancer drug derived from the bark of the Pacific Yew tree, now commonly used to treat breast, ovarian and lung cancers. In recent years, Dr. Horwitz has been making significant progress in their Taxol drug resistance research. The beta tubulin protein is Taxol's cellular target which Dr. Horwitz discovered. Her team has been able to show, for the first time, that Taxol binds less to one isotype of tubulin, perhaps contributing to resistance. Investigation continues with all seven tubulin isotypes so to understand Taxol's interaction with each, as well as with analogues of the natural product, discodermolide. As isotype expression in different tumors is determined, these studies may help predict which patients would be more likely to respond to Taxol, understandably sparing those who would not from the drug's side effects. Also, with support from a special collaborative research grant, Dr. Horwitz and NFCR-supported scientist Dr. Amos Smith have developed promising low toxic analogues from discodermolide that may serve as new anticancer therapeutics to treat recalcitrant breast, lung and ovarian cancer.

Amos Smith III, Ph.D.

University of Pennsylvania, Philadelphia, PA Research Focus: Microtubule Stabilizing Agents to Treat Brain Cancer and to Overcome Drug Resistance

Dr. Amos Smith's research interests include three diverse scientific areas: natural product synthesis, bioorganic chemistry and materials science. One research focus of his team is developing microtubule stabilizing agents (MSAs) that penetrate the brain and can be taken orally. This is especially important considering that more than 95% of current cancer drug molecules are not orally active. From a series of compounds designed, synthesized and evaluated by his team, multiple candidates exhibit good biological activity. These agents hold considerable promise for the treatment of brain cancer, specifically the deadliest type of brain cancer — glioblastoma multiforme. Dr. Smith was the first person to synthesize and enable large-scale production of an MSA called discodermolide — a natural agent that comes from a Caribbean sea sponge. In collaboration with NFCR-supported scientist Dr. Susan Horwitz, new potent discodermolide analogues were designed, and testing showed remarkably less toxicity than with its parent. These new analogues could have a high impact on the treatment of recalcitrant triple negative breast cancer — the deadliest type of all breast cancers and ovarian and lung cancers as a first line drug for patients and for patients whose cancer has spread to other vital organs.

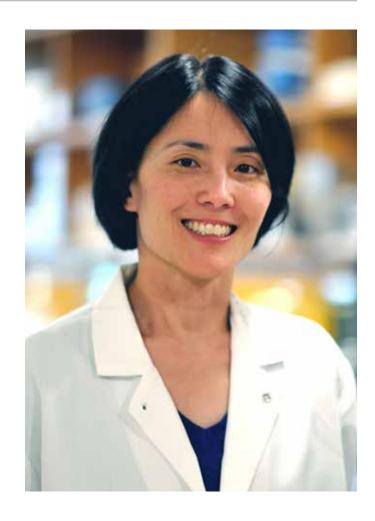


OVERCOMING DRUG RESISTANCE

Alice Shaw, M.D., Ph.D.

Massachusetts General Hospital, Boston, MA Research Focus: Fighting Drug Resistance and Metastasis in Lung Cancer

Dr. Alice Shaw has been leading several clinical trials and translational efforts aimed at overcoming drug resistance for patients with non-small cell lung cancer (NSCLC) that have mutations in the ALK gene. Part of her latest research focuses on the most common site of metastasis for ALKpositive NSCLC, the brain, and looks into why these tumor growths become resistant to the targeted therapy crizotinib (Xalkori®). Her team too launched a clinical trial with one of the newest ALK inhibitors, lorlatinib, and they are using both tissue and liquid biopsies to identify genetic alterations that may be driving the resistance. Another focus of Dr. Shaw's research is understanding why ALK-positive NSCLC patients who have never smoked have a low response to recently approved immunotherapies such as nivolumab (Opdivo®) or pembrolizumab (Keytruda®). These patients may have accumulated fewer DNA mutations over time, thus generating fewer neoantigens and evading an immune recognition. Comprehensive analyses of the tumor microenvironment are underway, and results will lay the groundwork for future clinical trials by Dr. Shaw's team which combine targeted and immune-based therapies, with the hope of significantly improving durations of response and clinical outcomes.



Dr. Alice Shaw's NFCR-funded research is made possible, in large part, by

The Hillsberg Lung Cancer Translational Research Grant

Each year, about 8,000 patients in the United States and 40,000 worldwide are diagnosed with ALK-positive NSCLC. While patients typically respond well initially to targeted ALK-inhibitor therapy, unfortunately, almost all patients eventually develop resistance to these drugs and their disease then progresses.



The lack of clinical development to address this issue caught the attention of Sanford and Penny Hillsberg, two long-time supporters of cancer research. They were determined to take action to solve this particular drug resistance problem. The Hillsbergs enlisted NFCR to establish a donor-initiated research fund in 2013 to support promising research in this critical field. Their biggest hope is that their partnership with NFCR will help accelerate the clinical development of new and effective treatments for those who have already run out of options for their resistant lung cancer.

If you are interested in establishing a donor-initiated research fund at NFCR, call us at 1-800-321-CURE (2873).

TRANSLATIONAL RESEARCH

For over four decades, the National Foundation for Cancer Research has been supporting fundamental, earlystage, basic cancer research by some of the world's most brilliant scientists. Many of the laboratory breakthroughs and discoveries made possible by NFCR funding and the distinctively wide latitude of inquiry granted to our affiliated center directors, fellows and project directors, have, years later, germinated novel treatments and diagnostics used by patients. They've also represented or been associated with first waves of transformation throughout cancer medicine, broadly.

Take for instance the fostering by long-time NFCR scientist Harold Dvorack, M.D., of the entire field of tumor angiogenesis research. His discovery of Vascular Endothelial Growth Factor paved the way, nearly two decades later, for an entire category of VEGF-targeting anti-angiogenic drugs, such as Avastin. Or the identification by NFCR researcher Daniel Haber, M.D., Ph.D., of a specific mutation of the Epidermal Growth Factor Receptor gene in a subset of non-small cell lung cancers which has made possible the profiling of patients who are much more likely to respond well to targeted therapy.

With these and dozens of other anecdotes in mind, NFCR's Board of Directors and management began exploring ways to help bring benefits derived from groundbreaking lab findings associated with our funded scientists more rapidly and efficiently to patients - from "from bench to bedside." Analysis by the NFCR Scientific Advisory Board

demonstrated that, from 2005 to 2017, the organization supported 60 scientists who had registered 57 inventions, innovations, discoveries and breakthroughs that served as technology bases for five out-licensing deals and 16 start-up companies, among which five were acquired and one went public.

Such impressive scientific, technological and commercial track records drive the decision, made and put into action in 2017, to widen NFCR's stance beyond support for basic cancer research (where the organization will remain firmly planted), and into "translational" research. This segue phase between basic and applied research is where cancer findings are validated - and better preventive, therapeutic or diagnostic leads are put on to the path toward human clinical trials and patient use.

NFCR's newly-launched translational research program provides enhanced and sustainable support to bridge the gap between innovative, early-stage cancer research and the successful development of novel oncology drugs and treatments. Initial projects receiving funding and other forms of support include usage of small-molecule derivatives of artemisinins to treat leukemia; targeting of stromal stellate cells for the treatment of cancer; development of Cancer Terminator Viruses for the targeted therapy of a diverse array of aggressive tumor types; and exploration of small-molecule inhibitors of a specific cancer-promoting protein.



NFCR President Sujuan Ba, Ph.D., presenting on translational research at a major international bio-medical industry conference, October 30, 2017.

Will each and every of these leads become a new drug? Unlikely and not anticipated. This is the nature of science and the quest for knowledge which underlies it. But the rigors of scientific validation, too, are the means for progress. Some projects - we are confident - will succeed in advancing further along the pathway to cancer patient use and benefit.

History validates the National Foundation for Cancer Research's extension beyond only the realm of basic research. The expanded support allowing for validation of some of the most promising NFCRassociated findings ushers in an exciting new era for the organization.

SZENT-GYÖRGYI PI PROGRESS IN CANCER



2017 SZENT-GYÖRGYI PRIZE

Michael N. Hall, Ph.D., Professor of Biochemistry at the Biozentrum of the University of Basel, Switzerland, was awarded the 2017 Szent-Györgyi Prize for Progress in Cancer Research. Dr. Hall discovered one of the most important cancer cell targets in the modern era of oncology, which he named "Target of Rapamycin" (TOR).

NFCR's selection committee was unanimous in its decision to recognize Dr. Hall, who has been a pioneer in the fields of TOR signaling and cell growth control, as well as TOR's role in development and aging.

"Michael N. Hall has contributed in a fundamental way to our understanding of critical life processes. His work is devoted to the discovery and characterization of the protein TOR, which controls many features of cell metabolism and behavior. Understanding how the pathways regulated by TOR work, and how they fail to work in cancer, has provided new strategies for the development of cancer therapies. His work is a lovely example of how basic science — experimental studies of proteins in yeast — can lead to discoveries of critical clinical importance," said Dr. Mary-Clair King, Professor of Medical Genetics and Genome Sciences at the University of Washington, winner of the 2016 Szent-Györgyi Prize and Chair of the 2017 Prize Selection Committee.

Dr. Hall discovered that TOR — a conserved protein kinase controls cell growth and a wide range of metabolic processes that when dysregulated cause disorders such as cancers, cardiovascular disease, diabetes and obesity. TOR inhibitors are used today in treatments for kidney, breast, brain and pancreatic cancers, and numerous clinical trials are currently underway testing TOR inhibitors in the treatments of many types of cancer.



Panel discussion with William Nelson, M.D., Ph.D., Webster Cavenee, Ph.D., Michael Hall, Ph.D., Chi Van Dang, M.D., Ph.D., and moderator Mary-Claire King, Ph.D.



2017 Szent-Györgyi Prize recipient Michael N. Hall, Ph.D., along with Committee Chair and 2016 Szent-Györgyi Prize winner Mary-Claire King, Ph.D. and Prize Selection Committee Co-Chair, Sujuan Ba, Ph.D.

"I am honored to have our cancer research recognized by the esteemed Szent-Györgyi Prize and to stand alongside the extraordinary scientists who have won it in previous years," said Dr. Hall. "I hope our work continues to pave the way for new scientific discoveries that lead to effective cancer treatments."

"Michael N. Hall's breakthrough discovery of TOR during a basic research phase, has made possible many of today's advanced anti-cancer therapies. This is a concrete example of how laboratory research at a fundamental stage can impact cancer treatment and patient care," said Sujuan Ba, Ph.D., Co-Chair of the 2017 Szent-Györgyi Prize Selection Committee and President of the National Foundation for Cancer Research. "Michael N. Hall is most deserving of the 2017 Szent-Györgyi Prize and NFCR thanks him for his continued work in cancer research. We look forward to seeing more discoveries from him in the future."

The award ceremony was hosted at the National Press Club in Washington, D.C., on May 1, 2017. A packed room of scientists, past Szent-Györgyi Prize winners, NFCR donors and supporters gathered together to congratulate Dr. Hall on his remarkable achievements and winning of the Prize for 2017. The audience also enjoyed an insightful roundtable discussion moderated by Dr. King. The panel featured Dr. Webster Cavanee (University of California, San Diego), Dr. Chi Van Dang (University of Pennsylvania), Dr. William Nelson (Johns Hopkins School of Medicine) and Dr. Hall discussing the latest updates of their respective work and future direction of cancer research.

2017 EVENTS & PROGRAMS



Play4TheCure

In 2017, *Play4TheCure* continued to be a major fundraising platform, promoting youth sports to help raise awareness and funds in support of cancer research. This year, NFCR partnered with 297 teams across 12 different sports and raised more than \$205,000.

- In their ninth year of support, Upper Dublin High School's Field Hockey team was able to collect over \$10,000 at their Corners for Cancer tournament in support of all types of cancer research.
- *Play4TheCur*e partnered with the Washington Inner City Lacrosse Foundation (WINNERS Lacrosse) to host the DC Lacrosse Classic, an event showcasing elite boys and girls high school lacrosse programs in the Washington-DC area and teaching lacrosse and life skills to inner-city youth. The event raised nearly \$2,000 to support cancer research.
- First time participants, George Washington University's club field hockey and softball teams organized fundraising tournaments and events. Each team member created individual fundraising pages to tell their own cancer impact stories and engage their unique supporter base to increase their reach to friends, family and classmates. The teams amassed over \$6,000 to support the work of NFCR.
- Thanks to the initiative started by NFCR's youth ambassador, Ally Minker, for the third summer in a row, *Play4TheCure* hosted cancer awareness nights at minor league ballparks nationwide. After losing her grandfather to cancer, Ally wanted to honor him and his love of baseball by creating a cancer research awareness campaign. Teams such as the Frederick Keys and Bowie Baysox hosted *Play4TheCure* at their ballparks throughout the summer.

2017 EVENTS & PROGRAMS

Arts4TheCure



In 2017, the National Foundation for Cancer Research created Arts4TheCure, the official fine and performing arts fundraising program for ALL CANCERS, ALL COLORS, ALL ARTS. Inspired by Play4TheCure and its sports platform, Arts4TheCure encourages musicians, singers, artists, performers and

other creative individuals to utilize their talents and skills to raise awareness and funds for cancer research.

The Dodos Combo, a student-formed jazz band from the Landon School in Bethesda, Maryland, kicked off the program. The band debuted at NFCR's 2017 Szent-Györgyi Prize for Progress in Cancer Research Dinner and Award Ceremony and performed at many other venues and events around the Washington, D.C. area, helping to raise more than \$3,000 towards cancer research.



The Dodos Combo.

Daffodils & Diamonds

The 36th annual Daffodils & Diamonds Luncheon and Fashion Show was held on March 9, 2017, at the Columbia Country Club in Chevy Chase, Maryland. This yearly event has become a meaningful spring tradition for raising awareness and funds for cancer research. It was attended by more than 300 dedicated women from the Washington, D.C. area. Daffodils & Diamonds 2017 raised more than \$125,000 to support NFCR funded scientist, Dr. Paul Fisher, and his work with a promising therapeutic for breast cancer, including metastatic cancer.

The special occasion was hosted by Alison Starling, WJLA TV ABC7 News Anchor, and included an upbeat and stylish fashion show presented by Nina McLemore. The program also included a luncheon, raffle and a silent auction featuring fashionable clothing and jewelry, gift certificates to favorite area restaurants, spa and salon treatments, gorgeous paintings by local artists and premier tickets to sporting events and theater.



Keynote speaker and First Lady of Maryland, Yumi Hogan, with event emcee Alison Starling.



2017 Daffodils & Diamonds Committee member Lyn Brown with Co-Chair Jennifer Soltesz.

REMEMBERING AN NFCR SUPPORTER

Born to be a political dynamo, Nancy Flood Cole came into the world on a day associated with presidential inaugurations, January 20, 1932, in Shelbyville, Kentucky. A Southern Belle and a quintessential Washingtonian, Nancy was a devoted Mother to Caroline, a true friend, a champion of political causes and a trusted advisor to the National Foundation for Cancer Research. Her grace, warmth and style were admired by all who were fortunate enough to know her. Sadly, Nancy passed away on September 17, 2017, from a cancer diagnosis made only ten days earlier.

The youngest of four children, Nancy enjoyed a unique childhood living in the beautiful and historic Armstrong Hotel, which her parents owned, on Main Street in Shelbyville. The Flood family was close, solid, happy and quite funny. Even as a young girl, Nancy's spirit and joie de vivre shone brightly.

In her 20s, Nancy relocated to the Nation's Capital to work for the Democratic National Committee. Nancy's political journey was diverse, illustrious in nature and spanned many decades. Her accomplishments included notable service for public figures such as President John F. Kennedy, Senator

Edward M. Kennedy, the Honorable Pamela C. Harriman, U.S. Ambassador to France and Texas Congressman Charlie Wilson, just to name a few. She distinguished herself as President and Founder of Capitol Connections, a firm specializing in public relations, fundraising, event management and consulting.

Nancy was an early supporter of Daffodils & Diamonds, an elegant event which includes a fashion show, silent auction and luncheon. Alice-Anne Birch, founder of Daffodils & Diamonds, reflects "as two Kentucky girls, we warmed to each other immediately. Nancy and Caroline joined the committee in 1995, and Nancy taught me everything about event planning. I accompanied Nancy to parties, balls, luncheons and political events where we were always networking and gathering ideas. She was a friend, a sister, a mother and a mentor to me, giving love and 'constructive criticism' in equal measure." Flourishing upon entering its 37th year, Daffodils & Diamonds has now raised more than one million dollars in support of NFCR scientists.

Nancy was a beloved and original member of the National Foundation for Cancer Research Board of Advisors. "Nancy was a wonderful friend and a strong supporter for NFCR during the past decade. She left such a wonderful legacy," states NFCR President Sujuan Ba, Ph.D. "We miss her energy and her 'can do' spirit! Her passing remains a loss for the cancer research community."

Nancy's greatest achievement, however, was raising her precious Caroline. Charm, grace and humor certainly were passed down from mother to daughter. Caroline's beauty and devotion to her friends is a mirror image of her mother. "My mother was the true definition of a lady—her hospitality was bar none" said Caroline Flood Cole. "She and I were always extremely close and, through the years, her unwavering support for me, for my friends and for the causes and people she believed in were unmatched." It has been said that "Nancy was everyone's positive life coach."

NFCR salutes Nancy Cole, the epitome of a lady, who continues to inspire us to live well, laugh often, display impeccable manners, be a dear friend and always have fun!



Caroline Flood Cole and Nancy Flood Cole.

NFCR SCIENTIFIC ADVISORY BOARD



Webster K. Cavenee, Ph.D., Chairman

Director of Strategic Alliances in Central Nervous System Cancers, Ludwig Institute for Cancer Research, San Diego, and Distinguished Professor at the University of California, San Diego

Dr. Cavenee's pioneering research in cancer genetics has fundamentally changed our understanding of tumor initiation and progression. His research on the most common and deadly form of brain cancer, glioblastoma multiforme (GBM), is illuminating the mechanisms of growth and survival of GBM and identifying potential new therapeutics. He is an Executive Director and Co-Investigator of GBM AGILE, a global effort to defeat GBM through an adaptive clinical trial platform. He is a member of the National Academy of Sciences and the National Academy of Medicine. Among his more than 100 awards and honors, Dr. Cavenee was the recipient of the 2007 Szent-Györgyi Prize for Progress in Cancer Research and the 2016 Feldman Founder's Award for Adult Brain Tumor Research from the National Brain Tumor Society.



Frederick W. Alt, Ph.D.

Director of the Program in Cellular and Molecular Medicine at Boston Children's Hospital, Charles A. Janeway Professor of Pediatrics at Boston Children's Hospital, and Professor of Genetics at Harvard Medical School Dr. Alt's groundbreaking work in cancer genetics and his seminal discovery of gene amplification has proved foundational to the modern understanding of how cancer forms and how it can become resistant to treatment. Equally important is Dr. Alt's work on the critical DNA repair mechanism called "non-homologous end joining" (NHEJ). He has made fundamental contributions to our understanding of B-cell development and function, and the mechanisms underlying B-cell lymphomas. Dr. Alt was the recipient of the 2015 Szent-Györgyi Prize for Progress in Cancer Research, the Lewis S. Rosenstiel Award for Distinguished Work in Basic Medical Research and numerous other awards. The Cancer Research Institute (CRI) of New York annually presents the Frederick W. Alt Award for New Discoveries in Immunology. He is a member of the National Academy of Sciences and the National Academy of Medicine.



Ruggero De Maria, M.D.

President of the Alliance Against Cancer and Director of the Institute of Pathology at Catholic University, Rome, Italy, and former Scientific Director of the Regina Elana National Cancer Institute, Rome, Italy Dr. De Maria's research team was the first to isolate cancer stem cells (CSCs), a rare population of cells responsible for tumor initiation and growth, from colon and lung cancers and develop innovative CSC-based preclinical models of these tumors. Dr. De Maria's current research characterizes innovative biomarkers and molecular targets in CSCs to develop novel cancer therapies and improve cancer management. His research also includes microRNA and the microenvironment in solid tumors. He is currently a member of the Pezcoller Foundation-AACR Innovator Scientific Advisory Board.



Kanaga Sabapathy, Ph.D.

Head of Division of Cellular & Molecular Research and Director of Planning & Strategy at The National Cancer Center Singapore, Professor of Cancer & Stem Cell & Biology Program at Duke-National University of Singapore (NUS) Graduate Medical School, and Director of the Academic Clinical Program in Oncology, SingHealth Dr. Sabapathy's research focuses on the molecular mechanisms of cancer formation and therapeutic resistance, with the goal of generating novel therapeutic strategies. Another major effort in his laboratory is to develop tumor models that would best represent the human cancer condition using state-of-the-art genetic engineering technology. In 2015, Dr. Sabapathy received Singapore's inaugural National Research Foundation Investigatorship for his research in identifying targets for therapy and designing of better treatment approaches.



Peter K. Vogt, Ph.D.

Executive Vice President, Chief Science Officer, and Professor in Department of Molecular and Experimental Medicine at The Scripps Research Institute in La Jolla, California

Dr. Vogt's seminal discovery of SRC, the first cancer-causing gene or oncogene, contributed to our present understanding of many critical molecular mechanisms of cancer. His contributions include the identification of other oncogenes such as Myc, JUN and PI3-kinase — some of today's most promising cancer targets. Dr. Vogt has received numerous awards including the 2010 Szent-Györgyi Prize for Progress in Cancer Research and the Institute of Human Virology Lifetime Achievement Award for Scientific Contributions. He is a member of the National Academy of Sciences, the National Academy of Medicine, as well as other prestigious scientific organizations.

REPORT OF INDEPENDENT AUDITORS

Board of Directors National Foundation for Cancer Research, Inc. Bethesda, MD

Report on the Financial Statements

We have audited the accompanying consolidated financial statements of National Foundation for Cancer Research, Inc. and affiliates, which comprise the consolidated statement of financial position as of December 31, 2017 and the related consolidated statements of activities, functional expenses and cash flows for the year then ended, and the related notes to the consolidated financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

REPORT OF INDEPENDENT AUDITORS

Opinion

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of National Foundation for Cancer Research, Inc. and affiliates as of December 31, 2017, and the changes in their net assets and their cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Other Matter - December 31, 2016 Financial Statements

Withem Smeth + Brown, PC

The consolidated financial statements of the National Foundation for Cancer Research, Inc. for the year ended December 31, 2016 were audited by Bond Beebe, PC, who joined WithumSmith+Brown, PC effective September 1, 2017, and they expressed an unmodified opinion on the statements in their report dated May 8, 2017. No auditing procedures have been performed since that date with respect to the December 31, 2016 financial statements.

Bethesda, MD May 10, 2018

NATIONAL FOUNDATION FOR CANCER RESEARCH, INC. CONSOLIDATED STATEMENTS OF FINANCIAL POSITION DECEMBER 31, 2017 AND 2016

ASSETS

ASSETS	2017	2016						
Cash	\$2,763,678	\$4,315,431						
Accounts receivable	122,419	133,972						
Prepaid expenses and other assets	428,444	367,657						
Fixed assets, net of accumulated depreciation and amortization	123,318	47,474						
Investments	9,104,784	7,953,489						
Amounts held in trust by others	2,611,748	2,398,467						
TOTAL ASSETS	\$15,154,391	\$15,216,490						
LIABILITIES AND NET ASSETS								
LIABILITIES								
Accounts payable	\$822,897	\$976,226						
Research contracts and grants payable	835,665	1,061,614						
Accrued compensation and benefits	126,932	137,451						
TOTAL LIABILITIES	_1,785,494	2,175,291						
NET ASSETS								
Unrestricted								
Designated for research contracts	5,271,071	4,812,470						
Undesignated	4,499,078	4,706,167						
	9,770,149	9,518,637						
Temporarily restricted	1,433,990	1,539,542						
Permanently restricted	2,164,758	1,983,020						
TOTAL NET ASSETS	13,368,897	13,041,199						
TOTAL LIABILITIES AND NET ASSETS	\$15,154,391	\$15,216,490						

For more information, please visit **nfcr.org**.

NATIONAL FOUNDATION FOR CANCER RESEARCH, INC. CONSOLIDATED STATEMENTS OF ACTIVITIES FOR THE YEARS ENDED DECEMBER 31, 2017 AND 2016

	2017				2016			
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
REVENUE AND SUP	PPORT							
Public support	\$9,526,330	\$289,266	\$ —	\$ 9,815,596	\$9,141,065	\$887,809	\$ —	\$10,028,874
Bequests	2,016,955	_	_	2,016,955	3,294,286	_	_	3,294,286
Mailing list rental	296,320	_	_	296,320	357,786	_	_	357,786
Net Investment incom Change in value of split-interest	e 1,309,451	_	_	1,309,451	495,730	_	_	495,730
agreements	45,146	31,544	181,738	258,428	(23,882)	(1,532)	23,841	(1,573)
Other revenue	20,886	_	_	20,886	6,095	_	_	6,095
Non-cash research support	227,678	_	_	227,678	644,515	_	_	644,515
Net assets released from restrictions	426,362	(426,362)			765,024	(765,024)		=
TOTAL REVENUE AND SUPPORT	13,869,128	(105,552)	181,738	13,945,314	14,680,619	121,253	23,841	14,825,713
EXPENSES								
Program Services								
Research	4,537,599	_	_	4,537,599	4,749,049	_	_	4,749,049
Public education and information	5,308,606	<u></u>	_	5,308,606	5,214,010	_	<u></u>	5,214,010
Subtotal	9,846,205			9,846,205	9,963,059			9,963,059
Supporting Services Fundraising	2,686,041	_	_	2,686,041	2,385,338	_	_	2,385,338
Management and general	1,085,370	_	_	1,085,370	972,792	_	_	972,792
Subtotal	3,771,411			3,771,411	3,358,130			3,358,130
TOTAL EXPENSES	13,617,616			13,617,616	13,321,189			13,321,189
CHANGE IN NET ASSETS	251,512	(105,552)	181,738	327,698	1,359,430	121,253	(151,148)	1,504,524
NET ASSETS AT BEGINNING OF YEAR	9,518,637	1,539,542	1,983,020	13,041,199	8,159,207	1,418,289	1,959,179	11,536,675
NET ASSETS AT END OF YEAR	\$9,770,149	\$1,433,990	<u>\$2,164,758</u>	\$13,368,897	\$9,518,637	\$1,539,542	\$1,983,020	\$13,041,199

For more information, please visit **nfcr.org**.



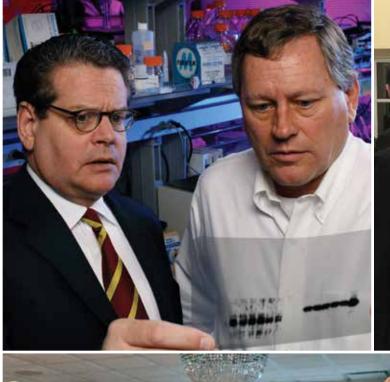








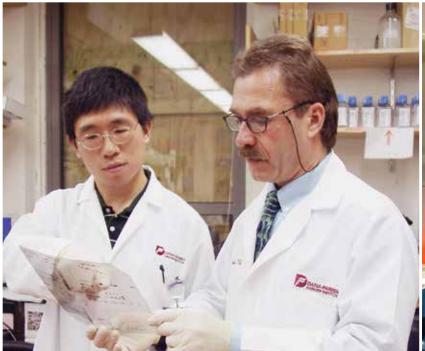
















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