



RESEARCH for
A **cure**

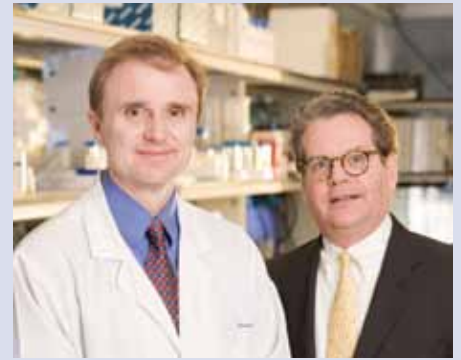
National Foundation
for Cancer Research
2011 Progress Report

NFCR 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 about Research for a Cure – cures for *all* types of cancer.

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FROM THE PRESIDENT

This is an age of cancer genetics. There is no more exciting time to be part of cancer medicine than now. By integrating molecular-based technologies, systematic tissue procurement and molecular diagnostics and genetic sequencing, the National Foundation for Cancer Research is pioneering the way in deciphering cancer's genetic code, and translating laboratory discoveries into remarkable new therapies that target the unique genomic and cellular characteristics of each patient's cancer.

The genetic knowledge about cancer's inner workings is changing everything. It alters how we think about cancer biology, how we develop new anti-cancer drugs, how we test those drugs in clinical trials, how we diagnose and treat an individual's cancer.

Genes are "broken" in cancer cells. Since 1973 the National Foundation for Cancer Research has spent over \$288 million to underwrite basic discoveries about the ways broken-down genes lead to cancer. NFCR's high impact research is paying off, but we also know there is much more we must do.

How much more? Cancer affects 11.7 million Americans directly. The disease is responsible for one out of every four deaths in this country.

NFCR-funded discoveries are the blueprints for the next generation of cancer treatments. NFCR is *Research* for a *Cure* – Cures for *all* types of cancer.

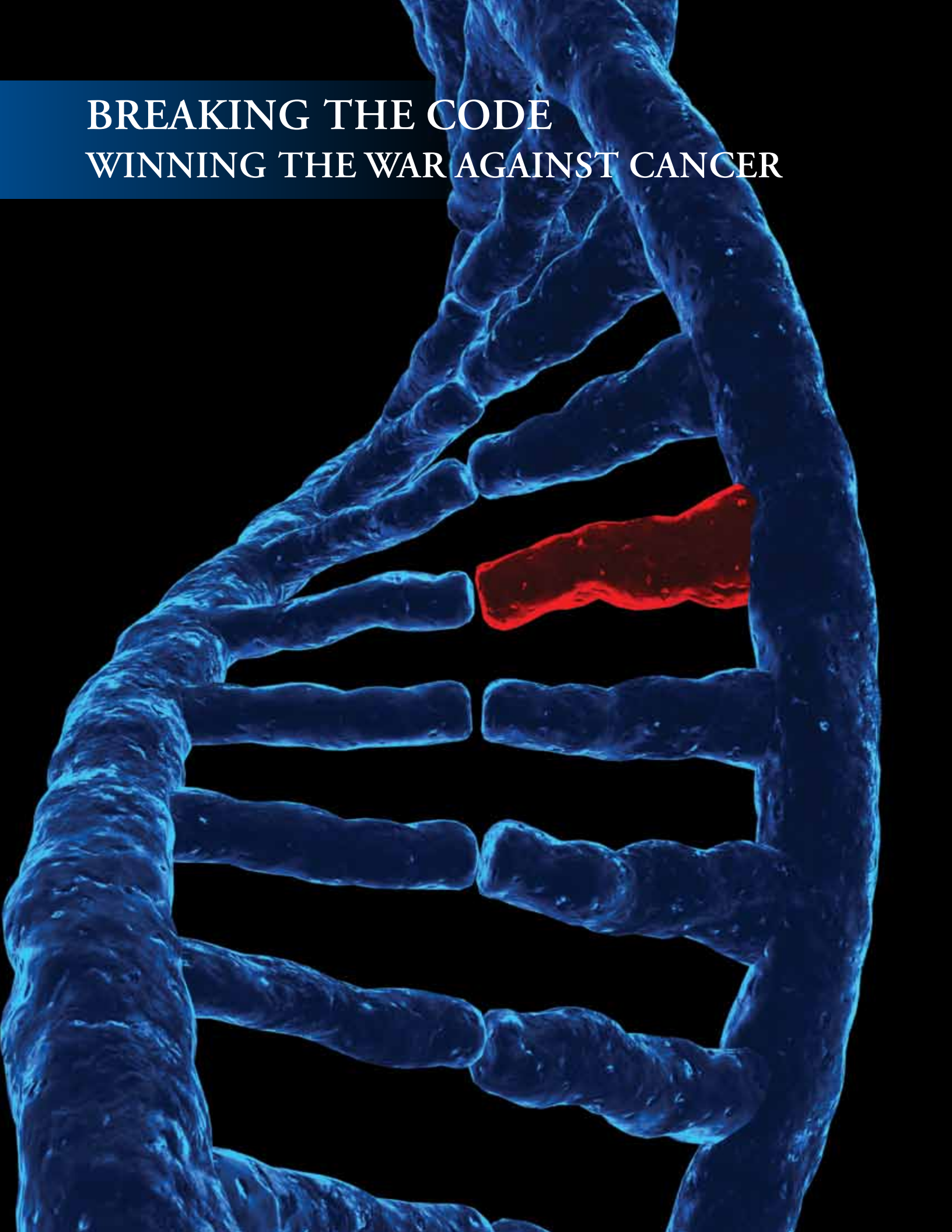
Those discoveries are what you make possible with your support.

Thank you and sincerely,

A handwritten signature in blue ink that reads "Franklin Salisbury, Jr." The signature is written in a cursive, flowing style.

Franklin C. Salisbury, Jr.
President

BREAKING THE CODE
WINNING THE WAR AGAINST CANCER



The “black box” that was the cancer cell has been opened and, with the support of millions of Americans, NFCR researchers have pioneered the redefinition of cancer as a genetic disease, making possible new approaches to treating cancer and transforming medicine so that real hope for a cure is now within sight.

NFCR scientists are at work on new anti-cancer drugs that target the very genes and signaling pathways that make a cell cancerous. These new targeted cancer therapies are proving more effective, longer lasting, and far less toxic than radiation and chemotherapy – treatments with side effects that inspire dread so deep that they are almost as feared as the cancer itself.

Today, more individuals diagnosed with cancer are surviving longer than ever before. Even those who ultimately succumb to cancer live longer and experience a much better quality of life than was possible just a few years ago. Every day at NFCR, our researchers report progress in the development of promising new ways to prevent, detect and treat cancer. But until there is a cure, we will not be satisfied – too many lives are at stake.

The National Foundation for Cancer Research is an innovative cancer charity, supporting cancer research in a truly collaborative way, reaching global dimensions. Since 1973, NFCR has spent over \$288 million to fund “high risk/high reward” research at universities and research hospitals worldwide.

The research funding we provide is having a catalytic effect and accelerating the pace of cancer research. Today in laboratories across the United States, Germany, and China, NFCR scientists are moving cancer research toward that ultimate goal – finding cures for *all* types of cancer.

TARGETING TOP KILLERS TO SAVE LIVES

In 2011, an estimated 1,596,670 new cases of cancer were diagnosed. As many as 570,000 people died of cancer in the United States alone. Sadly, that’s nearly 1,500 people a day. One person every minute. Nearly half of all cancer deaths in the United States are caused by four types of cancer: lung, prostate, breast, and colorectal. NFCR supports research on *all* types of cancer, but we have developed a comprehensive approach to support promising research that targets these four leading killers. NFCR funding helps our scientists push forward in developing new early diagnostic tools, discovering new cancer targets, and bringing more effective anti-cancer treatments to patients.

LUNG CANCER RESEARCH

Causing nearly one-third of all cancer deaths in the United States, lung cancer remains the number one killer among *all* types of cancer. NFCR provides funding to support eight leading scientists from around the world working to find a cure for lung cancer. Using the most advanced molecular technologies, NFCR scientists are focused on several critical areas, including: prevention, early diagnosis, personalized medicine, and the development of a simple blood test for real-time monitoring of cancer. Research breakthroughs in these areas will bring significant benefits to lung cancer patients, improving their survival rates and quality of life.

PROSTATE CANCER RESEARCH

Nearly 240,900 men were diagnosed with prostate cancer in 2011 in the United States, and more than 33,700 died from it. The 5-year survival rate for prostate cancer patients has dramatically increased to nearly 100%, largely due to recent advances in cancer research. However, once the cancer has spread, it can still be fatal because there is no curative treatment available at this time.

Seven NFCR scientists are working on ways to prevent prostate cancer, detect it sooner with innovative technology, and tackle the molecular mechanisms that drive its spread including new targeted approaches and novel gene therapies for treatment-resistant metastatic prostate cancer. Their critical and innovative research will lead to better strategies in prevention, earlier detection, and treatment of prostate cancer.

BREAST CANCER RESEARCH

Breast cancer is the most frequently diagnosed cancer and the second leading cause of cancer death in women. NFCR supports breast cancer research in the laboratories of 10 leading scientists. These scientists are on the frontline of multiple aspects of breast cancer research, including: the development of forward-looking molecular imaging technology that will allow earlier diagnosis, seeking new strategies to overcome tumor drug resistance, developing nanocomplex drug delivery technology, identifying genes that control the early migration of cancer cells into healthy tissue, and establishing more effective strategies to stop metastasis – which

is responsible for more than 90% of breast cancer deaths.

COLORECTAL CANCER RESEARCH

Colorectal cancer is the third leading cancer killer of both men and women in America. With NFCR support, six outstanding scientists are launching attacks on this deadly disease. Their research is refining dietary means for its prevention, identifying new biomarkers for early diagnosis, developing novel targeted cancer therapies, and demonstrating that Traditional Chinese Medicine can alleviate the gastrointestinal side effects of chemotherapy.

OTHER TYPES OF CANCER

NFCR scientists are also working around the clock to find more effective treatments for many other types of cancer. Pioneering research is being conducted to fight pancreatic, ovarian, brain, liver, esophageal, gastric, cervical, kidney, head and neck cancer, as well as leukemia, lymphoma, multiple myeloma, melanoma, soft tissue sarcoma, and many others. NFCR scientists are moving cancer research toward our ultimate goal – finding cures for cancer...all types of cancer.

WINNING THE WAR AGAINST CANCER A REVOLUTION IN MEDICINE

We are entering a revolutionary period in cancer detection and treatment that is being driven by breakthroughs in genomics and systems biology. The convergence of scientific research and emerging technologies is building an unprecedented understanding of cancer as a genetic disease, driven by abnormal genes and proteins. Twenty-first century medicine is changing how we look at cancer.

For decades the disease model was confined to what we could observe in tissues and organs. Scientists are beginning to “see” biological processes in real time at the genetic, molecular and cellular levels. Scientists can now view cancer as a mechanistic disruption of the normal cycle of cell growth and death. By determining which genes and proteins are driving the cancer process in an individual patient, we can define a much more precise target for our treatment interventions. These “biomarkers” will provide earlier alerts to cancer; an advanced technology such as nanotechnology promises to create extremely small-scale devices (one eighty-thousandth the width of a human hair) that will be able to detect changes that signal the presence of cancer and deliver treatment. Each advance, new tool and technique is helping to build a future where cancer is detected early and when we can intervene before the cancer is visible under the microscope. These new fronts in the war against cancer require team work at all levels.

NFCR MISSION: NON-INVASIVE DETECTION AND SPECIFIC ATTACK PLANS

NFCR Project Director Wei Zhang, a Professor of Pathology and Cancer Biology at the University of Texas MD Anderson Cancer Center has mobilized a team of 18 cancer scientists from 5 different countries interrogating several major cancer types, including colorectal, ovarian, breast cancers, as well as glioma and different types of sarcomas. This is a big mission, and the team of scientists Wei Zhang has recruited from the U.S., China, and Finland is collaborating on cancer genomics and systems biology. Their battle plan in the war against cancer is to find better and especially non-invasive markers for cancer detection, and to identify specific cancer targets for better treatment.

This is a difficult mission that requires persistent hard work and fearlessness of failures, but in 2011 Wei Zhang's NFCR team and its mission plan have already reported successes – giving patients new hope.

DISCOVERY OF A ROBUST BLOOD MARKER FOR METASTATIC COLORECTAL CANCER

Colorectal cancer remains one of the major cancer-related deaths in the United States. Progress in treating colorectal cancer has been hindered by suboptimal compliance



with strategies that can prevent and detect colorectal cancer in its early stages, monitor disease progression and predict therapy outcome. Identification of non-invasive markers for detection and prognosis is a significant area of colorectal cancer research. MicroRNAs (miRNAs) are small, non-coding RNAs that regulate expression of target genes through RNA interfering mechanism or translational inhibition.

Recently, accumulating evidence has indicated that aberrant expression of miRNA signatures is associated with cancer development and progression. Wei Zhang has begun

to investigate the potential of circulating miRNAs as biomarkers. In a proof-of-principle study, Dr. Zhang identified and validated that miR-141 was a novel plasma marker that complemented with carcinoembryonic antigen in detecting advanced colorectal cancer patients, and that plasma miR-141 is associated with poor survival in those patients.¹

By using high-throughput technology, Wei Zhang has profiled close to 1,000 microRNAs in blood of 40 colorectal cancer patients of different stages and healthy people as controls, identifying candidate microRNAs that are indicative of early stage cancer. These plasma miRNAs markers hold important clinical relevance and could give oncologists new diagnostic tools for colorectal cancer. Successful completion of Wei Zhang's NFCR research will have a long lasting impact on management of colorectal cancer and will likely change the current practice of colorectal cancer detection and prognosis.

OVARIAN CANCER PATIENTS SURVIVE LONGER WITH BRCA2 MUTATED IN TUMORS

Ovarian cancer is one of the most deadly gynecological cancers. As part of the Cancer Genome Atlas projects, Dr. Zhang's group has used an informatics method to investigate the relationships between genetic changes that are keys for ovarian cancer and their

¹ Cheng H, Zhang L, Cogdell DE, Zheng H, Schetter AJ, Nykter M, Harris CC, Chen K, Hamilton SR, Zhang W. *Circulating Plasma MiR-141 Is a Novel Biomarker for Metastatic Colon Cancer and Predicts Poor Prognosis*. PLoS ONE 6(3): e17745, 2011.

implication in treatment. A major discovery is that women with high-grade ovarian cancer live longer and respond better to platinum-based chemotherapy when their tumors have BRCA2 genetic mutations. The mutation effect of BRCA2 cousin, BRCA1, on response to chemotherapy is much less. BRCA2-mutated tumors are more vulnerable to these DNA-damaging agents, which is really exciting because there are numbers of drugs in clinical trials now that block DNA repair which might prove effective against these tumors in combinations.

Uncovering the separate potential effects of BRCA1 and BRCA2 mutations takes us a step toward a more personalized approach to treating ovarian cancer, and perhaps other cancers. Wei Zhang has discovered that those two genes – like many others involved in DNA repair – are prime targets for further research.

Of 316 cases Wei Zhang's team studied, 29 tumors had BRCA2 mutations tumors and 37 had BRCA1 mutations. Tumors were similar in grade and stage. Their findings included:

- 61 percent of patients with BRCA2 mutations survived for five years, compared with 25 percent of those with normal BRCA2 in their tumors.
- 44 percent of those with BRCA2 mutations lived three years after surgery and platinum treatment without disease progression, compared with 16 percent of those with normal BRCA2.
- BRCA1 mutations in tumors were not associated with survival.
- All of those with BRCA2 mutations responded to platinum chemotherapy, compared to 82 percent with the normal gene and 80 percent whose tumors had BRCA1 mutations.
- Their response to chemotherapy lasted 18 months, compared with 11.7 months for normal BRCA2 and 12.5 months for BRCA1 mutations.
- Tumors with BRCA2 variations also are hypermutants – they had more genetic mutations – with 84 mutations per tumor sample compared to 52 for normal BRCA2.

Zhang said this last aspect – called the hypermutator phenotype – might be both a factor in the development and growth of the tumor and a sign of its vulnerability. BRCA2 is normally involved in the repair of double-strand DNA breaks. Cells with BRCA2 mutants are less capable of repair, allowing other genetic mutations to survive and grow, the type of genomic instability that cancer thrives upon.

However, cancer cells in turn rely on DNA repair to defend themselves against DNA-damaging drugs, such as platinum-based agents. So adding drugs that inhibit DNA repair could increase the effectiveness of chemotherapy, Zhang noted. PARP-inhibitors, a new class of drug in clinical trials, block DNA repair and may also be effective in treating BRCA2 mutated ovarian cancer. Wei Zhang's Nfcr research findings have already been validated by two independent studies published in *Cancer* and *JAMA*.²

ACTIVATED IGF1R IS AN ONCOGENIC TARGET IN MALIGNANT PERIPHERAL NERVE SHEATH TUMOR (MPNST)

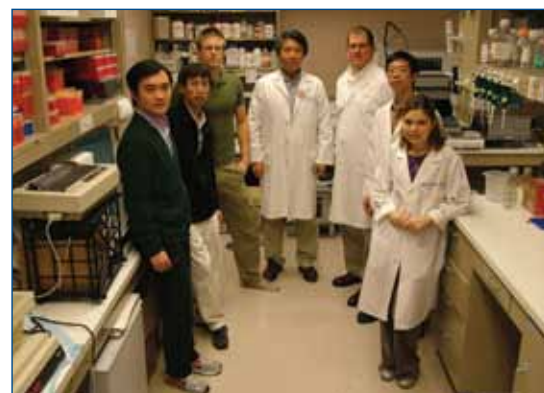
Despite aggressive surgery and high dose adjuvant chemotherapy and radiotherapy, the 5 year survival rates of MPNSTs are still poor. Genetic and molecular characterization of MPNST is needed for development of more effective therapies that target the driver events of MPNST. In research funded by the Nfcr-Hope Fund, Wei Zhang carried out a genomic study using genome-wide microarray based comparative genomics hybridization (aCGH) to profile genetic alterations of 53 MPNST tissues. Bioinformatic analysis revealed that 28.3% (15/53) and 43.4% (23/53) of cases had amplification of IGF1R and EGFR genes. Furthermore, overexpression of IGF1R and EGFR proteins occurs in 85.7% (48/56) and 58.9% (33/56), respectively, in the MPNSTs tested by immunohistochemistry. The IGF1R and EGFR expression had significant correlation with the tumor metastasis and/or recurrence.

The patients with IGF1R and/or EGFR positive expression had significantly worse disease free survival and had significantly higher hazard of tumor development than the negative ones.

These are important findings with clinical relevance because EGFR and IGF1R are targets for anti-EGFR and anti-IGF1R targeted therapeutic trials in several different types of cancers. Examples include gefitinib, erlotinib, and MK-0640 in the treatment of lung cancers.

The IGF1R is a multifunctional tyrosine kinase receptor involved in several biological processes including cell proliferation, differentiation, and survival. Aberrant activation of the IGF-I/IGF1R axis was associated with poor prognosis in many neoplasms including breast, gastric, and prostate cancers. However, there is very little information about the IGF1R expression and its prognostic significance in MPNST. Therefore, Dr. Zhang's finding that IGF1R is amplified in MPNST provides important motivation to study this pathway in MPNST and to provide laboratory evidence whether inhibition of IGF1R can be a viable approach for MPNST treatment. Wei Zhang's laboratory based research provided evidence the inhibition of IGF1R is capable of suppressing the MPNST cell growth.³ This finding offers new hope for the treatment of MPNST.

Dr. Wei Zhang is a powerful example of how Nfcr funding is paving the way for new and more effective cancer treatments that save more lives.



² Yang D, Khan S, Sun Y, Hess K, Shmulevich I, Sood A, Zhang W. Associations of BRCA1 and BRCA2 mutations with survival, chemotherapy sensitivity, and gene mutator phenotype in patients with ovarian cancer. *JAMA* 306(14):1557-1565, 2011.

³ Yang J, Ylipää A, Sun Y, Zheng H, Chen K, Nykter M, Trent J, Ratner N, Lev DC, Zhang W. Activated IGF1R is an Oncogenic Target in Malignant Peripheral Nerve Sheath Tumor. *Clin Cancer Res* 17(24):7563-7573, 2011.



ACCELERATING DISCOVERY RESEARCH HIGHLIGHTS

NFCR accelerates the pace of cancer research by recognizing innovative discoveries while they are still in their infancy, and providing scientists with the “adventure” funding to substantiate their discoveries. To maximize the productivity of its cancer research programs, NFCR has established an international network of scientists constituting our “Laboratory Without Walls” – promoting the sharing of ideas and information across research institutions and engaging top research minds from a wide range of scientific disciplines. Together, NFCR’s scientists at universities and research hospitals constitute a “research collaborative” working on cancer from diverse perspectives and actively sharing ideas and information with one another.

In laboratories across the United States, Europe, and China, NFCR scientists and their research teams are working at the leading edge of cancer research today. Highlighted here is a sampling of important research breakthroughs. To learn more about the latest research by NFCR scientists, visit www.NFCR.org.



Brian Leyland-Jones, M.D., Ph.D. – Consortium for Clinical Diagnostics (CCDx), Atlanta, is revolutionizing cancer therapy and diagnostics through the use of biomarkers. With the growing and urgent need for biomarker profiling and validation in cancer research today, the Consortium for Clinical Diagnostics (CCDx) is a partnership of scientists at research institutions and biopharmaceutical companies dedicated to facilitating genomic research and developing new diagnostic tools. CCDx provides a centralized infrastructure and expertise in genomics and molecular imaging as well as translational medicine. The Consortium provides key capabilities in all aspects of predictive medicine, including identification and validation of disease susceptibility genes and genetic signatures, pharmacogenomics, and the development of medical response tests as well as new and improved diagnostic tests – especially as they relate to cancer.



Xi-Shan Hao, M.D. – TMUCIH-NFCR Joint Tissue Banking Facility, Tianjin Medical University, Tianjin, China. Well-characterized tumor specimens, carefully gathered and preserved in a well-managed biorepository, constitute one of the most valuable resources for cancer researchers. Genetic data from tumor specimens, coupled with the development of technologies to assay the molecules and pathways in tumor cells, allow researchers to gain deeper understanding of the roles cancer-related genes, proteins and pathways are playing in different types of cancer, and are revolutionizing modern cancer therapy.

Scientists at the TMUCIH-NFCR Joint Tissue Bank collect and maintain biospecimens (tumor tissues and matching blood samples) from cancer patients fighting *all* types of cancer. This rapidly growing biorepository includes more than 24,000 fresh-frozen tissue samples and over 14,000 blood samples.

The TMUCIH-NFCR Joint Tissue Bank is part of an NFCR Tissue Bank Consortium in Asia (TBCA), a source of biospecimens essential to forward-thinking cancer research. NFCR provides consortium members access to a web-based biospecimen locator, enabling cancer researchers to determine the availability of suitable biospecimens. By providing cancer researchers access

to many different types of high quality tumor specimens, the TBCA plays an increasingly important role in cancer research.

The TBCA operates in total compliance with the highest international standards, and is governed by a TBCA Steering Committee made up of leading scientists from the NCI, Chinese Ministry of Health, as well as universities, research hospitals, and biopharmaceutical companies in the United States and China.

NEW BLOOD TEST FOR CANCER

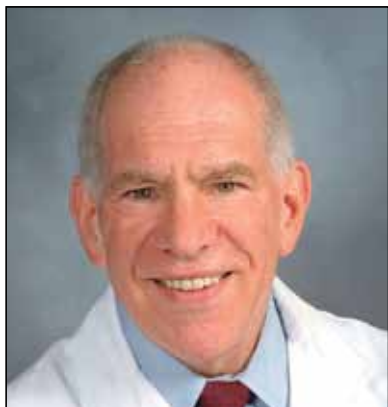


Daniel A. Haber, M.D., Ph.D. – Massachusetts General Hospital, Boston, and his team of scientists have developed a revolutionary way to detect and capture circulating tumor cells (CTCs) in the blood. This technology may provide doctors with an unprecedented means of rapidly detecting invasive cancers by using an easily administered blood test. Knowing about the presence and the genetic features of cancer cells in a patient's blood may enable the physician to identify and prescribe targeted anti-cancer treatments early on, before the disease can spread to and then reside in another organ. Such a test could also enable doctors to monitor the effectiveness of their patient's treatment and make any necessary treatment changes, increasing the positive effect of all cancer therapies.

TARGETING THE AGGRESSIVE BRAIN CANCER, GLIOBLASTOMA



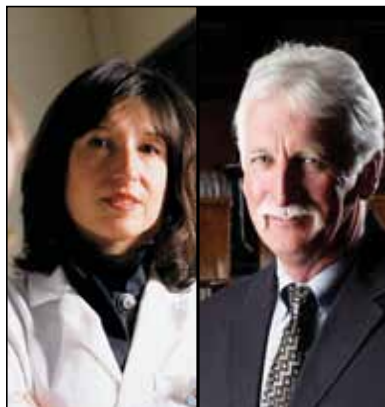
Webster K. Cavenee, Ph.D. – *Ludwig Institute for Cancer Research, La Jolla*, demonstrated in glioblastomas of two patient cohorts that a modification of tumor suppressor protein, PTEN, is an independent indicator of poor prognosis. PTEN modification in tumors is associated with and may cause the upfront and acquired tumor resistance to the targeted therapy, EGFR inhibitors. Current work is determining the molecular players of PTEN modification and linking them with different subtypes of gliomas. This ongoing research is highly significant as it will lead to the logical selection of patients and therapies, improving patients' initial response to therapy as well as extending patients' responses after a relapse.



Ronald G. Crystal, M.D. – *Weill Medical College of Cornell University, New York*, is conducting research on using recombinant proteins and antibodies to develop gene transfer treatments for glioblastoma as well as other central nervous system disorders. Dr. Crystal's lab has developed strategies

and the technology to successfully deliver genes to the central nervous system. This research will expand the technology and its application to cancer.

ANTI-CANCER DRUG DESIGN AND DISCOVERY



Alanna Schepartz, Ph.D. – *Yale University, New Haven*, has developed anti-cancer beta-peptide inhibitors to address one of the biggest challenges in drug discovery. Beta-peptide inhibitors represent a new generation of anti-cancer drugs that are highly effective and specific in targeting almost any cancer-related protein-protein interaction. Currently, Dr. Schepartz is designing beta-peptides against protein interactions involving PTHrP, a protein involved in breast cancer metastasis to bone. Beta-peptide inhibitors are a new platform technology that may positively impact the treatment of all major types of cancer.

William Jorgensen, Ph.D. – *Yale University, New Haven*, is a renowned leader in developing computational methodology and computer software to rapidly and cost-effectively develop novel targeted drugs. Dr. Jorgensen has successfully applied his methodology to rapidly obtain a novel, potent anti-HIV drug and an anti-inflammatory agent for arthritis. In 2011, his team has generated and optimized some potent lead compounds that inhibit FGFR (Fibroblast Growth Factor Receptor), which is implicated in pancreatic, breast, and other cancers. With further testing and refinement, these potential novel targeted drugs may be rapidly brought into the clinic, giving pancreatic patients hope that their cancer can be effectively treated.

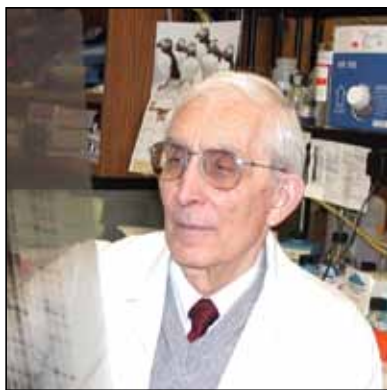


Susan Band Horwitz, Ph.D. – *Albert Einstein College of Medicine, Bronx*, is deciphering how tumors develop resistance to Taxol, and is developing new strategies to overcome the drug resistance problem in tumors. Her research has shown Taxol and the natural product, discodermolide, have complementary effects in inhibiting cell division, explaining why combining the two drugs can enhance the therapeutic activity of Taxol and may even reduce the emergence of drug resistance. In the past year, her team designed and synthesized a small library of Taxol-discodermolide hybrid molecules and showed that selected ones enhance antiproliferative effects in cancer cell lines. A single drug would eliminate complicated dosing that is necessary when two drugs are used in combination. The availability of such hybrid drugs for the treatment of lung, breast, and ovarian cancers could make a significant difference for patients whose tumors are resistant to Taxol.



Paul Schimmel, Ph.D. – *The Scripps Research Institute, La Jolla*, and colleagues are seeking to understand why human aminoacyl tRNA synthetases, which are among the essential enzymes

involved in the protein synthesis machinery found in all organisms, have distinct additional vital activities that are involved in pathways relevant to treating cancer and other diseases. In 2011, research continued on their discovery of how one tRNA synthetase stimulates production of platelets. The tRNA synthetase is being developed to treat thrombocytopenia or low number of platelets that causes abnormal bleeding – also a common side-effect of chemotherapy. tRNA synthetases are becoming a new class of medicines. Because they are based on molecules found naturally in human cells, they should have minimal untoward side effects.



Alan C. Sartorelli, Ph.D. – Yale University School of Medicine, New Haven, is a world-renowned pharmacologist who designed Cloretazine™ (now known as Onrigin™), a drug demonstrating promising treatment benefits for patients with Acute Myeloid Leukemia (AML), other types of leukemia, brain tumors, lung and other types of cancer. Onrigin is a member of a class of chemotherapy agents called guanine O6-targeting drugs which modify cellular DNA. To make Onrigin and similar agents target only cancer cells, Dr. Sartorelli has designed an inactive drug that converts to an active one only in low-oxygen or hypoxic cancer cells. With his innovative design, Dr. Sartorelli envisions these new targeted drugs will be effective in tumors that have been resistant to therapeutic intervention, providing hope to AML and other cancer patients that their cancer can be effectively treated.

PERSONALIZED MEDICINE



Waun Ki Hong, M.D. – MD Anderson Cancer Center, Houston, and his team are using the novel technology of Next-Generation Sequencing (NGS) to identify aberrant genes and molecular pathways associated with non-small cell lung cancer (NSCLC.) In a pilot project, the researchers used NGS on small tissue specimens from needle core biopsy and identified more than 3,500 genes as differently expressed in the tumor tissue as compared to normal lung tissue.

Using sophisticated software for further analysis, several pathways known to be involved in NSCLC progression were significantly overrepresented in the tumor, as well as other abnormalities in key cell functions. Importantly, NGS will allow Dr. Hong's team to identify very rare genetic changes which are expected in lung tumors, a critical "next step" toward more personalized medicine and, therefore, more effective therapies for patients with lung cancer.

Kathryn B. Horwitz, Ph.D. – University of Colorado Anschutz Medical Campus, a renowned leader in hormone-dependent breast cancer, is identifying the molecular cancer-causing factors that define the multiple groups of cancer cells that make up each breast tumor. Her vision is that each major subpopulation of cancer cells should be therapeutically targeted so that none is left to regrow after treatment. Her team's research results on the characteristics of these cancer subgroups will allow development of a cocktail of therapeutics that, after being matched to each woman's tumor, will blast each cancer cell subgroup into oblivion.



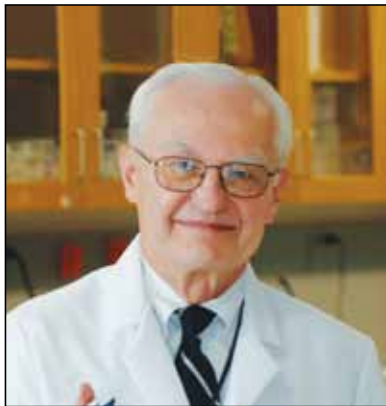
Laurence Hurley, Ph.D., Daniel Von Hoff, M.D. – NFCR Clinic for Targeted Cancer Therapies, TGen, Phoenix, are developing new targeted cancer therapies and improving the treatment efficacy of existing therapies. In the past year, these researchers continued their work on a new viable drug target for pancreatic cancer, YAP1, a gene that acts on other genes to promote pancreatic cell growth. In another research arena, the team published their work that demonstrated the combined use of an inhibitor to MEK protein with Erlotinib, the FDA-approved targeted therapy for pancreatic cancer, had enhanced efficacy in cell lines or tumor models of pancreatic cancer. These results are highly translational, as further evaluation of the combination treatment may result in new and improved treatment for patients with pancreatic cancer.



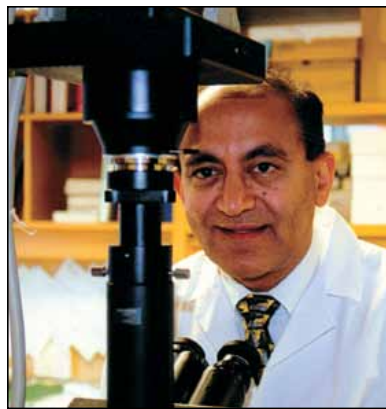
Esther H. Chang, Ph.D. – Georgetown University, Washington, DC, has developed a nanoscale, liposome-based tumor targeting drug delivery system that can carry anti-cancer agents directly to both primary and metastatic tumor cells, significantly

enhancing a tumor's sensitivity to chemo- and radiation therapy. Dr. Chang and her team successfully delivered tumor suppressor gene p53 and anti-HER2 siRNA to tumors, including breast and pancreatic tumors. In 2011, an early phase 1 clinical trial showed the p53 nanocomplex proved to be a safe, non-toxic potential targeted cancer therapy in treating patients with several types of solid tumors, and is now advancing to a phase 1B clinical trial.

ANTI-ANGIOGENESIS SHUTTING DOWN CANCER



Harold F. Dvorak, M.D. – *Beth Israel Deaconess Medical Center, Boston*, won the inaugural Szent-Györgyi Prize for his discovery of the Vascular Permeability Factor/Vascular Endothelial Cell Growth Factor (VPF/VEGF). The growth factor VEGF plays a central role in angiogenesis or the formation of blood vessels in and around malignant tumors. Dr. Dvorak's work has led to the development of anti-angiogenic therapies, a new generation of anti-cancer drugs that target tumor blood vessels. Recently, he has demonstrated that the therapeutic effects of individual anti-angiogenic drugs vary among different types of tumor blood vessels. His team has also identified several potential new therapeutic targets for inhibiting angiogenesis. Dr. Dvorak's work has significant clinical implications for the research community, as it clarifies the relative strengths and weaknesses of anti-angiogenic drugs for treating cancer, guiding the development of this critical component of effective targeted therapy.



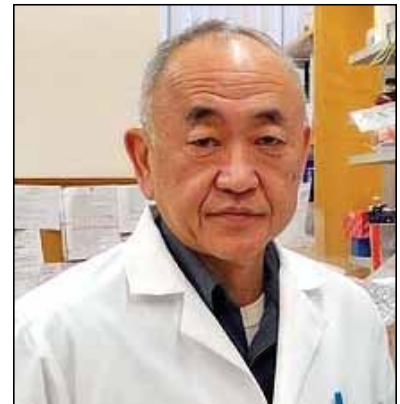
Rakesh K. Jain, Ph.D. – *Massachusetts General Hospital, Boston*, is discovering new ways of preventing resistance to anti-angiogenic therapy in glioblastoma patients. Although some patients initially respond positively to this therapy, in all cases the tumors eventually regrow. Identification of biomarkers that indicate tumor progression during therapy is urgently needed to guide the development of new treatments that will stop cancer growth. Recently Dr. Jain's team identified, for the first time, that biomarkers, PDGF-C and c-Met, are highly expressed in patients' glioblastoma cells after anti-angiogenic therapy. Research continues to evaluate these biomarkers and identify new potential candidates that may drive the tumor to progress and cause the resistance to the therapy. New effective treatments can be developed, giving patients renewed hope of winning the battle against this aggressive brain cancer.

METASTASIS SUPPRESSOR GENES

Danny Welch, Ph.D. – *NFCR Center for Metastasis Research, University of Kansas Cancer Center, Kansas City*, is addressing metastasis, the most lethal aspect of cancer, which is related to more than 90% of all cancer deaths. Center researchers and collaborators have discovered six metastasis suppressor genes, including KISS1, which when expressed in spreading cells, renders the cells incapable of growing into a secondary tumor. Researchers focus on identifying

how these genes and their proteins function to suppress metastasis in order to develop new anti-metastasis therapies. Recent results indicate that KISS1 proteins are secreted from tumor cells and cause nearby immune system cells to secrete factors that "feedback" on to the tumor cell to thwart its growth. The researchers are working tirelessly to pinpoint all the molecular players in this feedback process that suppresses metastasis. The data generated will be crucial for translating their laboratory discoveries into new anti-metastasis therapies for cancer, including breast, prostate, colon, ovarian, and pancreatic cancers and melanoma.

CHINESE HERBAL MEDICINES AS ADJUNCT TO CHEMOTHERAPY

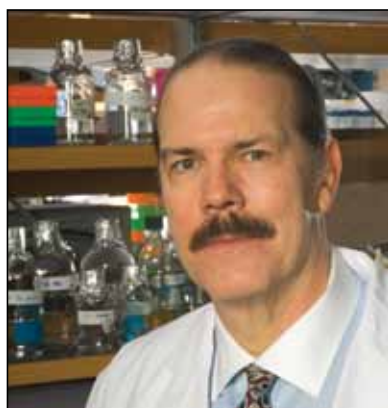


Yung-Chi Cheng, Ph.D. – *Yale University School of Medicine, New Haven*. The therapeutic effects of traditional Chinese medicines have been documented for centuries but have been regarded by modern medicine as "alternative therapy" because there was little scientific proof that they could work. For the last 10 years, with NFCR support, Dr. Cheng has explored the therapeutic properties of PHY906, a Chinese herbal medicine formula of four herbs described 1,700 years ago.

Recently completed phase I/IIa clinical trials demonstrated that combining PHY906 with chemotherapy alleviates the unpleasant gastrointestinal side effects of chemotherapy given to colorectal cancer patients.

A randomized, double-blind phase II trial will begin in 2012 and it is possible that PHY906 will improve the quality of life and increase survival time of patients undergoing chemotherapy. PHY906 could become one of the first FDA-approved oral herbal medicines for anti-cancer treatment. This breakthrough represents a paradigm shift in the way the cancer research community thinks about traditional Chinese medicine. It opens the door for new approaches to treating cancer using these ancient medicines and potentially gives physicians new and more effective options for treating many cancer patients.

CANCER TERMINATOR VIRUS

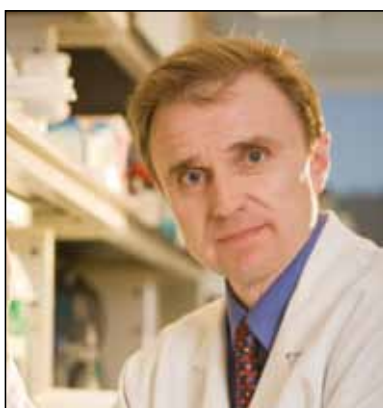


Paul B. Fisher, M.Ph., Ph.D. – *Virginia Commonwealth University School of Medicine*, has developed a novel gene therapy to treat early stage and metastatic prostate cancer.

This new therapeutic is a genetically reprogrammed virus, designed to specifically infect and destroy only tumor cells, leaving normal cells unharmed. The virus also delivers a natural product of our immune system, interferon gamma, which will seek out and destroy cancer cells that have metastasized. This powerful new gene therapy approach may soon be used to treat patients in a clinical trial.



Wayne Marasco, M.D., Ph.D. – *NFCR Center for Therapeutic Antibody Engineering, Dana-Farber Cancer Institute, Harvard Medical School, Cambridge*, is discovering and engineering therapeutic antibodies for clinical applications in cancer. The Center has established a library containing 1.6 billion different human sFv antibody-displaying phages, a tremendous resource for developing monoclonal antibody-based targeted therapies. Center researchers have identified high affinity human sFv antibodies against a unique domain of a selected cancer target for renal cell carcinoma. These reagents are being developed as new immunotherapies and diagnostic tools for kidney cancer patients who currently have no effective cancer treatment. Recent research indicates increasing types of cancer cells also have the selected target suggesting these new antibodies may have a broader use in cancer therapy.



Laurence J.N. Cooper, M.D., Ph.D. – *MD Anderson Cancer Center, Houston*, is developing new forward-looking technology which genetically engineers human immune cells for the

treatment of leukemia and lymphoma. The safety and feasibility of this novel immunotherapy were demonstrated in a phase I clinical trial in patients with CD19+ lymphoma.

To further improve the safety of this immunotherapy, Dr. Cooper has developed an innovative method that enables the engineered immune cells to target only leukemia or lymphoma cells, thereby limiting harmful targeting of normal cells. Plans are underway for the next-generation clinical trial in which a donor's immune cells will be engineered to target only cancer cells once infused back to patients during their bone marrow transplantation. The improved safety and specificity will result in more successful transplantations.

TARGETING OVARIAN CANCER



Robert C. Bast, Jr., M.D. – *MD Anderson Cancer Center, Houston*. Less than one-half of women with ovarian cancer are sensitive to paclitaxel. This commonly prescribed chemotherapeutic agent stabilizes microtubule proteins to inhibit cell division and causes cells to collapse. Finding therapeutic approaches to enhance the effects of paclitaxel would improve the outcomes significantly for women with ovarian cancer.

Through a large screening effort, Dr. Bast's team has identified genes for two groups of proteins, kinases and transporters, that when inhibited with siRNAs, sensitized cancer cell lines to the killing effects of paclitaxel. Most of the kinases also stabilized microtubules similar to paclitaxel while a few candidate kinases and transporters did not. Ongoing research is testing whether different combinations of siRNAs that enhance paclitaxel sensitivity through

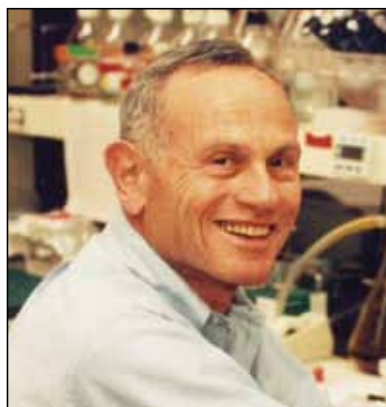
different mechanisms provide additive or synergistic anti-cancer effects. Inhibition of select kinase and transporter genes that enhance sensitivity to paclitaxel may become a promising new treatment approach for women with ovarian cancer.

IDENTIFICATION OF NEW THERAPEUTIC TARGETS



Curt I. Civin, M.D. – *University of Maryland, Baltimore*, is elucidating how the survival, proliferation, and differentiation of normal and malignant blood stem cells are regulated, with the goal of translating these findings into useful clinical tools. Dr. Civin's team discovered a set of microRNAs functioning as powerful "master switches" that control the maturation of adult blood-forming stem cells. Breaking the code of blood cell maturation may one day enable scientists to grow new blood cells for transplantation into patients with cancer or other bone marrow disorders. The researchers are further deciphering how two microRNAs may also function in normal blood cells to suppress the development of leukemia. Stay tuned for the development of the clinical potential of "microRNA mimics" for treating leukemia, as these scientists unravel the functions of these master biological switches.

CANCER PREVENTION



Michael B. Sporn, M.D. – *Dartmouth Medical School, Hanover*, is developing new triterpenoid compounds for the prevention and treatment of cancer. His highly fruitful research has resulted in several triterpenoid compounds which have potent preventative effects against liver cancer, melanoma, and highly aggressive lung cancer. Two of these agents have been evaluated in clinical trials for cancer treatment. The Sporn team is now demonstrating these agents are effective in preventing pancreatic cancer in tumor models. Anti-inflammatory properties of these compounds are being identified. With continued success, triterpenoids could be rapidly translated to the clinic to evaluate the effectiveness of these compounds in preventing this devastating disease among people who are known to be at high risk.

Janos Ladik, Ph.D. – *University Erlangen-Nürnberg, Erlangen, Germany*, is conducting research on DNA intercalating agents – anti-cancer drugs that wedge themselves into the DNA double helix to interfere with cell division and the making of RNA and proteins. Cells that are rapidly dividing, such as cancer cells, are inhibited by certain intercalating agents. Dr. Ladik uses theoretical physics and super computers to investigate the use of DNA intercalating agents as cancer preventive agents, inhibiting the formation of cancer-causing mutations and thereby preventing cancer initiation.

Helmut Sies, M.D. – *Heinrich-Heine-Universität, Düsseldorf, Germany*, is well recognized for his discovery of the skin cancer prevention effects of the micronutrient, lycopene, the antioxidant found in tomatoes and carrots. Dr. Sies continues to pioneer research in the critical area of micronutrients of which one focus is on selenium, a trace metal essential for good health. Dietary or supplemental selenium is incorporated into selenoproteins – critical cell proteins that have anti-oxidation functions. Many intervention trials suggest a beneficial impact of selenium for prevention and therapy of prostate, colon, lung, and liver cancer.

Dr. Sies' recent results indicate that the selenomethione may be a safe dietary supplement to increase our body's production of anti-oxidative selenoproteins. In contrast, sodium selenite and methylseleninic supplements carry a risk of developing Type-2 diabetes.

MOLECULAR IMAGING

Jim Basilion, Ph.D. – *NFCR Center for Molecular Imaging, Case Western Reserve University, Cleveland*, is building a new technology platform utilizing molecular imaging for early detection and improved treatment of many types of cancer. Utilizing an entirely new technique that permits the simultaneous imaging of multiple molecular markers, scientists in this Center make it possible to identify cancer at a very early and more treatable stage, significantly improving patients' chances of survival. Technologies developed at the Center can also help surgeons determine tumor margins during an operation and make it possible for more complete surgical removal of infiltrated tumor tissue such as brain cancer. One molecular imaging approach is currently being tested in a clinical trial to assess if margins of lumpectomy specimens from the breast are free of cancer. Success with this technique could dramatically reduce the current re-excision rates of 40-50%.

NFCR CLINIC FOR TARGETED CANCER THERAPIES

Next-Generation Sequencing techniques are being used by clinical researchers at the NFCR Clinic for Targeted Cancer Therapies in Scottsdale to identify and match the genetic makeup of a patient's cancer with anti-cancer treatments that target that patient's cancer. So far, this new approach to treating cancer reaches only a small segment of cancer patients, but for them, these new approaches to treating cancer are stunningly effective. This evolving genetic knowledge about cancer's inner workings is changing everything. It alters how we think about cancer biology, how we develop new drugs, how we test those drugs in clinical trials, how we diagnose and treat an individual's cancer.

For more than half a century, treatment of invasive cancer has relied mainly on surgery, chemotherapy, and/or radiation therapy. These approaches to treating cancer have had the effect of attacking cells in the body indiscriminately, since most of these treatments cannot distinguish healthy cells from cancer cells. These approaches are like mowing a lawn overrun with dandelions – it looks as though the weeds are gone, but the roots are intact and the dandelions come back.

In addition, due to the distinct genetic makeup and environment of each individual, those who appear to have the same type of cancer may respond very differently, and sometimes adversely, to a potentially beneficial treatment. By many estimates, fewer than 25% of cancer patients benefit from the drugs they take as part of traditional chemotherapy, and the rest merely experience the side effects caused by these highly toxic chemicals. Even worse, these treatments are extremely expensive. The dollars spent on treatments that don't work, and lost opportunities for potentially more effective therapies, are staggering.

But this is an age of cancer genetics, and we now have new molecular weapons in the war against cancer.

Now there is hope.

Because of genetic research, we now understand that cancer is not one disease, but many diseases with different combinations of genetic mutations that respond differently to therapies. Doctors can detect and target a tumor's underlying genetic malignancy which is often driven by just one or two mutated genes in a cancer cell, without the widespread collateral damage to healthy tissue of traditional radiation and chemotherapies. It is the difference between debugging a computer by tinkering with the hardware versus reprogramming the software.

But we cannot wait another three decades for these discoveries to reach cancer patients who need them now.

Targeted cancer therapies are a new class of anti-cancer drugs that home in specifically on cancer cells, disrupting the molecular signals that sustain them. This is a new approach to treating cancer, and every month researchers are identifying another genetic marker that says "treat here." If a patient is treated based on that target, the chance of having an anti-tumor response isn't 5 percent, it's upwards of 80 percent.¹



Daniel Von Hoff, M.D.

More and more, we can test an individual's cancer genes to determine the most effective treatment and predict the likelihood of metastasis and recurrence. Clinical researchers at the NFCR Clinic for Targeted Cancer Therapies in Scottsdale are using genetic sequencing of a patient's tumor genome versus normal genome to clearly characterize the potential targets in an individual patient's tumor.

Clinic Director, Daniel Von Hoff, M.D., is sequencing, or spelling out, the DNA of patients with cancer – spelling out all 3 billion letters in their DNA, to help determine the best course of treatment. Through Dr. Von Hoff's pioneering efforts in whole genome sequencing as a tool for matching a patient's

genetic makeup with anti-cancer treatments, the NFCR Clinic for Targeted Cancer Therapies represents the future of medicine where information gleaned from the complex assemblage of an individual's DNA can be used to target deadly tumors, even among patients with rare cancers.

Just this year, Dr. Von Hoff sequenced the entire DNA and RNA of metastatic adenocarcinoma of the lung from a patient who never smoked. The patient, a 61-year-old woman whose lung cancer had entered her bloodstream and spread to other parts of her body, had been treated with several types of chemotherapy.

Dr. Von Hoff used Whole Genome Sequencing, also called Next-Generation Sequencing, to look at all 3 billion chemical bases of the patient's normal DNA, as well as the patient's tumor DNA. Researchers at the Personalized Medicine Research Clinic went further by examining the normal and tumor RNA for whole transcriptome sequencing, which can reveal the possible defects in how proteins are synthesized. This provided an even more intricate view of the tumor's biological make up and what might have led to her cancer.

The results of the patient's sequencing were discussed with her treating oncologist who used this data along with other information to help decide the best course of future treatment. A review of well-characterized cancer-related genes found that a mutation resided in the TP53 gene, a mutation in the tumor (one base change in the genetic code), and that the mutation was always present in both the DNA and RNA. Such a mutation can halt the creation of tumor suppressor genes and result in the generation of a tumor. Interestingly, the cancer specimen showed no loss of heterozygosity, in which one side of the DNA's chromosome becomes inactive because of a mutation.

¹ JR Nevins, "Genomic Signatures to Guide the Use of Chemotherapeutics," *Nature Medicine*, November 2006, p. 1294.

NFCR|NCI INTERNATIONAL WORKSHOP TIANJIN

This is an age of cancer genetics, calling for new strategies and new tools.

Promising new cancer treatments rely on identifying the specific molecular profile of each tumor and understanding the susceptibility imparted by the patient's underlying genetics, to optimize through pharmacogenomics the therapy that will be most effective and least toxic. Such targeted cancer therapies will be more successful and less costly than conventional treatments. However, the success of these new cancer treatments depends upon having high-quality human biospecimens for screening, monitoring, and research, so that findings at the bench can be translated into therapeutic regimens for the patient.

In this way, cancer tissue can be considered the center of the molecular-medicine universe, and as biospecimen quality underpins the movement to

personalized molecular medicine, collaborative efforts – including private-public partnerships like NFCR's Tissue Bank Consortium of Asia – can accelerate drug discovery and help defeat cancer.

Accordingly, in partnership with the U.S. National Cancer Institute Office of Biorepositories and Biospecimen Research, the National Foundation for Cancer Research and the Tianjin Medical University Cancer

Institute and Hospital hosted a “U.S.-China Workshop on Common Standards for Biorepositories and Biospecimen Research” in Tianjin, China. This international workshop was designed to advance cancer research by raising awareness about the importance of developing and implementing common standards for biorepositories internationally. Great steps were made to develop an interoperable biorepository infrastructure to

promote resource sharing and team science to facilitate multi-institutional, high-throughput genomic and proteomic research.

An overriding theme of the workshop was one of “collaboration, communication, and sharing credit.” The workshop agenda highlighted the role of biospecimens in translational research and molecularly informed medicine. Scientists discussed the importance of robust information systems, and emphasized how this data must be interoperable with clinical and research data systems. The workshop featured examples of successful collaborations that have contributed to the development of high-quality biorepositories in Tianjin, Shanghai, and Japan.

Invited participants from China, Finland, Japan, Singapore,

the United States, and Vietnam included biospecimen researchers, biorepository managers, pathologists, bioinformaticians, and epidemiologists, as well as representatives of pharmaceutical companies and government officials. Additional support was provided by Pfizer, Amgen, and Eli Lilly, as well as Novartis, Takeda Millennium, Abbott Laboratories, and the Asian Fund for Cancer Research.

The poster features a large, stylized graphic of a DNA double helix composed of colorful dots. At the top, there are maps of the United States and China. The title is prominently displayed in English and Chinese. Below the title, the location and date are given in both languages. A list of goals is presented in English and Chinese. The right side of the poster lists the logos of participating organizations: Pfizer, AMGEN, Oncology (Lilly), NOVARTIS, Abbott, Takeda/MILLENNIUM, and ASIAN FUND FOR CANCER RESEARCH. At the bottom, logos for the NATIONAL FOUNDATION FOR CANCER RESEARCH, NATIONAL CANCER INSTITUTE, OBBR, and the Tianjin Medical University Cancer Institute & Hospital are shown.

**U.S.-China Workshop on
Developing Common Standards
for Biorepositories and Biospecimen Research**
中美生物标本标准化研究研讨会

Tianjin, China
October 19, 2011

中国天津
2011年10月19日

- ❖ Advance Translational Research
- ❖ Develop New Diagnostic Tools and Therapies
- ❖ Save Cancer Patients Lives
- ❖ 推动科研成果临床应用的转化
- ❖ 促进新型诊断和治疗手段的研发
- ❖ 挽救癌症患者生命

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天津市肿瘤医院
TJ MEDICAL UNIVERSITY CANCER INSTITUTE & HOSPITAL

6TH ANNUAL SZENT-GYÖRGYI PRIZE

The 6th Annual Szent-Györgyi Prize for Progress in Cancer Research was awarded to Beatrice Mintz, Ph.D., Professor and Jack Schultz, Chair in Basic Science at the Fox Chase Cancer Center in Philadelphia, PA. The Prize was presented to Dr. Mintz on March 8, 2011 at The Westin New York at Times Square during an award ceremony featuring a keynote address by Lewis C. Cantley, Ph.D., Professor, Beth Israel Deaconess Medical Center.

“The Szent-Györgyi Prize is an honor to receive in celebration of Dr. Szent-Györgyi’s extraordinary vision and accomplishments,” said Dr. Mintz. “This recognition is an encouragement for ongoing research, public education about cancer, and improved treatments. I am deeply pleased to find myself in the company of previous awardees whose work I have long admired.” Dr. Mintz’s discoveries have a broad relevance for cancer research and for new cancer treatment prospects.

Dr. Mintz received the Prize for her discoveries of the relationship between development and cancer, based on construction and analysis of chimeric and transgenic mouse models. Her work has enabled the study of cancer and other genetic diseases to be carried out within the framework of the whole organism.

“Dr. Beatrice Mintz’s groundbreaking research has changed the way scientists are able to investigate the progression and metastasis of cancers and shed light on this disease,” said Peter K. Vogt, Ph.D., Chair, 6th Annual Szent-Györgyi Prize Selection Committee, and

last year’s Prize winner. “Her contributions to the field of cancer research are remarkable.”

Dr. Mintz first analyzed development by producing chimeric individuals in which genetically different cells coexisted throughout life. She found that normal development is based on an expanding clonal organization in which a succession of small numbers of stem cells are competent to divide or to differentiate further. In cancer, the differentiation option is diminished, while the capacity to divide may increase. Thus, cancer may be regarded as an aberration of development.

Dr. Mintz was also the first to discover the importance of the microenvironment in the behavior of stem cells in the organism.

Her experiments showed that when stem cells from a teratocarcinoma, a type of tumor derived from a “multipotent” stem cell, were transferred into a normal early embryo, those cells contributed, along with host cells, to development of the wide range of normally functioning tissues. This “normalization” of the tumor stem cells is attributable to the normal microenvironment in which they were placed, and has influenced many fields of biology.

The first transgenic model of malignant melanoma was produced in Dr. Mintz’s lab. This genetically engineered model is currently the only one that encompasses different subtypes of primary skin melanomas, which undergo widespread metastasis, thereby mirroring the disease in people.

The Prize is named in memory of 1937 Nobel Prize-winning scientist and NFCR Co-Founder, Albert Szent-Györgyi, M.D., Ph.D.,

who won the Nobel Prize for Physiology and Medicine in 1937 for his discovery of vitamin C. In 1973, Dr. Szent-Györgyi helped change the face of cancer research by co-founding NFCR, to provide scientists with the financial support necessary to pursue innovative, basic cancer research. The Prize is awarded annually to a scientist, nominated by colleagues or peers, who has contributed outstanding, substantial research to the fight against cancer and whose accomplishments have helped improve treatment options for cancer patients.

The 6th Annual Szent-Györgyi Prize Selection Committee was Chaired by Peter K. Vogt, Ph.D., and Co-Chaired by Sujuan Ba, Ph.D.



STRETCH TO THE CURE



Some run, some walk, but the bold STRETCH their way to the cure! For the second year, The National Foundation for Cancer Research

partnered with Yoga and Pilate Studios across America to Stretch for the Cure. From September 19–25, studios and instructors participated by distributing educational materials on cancer prevention to their students, and donated proceeds raised in each of their classes to NFCR.

STICK IT TO CANCER

High school and collegiate field hockey teams from across the country continue to show their support and grow Stick it to Cancer events. The field hockey community is an amazing group to work with and they continue to raise awareness and support in creative ways.

From August 12–19 in Louisville, KY, Ballard, Christian Academy, Collegiate, Eastern, Kentucky Country Day, Manuel, North Oldham, and Presentation's Varsity Field Hockey teams participated in a preseason tournament that raised over \$7,000 for NFCR cancer research.

Special recognition goes to Amy Charasika (Kentucky Country Day's coach) and Jenny Dobbins (former coach and parent) for their organizing and fundraising efforts, in recognition of their friends and family who have been affected by cancer. "The tournament," Jenny said, "brings everyone together from different schools for a great cause. It shows that we can be rivals on the field, but after the game we are all friends and we do what we can to support each other and give back to our community."



Tournament Winners from Louisville Collegiate School.

TAKING ACTION



New Answers for Cancer: NFCR Donors are helping us solve the Cancer Puzzle –helping us solve the scientific mysteries of cancer to bring promising new therapies to patients.

NFCR's Kick Cancer program is an incredible success. High school, college, and even professional teams join together in the fight against cancer. Participants sell t-shirts, hold bake sales, release balloons to honor and remember their loved ones, and distribute materials to raise cancer awareness. Even the smallest gestures make a difference, and we are grateful to work with such caring individuals and communities.



BEAT CANCER WITH A BAT

During the 2011 Girls Softball Season, teams from around the nation chose to Beat Cancer with a Bat by hosting fundraisers during their games and tournaments. The National Foundation for Cancer Research was honored to be a part of each of these girls' seasons, and is hopeful that they will continue their contributions in the fight to find cures for *all* types of cancer. Beat Cancer with a Bat was one of NFCR's top sports fundraisers in 2011, and we are excited for the future of this growing program.

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THE LUCY FUND FOR METASTATIC BREAST CANCER RESEARCH



Sujuan Ba, NFCR with Lucy

Lucy, a college professor and mother of two, was diagnosed with metastatic breast cancer in 2008 at age 42. Says Lucy, “While there was plenty to read about breast cancer, I found almost nothing about stage IV. It was as if I didn’t exist, like I was already a lost cause.” Lucy turned her passion for fighting metastatic breast cancer into something bigger – **The Lucy Fund for Metastatic Breast Cancer Research** at the National Foundation for Cancer Research.

The Lucy Fund has raised \$110,000 for metastatic breast cancer research – a form of the disease that took the life of Elizabeth Edwards and one that urgently demands more research funding. “While there is no cure,” says Lucy, “there are therapeutic options, and if we can get more research and attention focused on stage IV, it may one day be possible to treat stage IV like a chronic, rather than a deadly, disease.”

Funds raised through the Lucy Fund support Danny Welch, Ph.D., Director of the NFCR Center for Metastasis Research at the University of Kansas. He and his collaborators have discovered six genes that suppress the spread of certain types of cancer – including breast cancer. Right now, Welch and his team are working to understand the mechanisms that govern how these genes work and, more importantly, considering ways that these discoveries can be rapidly translated into new targeted therapies for patients whose breast cancer has spread.

DAFFODILS & DIAMONDS

Diamonds glittered and daffodils bloomed while beautiful models strutted the latest fashions down the runway at the 30th Annual Daffodils and Diamonds Luncheon at the Congressional Country Club in Bethesda, on March 10, 2011. The event, emceed by Alison

Starling, WJLA TV ABC 7 News Anchor, and co-chaired by Mrs. Powell Smith Lindsay and Mrs. Claudia H. Neal, featured some of the area’s most prominent women. This Annual Luncheon has become a spring ritual in DC, drawing hundreds of women and raising hundreds of thousands of dollars since its inception to fund breast and ovarian cancer research in the Capital region.

Long-time Daffodils and Diamonds Board member and three-time cancer survivor, Lynn Novelli, strongly believes “that NFCR’s research on early detection and expanding cancer treatment options will make it possible for cancer patients to live longer, healthier lives. NFCR’s approach of leaving no stone unturned in the search for cures is the right way to go.”

Cancer is so close to home for all of us and this event is really all about celebrating the survivors, remembering those who have passed on, and committing ourselves to continuing the important fight against cancer. “We all have to dig a little deeper and resolve to keep working to conquer one of the world’s most prevalent life-threatening diseases,” said 2010 Co-Chair Nancy Cole.



The Daffodils and Diamonds Luncheon supports breast and ovarian cancer research, education, and prevention. Daffodils and Diamonds has the ability to work “hands-on” with NFCR to fund research locally.

This year’s event featured fashions from Lord & Taylor, with jewelry provided by Lynn Novelli.

Companies contributing to the success of the event included Lord & Taylor, Gucci, John Greenan & Sons Jewelers, Marriott, Bloomingdales, Ritz Carlton, Georgetown Cupcake, Fuddruckers, Dave & Busters, and others.

JANIS AND LOVE USE STAR POWER AND BEAUTIFUL MUSIC TO ADVANCE CANCER RESEARCH

Tim Janis, an award-winning composer, pianist, and conductor, decided the cancer problem was just too serious for him to remain on the sidelines. He approached NFCR with an idea. “If I make a commitment to NFCR, a sizable commitment, could you use my support as a challenge to encourage other donors to come on board and join in the battle against cancer?” NFCR’s answer was an enthusiastic, “Yes!” But in truth, we didn’t realize how powerful **Tim’s Matching Gift Challenge** would be in generating new support for cancer research.



In the three years since the first Matching Gift Challenge, NFCR’s loyal donors have given over \$1.5 million.

Tim’s friends in the music world have not remained in the audience, either. Actress and Rock and Roll Hall of Fame singer Darlene Love reached for the microphone and developed a collaborative album with Tim, “Celebrating America at Christmas.” The unique blend of these two mega-talented artists resulted in one of the most beautiful holiday albums around, and one that is sure to be timeless.

“Nothing is more valuable than the gift of good health,” says Tim. “Without it, Darlene and I could not enjoy those things we love most in life, and our greatest love is music.” Darlene added, “It was such a natural thing for us to partner together...and we are both very proud to have the proceeds committed to such an important cause.”

GOLF FOR A CURE

The 8th Annual Golf for a Cure Classic was held on September 12, 2011 at Kenwood Golf and Country Club in Bethesda, MD. 140 players from as far away as Massachusetts, Illinois, and Nebraska gathered for a warm and sunny day of golf. After showcasing their talent in the putting contest, golfers enjoyed a hearty BBQ lunch before hopping in their carts to conquer the golf course. Following a day of straight drives and birdies, golfers returned to the clubhouse where they enjoyed dinner, followed by Silent and Live auctions, and Raffle drawings throughout the evening. Paul Fisher, M.Ph., Ph.D., at Virginia Commonwealth University, spoke about gene therapy and the “Cancer Terminator Virus,” which destroys cancer cells without damaging surrounding healthy tissue (*see Paul Fisher, page 11*).

This year’s tournament, which raised over \$80,000 for NCFR cancer research, was sponsored by **Calmark, Inc.**, with other significant sponsorships from:

- Atlas Wood Floors, Inc.
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“We are so grateful to all of our sponsors and for the volunteers who donated their time to work on this event,” said Wendy Gowdey, a long-time cancer research supporter and Co-Chair of the tournament with Sarah Funt. “We couldn’t have done it without them, and because of their contributions we were able to raise thousands of dollars to fund NCFR’s groundbreaking research.”



THE MURIEL ETTINGER MEMORIAL FUND

Allan Ettinger of Chicago lost his mother, Muriel, when he was just 14 years old after her long battle with lung cancer. “I will never forget those painful memories of seeing her suffer both from cancer and from the side effects caused by chemotherapy.” Cancer kills almost half a million Americans each year, and lung cancer is the No.1 killer in the U.S., accounting for almost 30% of all cancer deaths. Through the **Muriel Ettinger Memorial Fund**, Allan is raising money for lung cancer research and public education on second-hand smoke – in memory of his mom.

THE HOPE FUND FOR SARCOMA RESEARCH

Six years ago, Marianne and Ken Bouldin’s daughter Jen was diagnosed with MPNST, a rare and aggressive form of soft tissue sarcoma. Says Marianne, “We listened, frustrated, as doctors explained the lack of treatment options available to sarcoma patients.” The Bouldins realized that more sarcoma research was badly needed.

Fortunately, Jen made it through. But Marianne and Ken were determined to make sure that other families would not have to go through the same frustration. When Jen was pronounced cancer-free, Marianne and Ken established the **Hope Fund for Sarcoma Research** at the National Foundation for Cancer Research. “Our goal was to provide research funding for an improved understanding, and ultimately, effective treatments for MPNST and other sarcomas,” says Marianne. Their efforts are paying off. Hope Fund scientists have made several major scientific observations, one that will soon be published and two that are under review by major cancer research journals.

The Hope Fund has raised over \$205,000! Today, Jen remains cancer-free, and thanks to her parents’ ongoing efforts to support sarcoma research by NCFR Project Director Wei Zhang, Ph.D., at the University of Texas MD Anderson Cancer Center (*see article on page 4*), she and the 10,000 other patients diagnosed yearly with soft tissue sarcomas may have a better chance of living out their entire lives cancer-free.

EXTRAORDINARY SUPPORT

2011 was distinguished by the extraordinary breadth and depth of support for NCFR. An unprecedented number of donors, corporations, foundations and institutions made gifts totaling \$12,675,779. We are deeply grateful to all of our donors for their generosity and confidence in our vision of *Research for a Cure*. Every gift, large and small, is an investment in new and better ways to prevent, diagnose and treat cancer. NCFR is about cancer research, for research will cure cancer.

On these pages, we are pleased to recognize those donors, corporations, foundations and institutions who made significant gifts to the National Foundation for Cancer Research in 2011.

Anonymous (154)

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