Accelerating Progress to Save Lives

MD Anderson’s Plan to End Cancer

Even as the number of survivors in the U.S. is expected to grow to an estimated 20 million by 2026, according to the American Cancer Society, cancer remains one of the most destructive and vexing diseases. An estimated 100 million people worldwide are expected to lose their lives to cancer in this decade alone. As its incidence has increased, cancer is now the second leading cause of death in the United States and worldwide.

The University of Texas MD Anderson Cancer Center’s Moon Shots Program™ is collaborative effort to accelerate the development of scientific discoveries into clinical advances that save patients’ lives. Launched in the fall of 2012, the program already has yielded notable discoveries across the spectrum of cancer care, including prevention, early detection and treatment, and has inspired tremendous philanthropic support.

The program takes its inspiration from President John F. Kennedy’s famous 1962 speech, made over 50 years ago at Rice University, just a mile from the main MD Anderson campus. “We choose to go to the moon in this decade … because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win,” Kennedy said.

“We choose to go to the moon in this decade … because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win.”

— President John F. Kennedy
The Moon Shots

First inspired by MD Anderson's fourth full-time president Ronald A. DePinho, M.D., the Moon Shots Program established focused, multidisciplinary teams of clinicians and researchers tasked with developing comprehensive approaches to improving the lives of patients and reducing cancer mortality. Each component of the program undergoes regular internal and external peer-review to prioritize and direct ongoing efforts, focusing on those most likely to have significant, rapid impact for patients. Philanthropic funding goes directly to support these areas of priority research and program infrastructure.

Beginning with six Moon Shots, the program was expanded in 2015 for a total of 13 disease-focused initiatives, focused on:

- B-cell Lymphoma
- Breast Cancer
- Chronic Lymphocytic Leukemia
- Colorectal Cancer
- Glioblastoma
- High-Risk Multiple Myeloma
- Human Papillomavirus (HPV)-Related Cancers
- Lung Cancer
- Melanoma
- Myelodysplastic Syndromes and Acute Myeloid Leukemia
- Ovarian Cancer
- Pancreatic Cancer
- Prostate Cancer

B-Cell Lymphoma Moon Shot

Lymphoma is the most common form of blood cancer in the developed world. Approximately 85 percent of non-Hodgkin lymphomas form from B cells, white blood cells that are an important part of the body’s immune system. In most cases, this deadly malignancy develops resistance to all therapies, eventually leading to relapse. The B-cell Lymphoma Moon Shot team aims to double the cure rate for this cancer by focusing on overcoming disease mechanisms that resist promising treatments. They hope to eliminate this disease by developing new predictive tools based on immunologic and genomic biomarkers, discovering new molecular targets for therapy, and using novel immunotherapies, targeted drugs and cellular therapies.

Breast Cancer Moon Shot

The Breast Cancer Moon Shot uses precision medicine to determine pre-surgical treatment for newly diagnosed, high-risk breast cancers. Optimization of treatments that go throughout the body to kill cancer cells in the breast, as well as undetectable cancer cells in other areas of the body, offers the greatest opportunity of cure for the disease. Our focus is to test innovative targeted-therapy strategies using cutting-edge molecular profiling of these cancers in order to tailor therapy based upon tumor subtype. We are also exploring what causes tumor cell resistance by collaborating with both the APOLLO and CGL platforms to genomically characterize serial tumor biopsies pre- and post-therapy in order to assess clonal change due to treatment. In addition to our treatment-specific strategies, we also support the development of patient derived xenograft models and the preclinical evaluations of these models. The information generated from these experiments will serve to generate the second phase of targeted therapies for breast cancers that are resistant to standard drugs.

Chronic Lymphocytic Leukemia Moon Shot

The Chronic Lymphocytic Leukemia (CLL) Moon Shot focuses on identifying and developing curative strategies for all patients with CLL, with the intention of doubling the cure rate for the disease. The drug development project seeks to understand resistance mechanisms that arise and enable cancer to evade effective new targeted therapies for CLL and identify novel agents or combinations that have the potential to effectively eradicate the disease and replace chemotherapy. The immunotherapy project aims to harness patients’ own immune systems to treat and prevent recurrence. The genomics project is identifying key predictors of treatment response in order to improve risk assessment and prevention of secondary cancers related to CLL or to treatment, as well as progression to Richter’s Syndrome.

Colorectal Cancer Moon Shot

Colorectal cancer is the second leading cause of cancer death in the U.S. and the third most common cancer in
men and in women. The Colorectal Cancer Moon Shot™ team is helping lead this field by focusing on improving early detection and prevention through less invasive, blood-based screening methods. The team is testing a personalized approach to treatment with vaccine-based immunotherapies. Another project deeply characterizes colorectal cancer subtypes and precancerous growths based on integrated molecular and genomic analyses to improve targeted treatment.

Glioblastoma Moon Shot
Current treatments for glioblastoma are low in number and short on effectiveness. The Glioblastoma Moon Shot™ aims to improve the five-year survival rate for glioblastoma patients to 40 percent by providing insights into the molecular landscape of this intractable disease, rapidly translating new diagnostic and therapeutic approaches based on rigorous preclinical vetting, and using window-of-opportunity clinical trials to verify modulation of target and mechanisms of therapeutic resistance prior to proceeding to later stage clinical trials.

High-Risk Multiple Myeloma Moon Shot
Multiple myeloma is the second most commonly diagnosed blood malignancy. While survival for most myeloma patients has been dramatically improved by new classes of drugs, stem cell transplants and their combinations, progress has lagged for patients with high-risk disease. The High-Risk Multiple Myeloma Moon Shot™ is studying immunotherapies in clinical trials to prevent high-risk precursor conditions from progressing to symptomatic multiple myeloma. Cellular immunotherapy with umbilical cord-derived immune cells is being tested in combination with stem cell transplantation to improve outcomes for those with high-risk disease. Correlative genetic and biomarker research is underway to identify new druggable protein targets and develop new therapies.

HPV-Related Cancers Moon Shot
Human papillomavirus (HPV) is a group of more than 150 related viruses. While certain forms of the virus cause common skin warts (papillomas), others can lead to cervical, oropharyngeal, anal and other cancers. The HPV-Related Cancers Moon Shot™ is taking three approaches to defeating these cancers: prevention and screening, including projects to dramatically increase HPV vaccination rates through education and policy, and to increase access to early diagnosis through screening, outreach and new clinical trials; discovery, which will identify new targets for therapy through an integrated effort across disease sites; and immunotherapy and novel trials, which will capitalize on the immune system’s ability to fight cancer.

Lung Cancer Moon Shot
The Lung Cancer Moon Shot™ develops new integrated approaches to change the way we prevent, detect and treat lung cancer. The prevention project develops new approaches to enhance adult smoking cessation strategies through novel, personalized clinical trials and helps to disseminate unique MD Anderson cessation tools through a Certified Tobacco Treatment Training Program. The early detection project is conducting a 10,000-person international trial to identify predictive blood-based biomarkers to detect lung cancer at an early stage when it is most curable. The GEMINI project looks to change the paradigm for treating lung cancer by performing molecular profiling on patients’ tumors, using the information to personalize treatments, and developing new therapeutic regimens with combinations of targeted and immunotherapies with surgery and radiation.

Melanoma Moon Shot
The Melanoma Moon Shot™ advances improved prevention and treatment of this deadly and aggressive form of skin cancer. The team focuses prevention efforts on projects to reduce ultraviolet ray exposure in children and adolescents through a multifaceted approach, leveraging public policy and education in addition to educating providers on the use of dermoscopy to increase diagnostic accuracy and early detection of melanoma. Treatment projects seek to reduce the risk of relapse and death by developing effective personalized approaches for patients with local and regional disease; predictors of benefit/response and toxicity from available treatments in advanced stage; and new treatments across the continuum that fill unmet clinical needs, including novel targeted and immunotherapy combinations.

Myelodysplastic Syndromes and Acute Myeloid Leukemia Moon Shot
Myelodysplastic syndromes (MDS) and acute myeloid leukemia (AML) are a complex group of bone marrow disorders characterized by overproduction of immature blood cells. Since 2013, the MDS and AML Moon Shot™
has made significant developments that have translated into improved outcomes for our patients. We are focusing on: understanding clonal hematopoiesis, which may lead to identification of people at risk of developing MDS, AML, or other conditions; developing state-of-the-art cellular transplantation strategies to contribute to the cure of patients with MDS and AML; understanding blood formation anomalies, potentially leading to new therapeutic approaches to MDS and overcoming hypomethylating agent failure; and eradicating minimal residual disease from patients with AML. Our program has one objective: curing these complex disorders.

Ovarian Cancer Moon Shot
The Ovarian Cancer Moon Shot™ is an integrated initiative to lower mortality from two of the most aggressive types of women’s cancer: high-grade serous ovarian cancer and chemo-resistant low-grade serous carcinoma. For ovarian cancer patients, precision medicine options include targeted therapy clinical trials and personalized surgery based on a less-invasive laparoscopic evaluation. An upfront therapy (the Anderson Algorithm) dramatically increases the frequency of complete removal of all visible tumors. An innovative group of window-of-opportunity neoadjuvant trials aims to establish better timing for these targeted therapies, including a number of immune-related targets, thereby increasing the personalized approach of an individual patient’s tumor. Extensive identification and analysis of both target mutations and molecular biomarkers are key first steps in developing practice-changing therapies for the low-grade tumors. The team works to understand tumor biology and develop new treatments to target tumor adaptation and resistance to therapy.

Pancreatic Cancer Moon Shot
Pancreatic cancer is the most deadly cancer, with a five-year survival rate of five percent. The Pancreatic Cancer Moon Shot™ focuses on early detection methods, development of predictive blood-based biomarkers to guide pre-surgical targeted therapy, and testing of new immune-based therapies, such as “personalized” T cells, to dramatically impact the mortality rate of patients. The team also established MD Anderson’s first pancreatic cancer high-risk clinic to screen and advise people at increased risk, such as those with multiple family members with the disease or pancreatic cysts, as well as elderly patients with newly diagnosed diabetes.

Prostate Cancer Moon Shot
The Prostate Cancer Moon Shot™ aims to reduce deaths and to increase progression-free survival in patients with treatment-resistant prostate cancer. This effort builds on recent clinical advances, including novel drug agents that have demonstrated prolonged response for early prostate cancer, development of second-generation androgen signaling inhibitors, as well as existing life-prolonging bone targeted therapy to anticipate or treat prostate cancer bone metastases. The Moon Shot also seeks to provide objective evidence that combination chemotherapy is more successful than single-agent chemotherapy in defined subsets of patients. In addition, the team aims to further advance development of targeted therapy approaches for treatment of refractory prostate cancer.
The Platforms

The Moon Shots Program established 10 platforms, which provide unique expertise, technical support and novel infrastructure to support the team science approach and accelerate the translation of data and discoveries for patients’ benefit.

The research platforms, which work across the Moon Shots, continue to advance therapies to the clinic and evaluate patient data to refine clinical strategies, ensuring patients receive the best care specific to their cancer.

These platforms include:

**Adaptive Patient-Oriented Longitudinal Learning and Optimization (APOLLO)**
A clinical framework aimed at quality assurance of data and biologic samples by providing an operations-driven structure that accelerates research-driven patient care. Its goal is to ensure that high-quality, longitudinal, phenotypically relevant clinical and research data are captured systematically, resulting in accelerated learning and improved outcomes.

**Adoptive Cell Therapy (ACT)**
Enables rapid development and implementation of innovative cell-based therapies for a broad range of cancer types with the prospect of providing long-lasting and effective treatment with minimal toxicity.

**Translational Research Accelerator (TRA)**
Integrates systems to improve patient outcomes, such that every patient contributes to, and potentially benefits from, research. This big data platform gathers data related to questions across tumor types, increases efficient use of data, focuses on a foundation built to secure and protect data, and maintains historical accuracy of legacy data.

**Cancer Genomics Laboratory (CGL)**
Ensures streamlined processes and access to rapid, high-quality next-generation sequencing services and data analysis for all Moon Shots, in addition to making the associated data available to all MD Anderson researchers through the TRA Platform.

**Cancer Prevention and Control**
Accelerates the development, dissemination and amplification of evidence-based strategies, community services, policy interventions and knowledge targeting measurable reductions in cancer incidence and mortality at a population level. The platform is guided by the ideology that research advances in cancer medicine must be translated, practically and rapidly, into health systems, communities in Texas, across the U.S., and on a global scale.

**Center for Co-Clinical Trials (CCCT)**
Functions as a translational-biology unit dedicated to accelerating the development and preclinical evaluation of drugs to inform the design and implementation of
biomarker-driven clinical trials. The center’s capabilities span the translational research continuum from novel target identification to robust biomarker development and validation, through preclinical efficacy modeling and finally clinical translation.

**Immunotherapy (IMT)**
Integrates cutting-edge basic immunology with novel clinical trials through in-depth analyses of animal models and patients’ samples over time, which will efficiently guide rational use and development of immunotherapies for the treatment and eradication of all types of cancer.

**Institute for Applied Cancer Science (IACS)**
Applies the scientific knowledge of mechanisms driving tumorigenesis to the development of impactful, small molecule cancer therapies for specific cancer patients, thereby targeting areas of unmet medical need.

**Oncology Research for Biologics and Immunotherapy Translation (ORBIT)**
A centralized organization for biologics discovery and development to guide, inform, accelerate and execute the translation of novel discoveries into clinically relevant monoclonal antibodies.

**Proteomics**
Sifts through the tens of thousands of proteins and molecules released by cancer cells into the blood or that reside within specific cellular compartments that may be used as predictive biomarkers, for tumor imaging, or targeted for various types of treatment from immunotherapy to antibodies to small molecules.
“Our singular vision of improving patient care has catalyzed our teams toward novel discoveries that, quite simply, would not have occurred without such focus. In five years, we have made notable advances for patients – most of which would not have been possible without the Moon Shots Program.”

– Giulio Draetta, M.D., Ph.D., Senior Vice President for Discovery and Platforms