NYU Langone MEDICAL CENTER

2016 / YEAR IN REVIEW

Perlmutter Cancer Center

11
CLINICAL AND RESEARCH LEADERSHIP RECRUITS

$90M +
IN RESEARCH FUNDING

50 %
GROWTH IN CLINICAL TRIAL PORTFOLIO

Contents

Dear Colleagues and Friends:

BENJAMIN G. NEEL, MD, PhD

Professor of Medicine

Laura and Isaac Perlmutter Director

Laura and Isaac Perlmutter Cancer Center at NYU Langone

2016 has been a whirlwind year of rapid expansion for Laura and Isaac Perlmutter Cancer Center. The momentum generated through the Perlmutters' generous gift of over $50 million continues, as we build our clinical network, add outstanding faculty, and expand both the number and variety of clinical trials we can offer to our patients.

We have entered a new era in cancer biology and medicine. For many previously intractable cancers, promising treatments—some experimental, some standard-of-care—are now available to patients. To better connect our patients with innovative, ever-expanding, and often life-changing options, we have doubled the capacity of our Clinical Trials Office. Over the last year, we connected nearly 20 percent more patients with these treatments, which are often based in immunotherapy or other targeted biological agents. In fact, some of tomorrow's best treatments are already available at Perlmutter Cancer Center. Our robust phase I clinical trials program gives patients unprecedented access to novel treatment options, should their first line of therapy fail. With the addition of Jeffrey S. Weber, MD, PhD, deputy director of Perlmutter Cancer Center and director of Experimental Therapeutics, our physician-scientists have expanded their already strong research programs and continue to pioneer advancements in the application of immunotherapy to cancer.

Over the past year, we increased the number of open interventional clinical trials available to our patients by nearly 50 percent—setting a pace for even greater growth in the coming year. Seeking out cutting-edge treatments for patients, our faculty has shown national leadership in early-phase and investigator-initiated trials. This expansion has significantly impacted the diversity of the cancer center's trial portfolio: nearly one-fourth of available trials are early-phase and approximately one in five of these are investigator-initiated.

We also had an outstanding year in faculty recruitment, balanced between seasoned physician-scientists and promising young faculty. Of these recruits, we welcomed an array of clinical trialists to our leadership, including Andrew S. Chi, MD, PhD, as chief of neuro-oncology and co-director of the Brain Tumor Center; Alec Kimmelman, MD, PhD, as chair of the Department of Radiation Oncology; Douglas A. Levine, MD, as director of gynecologic oncology; and Leena Gandhi, MD, PhD, as director of thoracic medical oncology. In January 2017, Kwok-Kin Wong, MD, PhD, a world-renowned translational lung cancer physician-scientist, joined us as our new division chief for hematology and medical oncology and the Anne Murnick Cogan and David H. Cogan Professor in Oncology. This spring, we'll welcome Diane M. Simeone, MD, as director of our new Pancreatic Cancer Center and Theodore H. Welling III, MD, as director of our Liver Tumor Program. Our newest colleagues have already made significant contributions, from leading cutting-edge clinical trials to collaborating with faculty and research teams across NYU Langone. In the pages that follow, we are proud to introduce these outstanding individuals, who will lead a reshaped Perlmutter Cancer Center in the decades to come.

With several new locations and a growing roster of physicians, Perlmutter Cancer Center is delivering world-class care to more patients than ever. Thanks to our recent merger with NYU Lutheran in Brooklyn, our cancer physicians now treat patients at more than 20 locations across Manhattan, Brooklyn, Queens, and Long Island. Our expanded footprint allows us to serve one of the largest, most diverse patient bases in the nation.

With pioneering research, exceptional medical education, and innovative clinical trials, we continue to shape the future of cancer care.

Perlmutter Cancer Center

Clinical

5,643
NEW PATIENTS

143
CLINICAL TRIALS OPENED*

20
PHASE I CLINICAL TRIALS OPENED*

321,000+
PATIENT ENCOUNTERS
at outpatient sites

Education and Research

62
HIGH IMPACT (IF>14) PUBLICATIONS
by Perlmutter Cancer Center members†

$90M+
FUNDING
in cancer-related extramural research

165
MEMBERS
in the cancer center

67
OUTREACH EVENTS

Accolades

TOP RANKED
FOR CANCER
in *U.S. News & World Report*'s "Best Hospitals"

MAGNET®
RECOGNITION
for nursing excellence for NYU Langone's Tisch Hospital, Rusk Rehabilitation, and Hospital for Joint Diseases

FACT®
ACCREDITATION
Foundation for the Accreditation of Cellular Therapy certified by University of Nebraska Medical Center

QOPI®
QUALITY ONCOLOGY PRACTICE INITIATIVE CERTIFIED
through the QOPI Certification Program (QCP™), an affiliate of the American Society of Clinical Oncology

NYU Langone Medical Center

1 OF 69

NCI-DESIGNATED CANCER CENTERS

NCI Designated Cancer Center

3,200+

ATTENDEES

includes in-person lectures, screenings, health fairs, and speakers bureau events

COMMISSION

ON CANCER

accredited by the American College of Surgeons

Numbers represent FY16 (Sept 2015–Aug 2016) unless otherwise noted
*January–November 2016
†January–December 2016

BEST HOSPITALS U.S.News & World Report HONOR ROLL 2016-17

#10

IN THE NATION BEST HOSPITALS

and nationally ranked in 12 specialties, including top 10 rankings in Orthopaedics, Geriatrics, Neurology & Neurosurgery, Rheumatology, Rehabilitation, Cardiology & Heart Surgery, and Urology. Nationally ranked in Cancer, Diabetes & Endocrinology, Ear, Nose & Throat, Gastroenterology & GI Surgery, and Pulmonology

BEST GRAD SCHOOLS U.S.News & World Report MEDICAL RESEARCH 2017

#11

IN THE NATION BEST MEDICAL SCHOOLS FOR RESEARCH

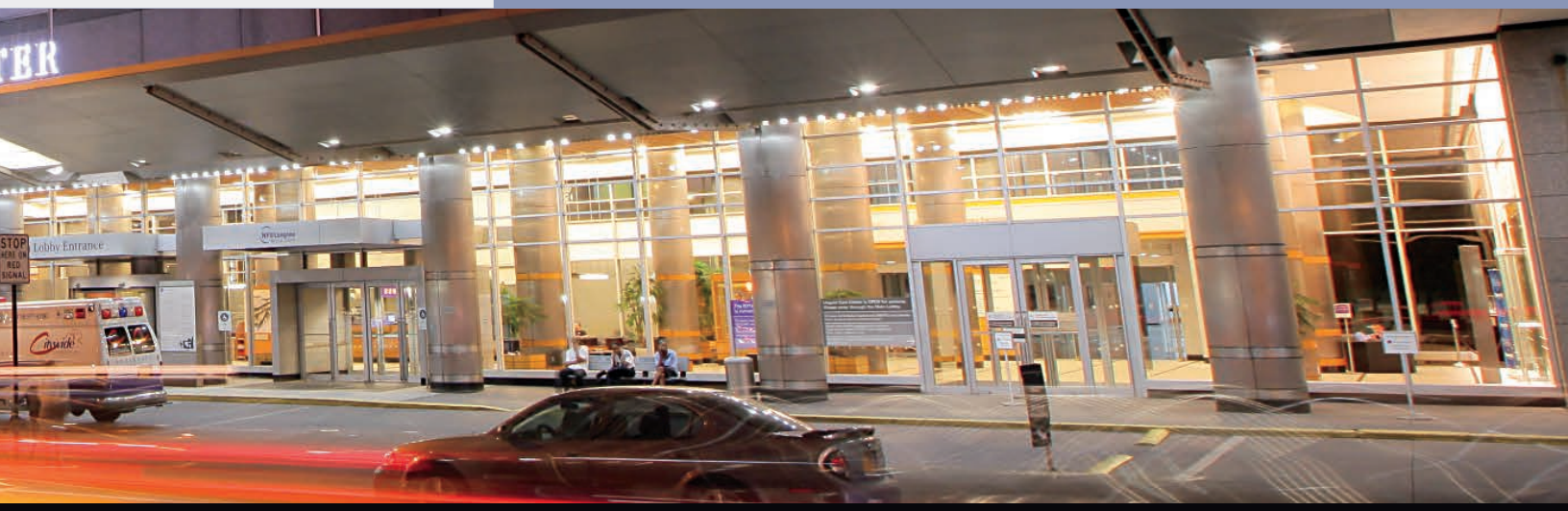
and a leader in innovation in medical education, including accelerated pathways to the MD degree

Bernard A Birnbaum, MD Quality Leadership Award 2016 Winner vizient.

LEADER

IN QUALITY CARE AND PATIENT SAFETY

and recognized for superior performance as measured by Vizient's nationwide 2016 Quality and Accountability Study



Perlmutter Cancer Center Advances Cancer Care Through New Partnerships, Promising Therapies, and Expanded Clinical Network

Partnerships

BEATRICE W. WELTERS BREAST HEALTH OUTREACH AND NAVIGATION PROGRAM LAUNCHES

After her own experience surviving breast cancer, nationally renowned philanthropist Bea Welters wanted to "pay it forward" and help educate other women about breast cancer and the importance of early detection. In collaboration with NYU Langone, Ms. Welters established the Beatrice W. Welters Breast Health Outreach and Navigation Program to ensure access in medically underserved communities throughout New York City. The program, which provides important information on breast cancer and the benefits of screening mammography, launched in Brooklyn in late 2016, with plans to expand services to the other NYC boroughs.

A noted businesswoman and philanthropist, as well as a former U.S. ambassador to Trinidad and Tobago, Ms. Welters was diagnosed in February 2007 with triple-negative breast cancer. This aggressive form of breast cancer has lower survival rates than others, especially among African American and Hispanic populations. After considering all options, she was treated at Perlmutter Cancer Center by Richard L. Shapiro, MD, associate professor of surgery, who removed Ms. Welters's cancerous breast and some of the surrounding lymph nodes. Fortunately, because the cancer was caught early, Ms. Welters did not require any follow-up treatments.

"Not only is this program educating women on breast cancer and the critical importance of screening and early detection," Ms. Welters says, "but it also is helping them through one-on-one and direct interaction to navigate the sometimes complex health care system as a whole."

In addition to contributions from Ms. Welters and her family, the program has received philanthropic support from the Laura and Isaac Perlmutter Foundation.

↑ Richard L. Shapiro, MD, and Beatrice W. Welters

PERLMUTTER CANCER CENTER AND THE TECHNION-ISRAEL INSTITUTE OF TECHNOLOGY ANNOUNCE A SECOND ROUND OF COLLABORATIVE ONCOLOGY FUNDING

With generous support from the Laura and Isaac Perlmutter Foundation, the Perlmutter Cancer Center at NYU Langone and the Technion-Israel Institute of Technology Collaborative Oncology Research Grant Program recently announced a second round of funding for high-risk/high-reward projects focused on key questions in oncology that are best addressed through collaboration:

- *Sculpting the MHC class I peptide repertoire to drive oncolytic virus immunotherapy.* Ian J. Mohr, PhD, professor of microbiology, and Alan B. Frey, PhD, associate professor of cell biology, NYU Langone; Arie Admon, PhD, head of the Smoler Proteomics Center at Technion.
- *KRAS splice variants drive specific metabolic traits in pancreatic cancer: A clinical management outlook.* Mark R. Philips, MD, professor of medicine, cell biology, and biochemistry and molecular pharmacology, and Alec Kimmelman, MD, PhD, professor of radiation oncology and chair of the Department of Radiation Oncology, NYU Langone; Hossam Haick, PhD, and Eyal Gottlieb, PhD, professors at Technion.

NEW PARTNERSHIP WITH IβECA THERAPEUTICS TO DEVELOP THERAPIES FOR HARD-TO-TREAT CANCERS

iβeCa Therapeutics, an innovative partnership between NYU Langone and Allied-Bristol Life Sciences, LLC (ABLS), has licensed compounds from the NYU School of Medicine to battle hard-to-treat cancers. NYU Langone's Office of Therapeutics Alliances (OTA) announced the licensing agreement with iβeCa Therapeutics, which is owned jointly by Bristol-Myers Squibb Company and Allied Minds, in March 2016. The compounds block a growth-promoting signaling cascade, the Wnt pathway, that functions abnormally in many tumors, including colorectal, breast, and liver cancers. Developed by Ramanuj Dasgupta, PhD, associate professor of biochemistry and molecular pharmacology, the compounds have been optimized to selectively inhibit the tumor-driving activities of a member of this signaling pathway, β-catenin.

"iβeCa Therapeutics is a great example of how promising early academic projects can be advanced to attract highly qualified partners such as ABLS," says Nadim Shohdy, PhD, assistant dean of the OTA.

Discoveries

MASTER GENE REGULATOR MED12 TIED TO DEVELOPMENT OF LEUKEMIA AND OTHER CANCERS

A group of regulatory proteins has been found to play a particularly commanding role in hematopoiesis and, when mutated, in the development of leukemia and other cancers, according to a research group led by Perlmutter Cancer Center member Iannis Aifantis, PhD, professor of pathology and chair of the Department of Pathology. Researchers say their experiments, conducted in mice and human cells, and published in August 2016 in *Cell Stem Cell*, clarify the role of mediator complex subunit 12 (MED12) and could serve as a tool for stopping a variety of cancers. MED12 mutations, they note, have been linked to several kinds of leukemia, as well as to cancers of the uterus and prostate. Further, MED12 is vital to the growth of normal hematopoietic stem cells in bone marrow. First author and NYU Langone associate research scientist Beatriz Aranda-Orgilles, PhD, says the team next plans to screen blood samples from cancer patients for signs of MED12 mutations and uncontrolled hematopoietic stem cell development. The team would then seek inhibitors that could block MED12 hyperactivity.

NEW TOPICAL PASTE SHOWS PROMISE FOR PREVENTING RADIATION THERAPY SCARRING

When applied to the skin, an innovative anti-scarring paste halts fibrosis caused by the radiation used in cancer therapy, according to a new animal study. Bruce N. Cronstein, MD, the Dr. Paul R. Esserman Professor of Medicine and the study's senior investigator, says such therapies are badly needed because very few drugs are currently available to treat fibrosis and those that are on the market are not very effective. Moreover, he says, using a topical formulation like the one his team tested is advantageous because it can be applied directly to affected tissues and patients do not have to worry about any adverse systemic reactions. The study, published in the *The FASEB Journal*, addressed a type of fibrosis called radiation dermatitis, which is a side effect experienced by as many as 95 percent of patients undergoing initial radiation treatment. Radiation applied to the skin causes the buildup of fibrotic tissue and skin thickening, with the effects severe enough in some patients to stop treatment. The topical paste, whose application is patented, contains an A2A receptor blocker and is based on the team's research on the molecular pathways leading to fibrosis.

Clinical Network

NYU LUTHERAN NOW OFFERING MRI-FUSION BIOPSY AND ROBOTIC SURGERY

Precision-targeted biopsy and robotic prostate surgery are now available in Brooklyn with the expansion of NYU Langone's experienced urology team to NYU Lutheran. Marc A. Bjurlin, DO, clinical assistant professor of urology and director of urologic oncology at NYU Lutheran, directs this program, which offers the same level of care available at the Manhattan location. In both locations, computerized systems register diagnostic MRI and ultrasound images to allow precise targeting of suspicious prostate lesions. The robotic surgery system, long in use at NYU Langone's Manhattan location, is available in Brooklyn only at NYU Lutheran. "The greatest advantage of robot-assisted prostate surgery is more rapid convalescence," says Dr. Bjurlin. "Patients often are up and about a few hours after surgery, stay in the hospital overnight, and go home the next day. And for patients in Brooklyn, the NYU Lutheran location puts them that much closer to home."

150 cancer specialists

from Perlmutter Cancer Center treat patients at

20+ locations

across Manhattan, Brooklyn, Queens, and Long Island

NYU LANGONE AFFILIATION WITH WINTHROP-UNIVERSITY HOSPITAL BRINGS EXPANDED AND ENHANCED HEALTHCARE NETWORKS TO LONG ISLAND

NYU Langone Medical Center and Winthrop-University Hospital on Long Island have reached an agreement to affiliate the institutions' extensive healthcare networks. NYU Langone, with more than 150 ambulatory sites throughout the region, will complement Winthrop-University Hospital's main campus, multiple ambulatory sites, and network of 66 faculty and community-based practices in more than 140 locations extending from eastern Long Island to Upper Manhattan.

The affiliation will further expand NYU Langone's presence on Long Island, while enhancing Winthrop-University Hospital's inpatient and outpatient services with improved access to NYU Langone's wide range of medical and surgical specialties.

"This agreement publicly confirms our confidence that an affiliation will allow both of our institutions to collaborate and share best practices to better meet the healthcare needs of the communities we serve," says Robert I. Grossman, MD, the Saul J. Farber Dean and CEO of NYU Langone. Pending regulatory approval, the institutions are aiming to complete their affiliation in spring 2017.

Transplantation

NEW COLLABORATION BROADENS TREATMENT OPTIONS FOR BONE MARROW TRANSPLANT PATIENTS

For patients with a variety of hematological disorders, bone marrow transplantation offers a potentially curative treatment. However, without a matched sibling, the odds of locating a perfectly matched unrelated donor can be quite low—particularly for ethnic minorities, who have a smaller donor pool.

Now, an academic collaboration between Johns Hopkins University and NYU Langone's newly established Transplant Institute will give eligible patients access to half-matched bone marrow donors. With this new method, patients can receive stem cells from their parents and children who are half-matches and were not considered to be viable matches under previous protocols. In addition, this method substantially increases the number of potential matches for patients from the general population, without apparent impact on treatment efficacy; recently published results show outcomes with half-matched donors are comparable to those of fully matched, unrelated donors.

"What's exciting is that most of the haploidentical transplant patients are able to complete their treatment as outpatients."

— Lawrence B. Gardner, MD

The key to the approach, says Lawrence B. Gardner, MD, associate professor of medicine, biochemistry, and molecular pharmacology and acting director of the stem cell transplant program, is the post-transplant use of cyclophosphamide, which is thought to kill activated T cells, sparing quiescent immune system–reconstituting T cells and hematopoietic stem cells and minimizing graft versus host disease. Indeed, experience has shown that after reconstitution, the immune system can effectively work to eliminate any residual cancer in certain cases. "What's exciting for patients is that this is a less toxic approach and most haploidentical transplant patients are able to complete their treatment as outpatients," says Dr. Gardner. "Half never spend a night in the hospital."

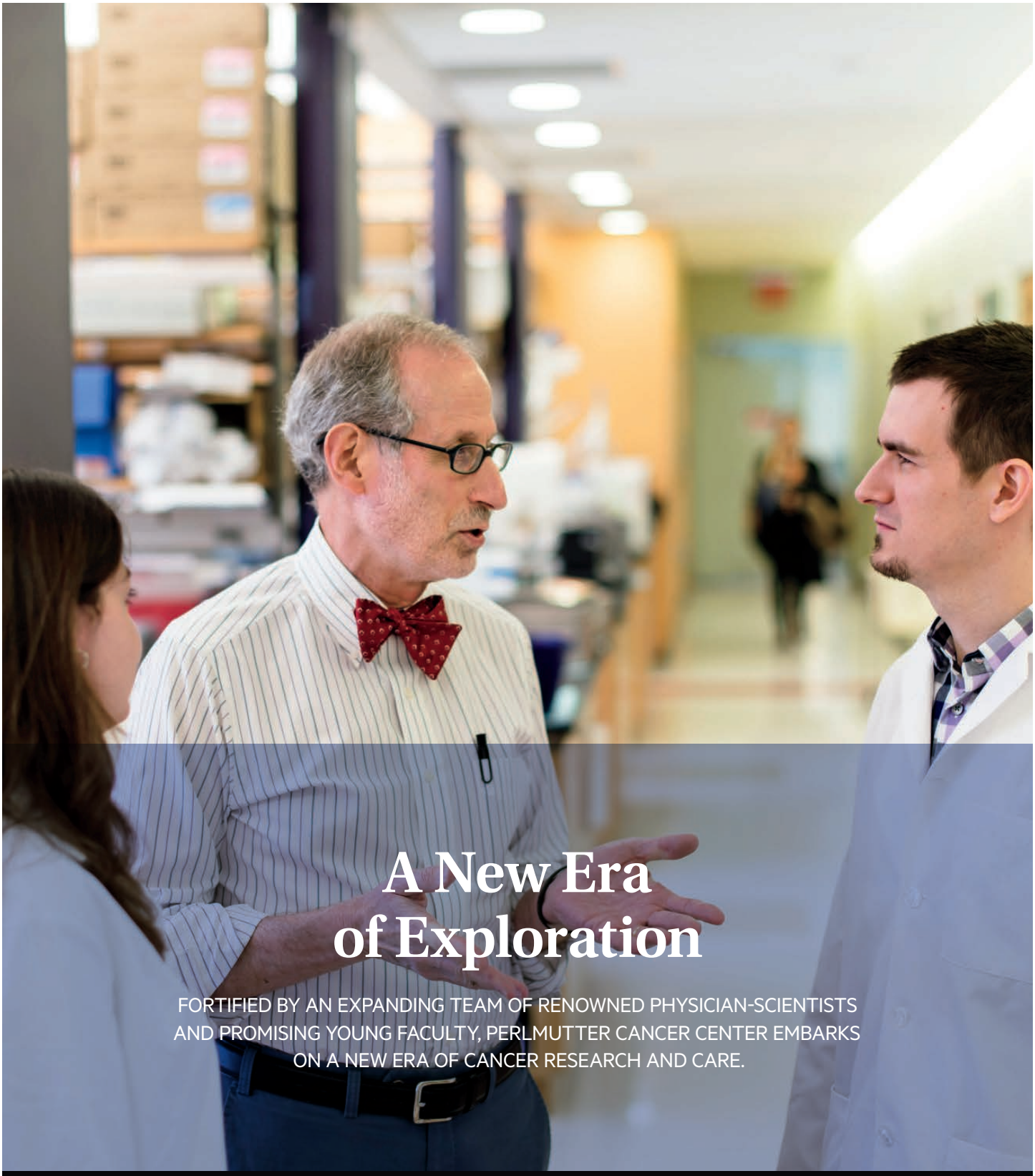
"This collaboration will allow us to cross-train physicians and nurses between our two institutions and will open up new treatment and research protocols unique to the greater New York area," adds Gardner.

The Rita J. and Stanley H. Kaplan Stem Cell and Bone Marrow Transplant Center at NYU Langone has been performing autologous bone marrow transplants since 1994 and allogeneic transplants for more than four years. The addition of half-match research protocols is expected to dramatically increase both the number and diversity of patients eligible for a transplant.

In addition to their traditional role in treating hematologic malignancies and other blood disorders, haploidentical transplants may also have implications for solid tumors and organ transplants. "Johns Hopkins has initiated novel clinical trials in which patients are given mild doses of chemotherapy and, in some instances, stem cells prior to solid organ transplant," says Dr. Gardner. "Our collaboration offers new possibilities with the arrival of Robert Montgomery, director of the NYU Langone Transplant Institute, who initiated many of these protocols at Johns Hopkins."

↓ Robert A. Montgomery, MD, DPhil

Internationally renowned surgeon Robert A. Montgomery, MD, DPhil, whose groundbreaking work in kidney transplantation includes laparoscopic innovations and "domino" multi-way donor transplant exchanges, joined the faculty of NYU Langone as director of its newly created Transplant Institute in March 2016. Prior to his appointment at NYU Langone, Dr. Montgomery was chief of the Division of Transplantation at The Johns Hopkins Hospital, where he was professor of surgery and director of the Comprehensive Transplant Center and the Incompatible Kidney Transplant Program. While at Hopkins, he was part of the team that developed laparoscopic procurement of a live kidney donation through small incisions in the abdomen. This approach is now a standard practice for kidney donation worldwide.



A New Era of Exploration

FORTIFIED BY AN EXPANDING TEAM OF RENOWNED PHYSICIAN-SCIENTISTS AND PROMISING YOUNG FACULTY, PERLMUTTER CANCER CENTER EMBARKS ON A NEW ERA OF CANCER RESEARCH AND CARE.

↑ Jeffrey S. Weber, MD, PhD, and David M. Woods, PhD

Top-Tier Talent Redefines the Future of Cancer Care

As one of the country's 69 National Cancer Institute (NCI)-designated cancer centers, Perlmutter Cancer Center is committed to building a comprehensive cancer research portfolio that spans the spectrum from basic science to late-stage clinical trials. To do that, the center is investing in its faculty, as evidenced by the outstanding 2016 recruits presented here.

ANDREW S. CHI, MD, PhD, noted brain tumor specialist, joined NYU Langone and Perlmutter Cancer Center in late 2015 as assistant professor of medicine, neurology, and neurosurgery, chief of neuro-oncology, and co-director of the Brain Tumor Center, where he works with other highly respected experts from a wide range of medical and surgical specialties. Since his arrival at the cancer center, Dr. Chi has spearheaded the use of genetic profiling of tumor tissue, allowing each patient's treatment to be tailored to their tumor subtype. In addition to founding the Massachusetts General Hospital Translational Neuro-Oncology Laboratory, Dr. Chi has made major contributions to the understanding of specific mutations in gliomas that affect tumor metabolism and patient outcomes, and also uncovered potential molecular targets for treatment. His investigative work continues to elucidate molecular alterations associated with outcome in gliomas, metabolic targeting of gliomas, and innovative glioma clinical trial design based on molecular subtype *(see page 35 for clinical trial information).*

↑ Andrew S. Chi, MD, PhD

LEENA GANDHI, MD, PhD, physician-scientist who has led a number of seminal immunotherapy trials, joined the faculty of NYU Langone and its Perlmutter Cancer Center as director of thoracic medical oncology in August 2016. Most recently, she was assistant professor of medical oncology at Harvard Medical School and Dana-Farber Cancer Institute, where she was a member of its Lowe Center for Thoracic Oncology and its Early Stage Drug Development Center. Dr. Gandhi's research focuses on novel lung cancer therapies and biomarkers of tumor progression (*see page 15 for clinical trial information*). In her new role, Dr. Gandhi is charged with building a world-class lung cancer program that focuses on advancing clinical care, increasing translational and clinical research, particularly in immune therapy, and recruiting additional clinical faculty.

↑ Leena Gandhi, MD, PhD

ALEC KIMMELMAN, MD, PhD, internationally renowned clinician-scientist, joined NYU Langone in February 2016 as chair of the Department of Radiation Oncology. Dr. Kimmelman arrived after a distinguished career in the Departments of Radiation Oncology at Harvard Medical School and its major teaching affiliates, the Dana-Farber Cancer Institute and Brigham and Women's Hospital. Recent findings from his laboratory have established that pancreatic tumors rely on autophagy ("self-eating") for proper growth (*see page 23*), which could result in a specific vulnerability for these tumors that might be targeted by existing drugs. His research has identified unique metabolic pathways in pancreatic cancer and has elucidated how the *KRAS* oncogene can rewire the metabolism of these tumors. This body of work has served to define the metabolic landscape of pancreatic cancer. Dr. Kimmelman was recently inducted to the American Society for Clinical Investigation, and he continues to practice radiation oncology, specializing in the treatment of gastrointestinal cancers.

↑ Alec Kimmelman, MD, PhD

SHOHEI KOIDE, PhD, an internationally renowned leader in protein engineering, was appointed to lead NYU Langone's new initiative in cancer biologics. As one of the country's first academically based cancer biologics programs, the new initiative builds on the Perlmutter Cancer Center's commitment to investing in promising individuals and technologies that can help advance its research endeavors. It also creates greater opportunity to develop partnerships with pharmaceutical companies under the auspices of NYU Langone's Office of Therapeutics Alliances. "No other academic medical institution on the East Coast has a major presence in biologics development," said Dafna Bar-Sagi, PhD, professor of medicine, biochemistry, and molecular pharmacology, and senior vice president, vice dean for science, and chief scientific officer, in announcing the new initiative. "Dr. Koide, in partnership with other NYU Langone researchers, will help us develop a world-class cancer biologics research program that will have synergistic effects throughout our institution, giving our investigators greater access to this powerful technology."

↑ Shohei Koide, PhD

DOUGLAS A. LEVINE, MD, internationally renowned surgeon-scientist whose seminal biomarker research has helped to advance early detection and treatment of ovarian cancer, has joined the faculty of Perlmutter Cancer Center as professor of obstetrics and gynecology and director of gynecologic oncology. Dr. Levine was most recently on the faculty at Memorial Sloan Kettering Cancer Center (MSKCC), where he was an attending physician and the head of the Gynecology Research Laboratory. While at MSKCC, Dr. Levine made significant contributions to The Cancer Genome Atlas project by defining the genetic abnormalities underpinning several gynecologic malignancies. At Perlmutter Cancer Center, Dr. Levine is expanding clinical trial efforts to treat gynecologic malignancies and assembling a research team to study new therapeutic approaches for ovarian and endometrial cancers.

↑ Douglas A. Levine, MD

DIANE M. SIMEONE, MD, world-renowned pancreatic cancer surgeon and researcher, will join Perlmutter Cancer Center in March 2017 as director of its new Pancreatic Cancer Center and associate director of Translational Research. She most recently served as director of the Gastrointestinal Oncology Program at the University of Michigan's Comprehensive Cancer Center.

Dr. Simeone has received multiple National Institutes of Health grants to investigate the molecular mechanisms that drive the development and progression of pancreatic adenocarcinoma. Her laboratory was the first to identify pancreatic cancer stem cells, and she leads a research program focused on early detection of pancreatic cancer. She is the incoming national chair of the Scientific and Medical Advisory Board of the Pancreatic Cancer Action Network's board of directors and serves as the U.S. lead on the Precision Promise Clinical Trial Consortium, which focuses on developing novel, more effective clinical trial options for pancreatic cancer patients. Dr. Simeone has also served as president for the Society of University Surgeons and the American Pancreatic Association, is a member of the Institute of Medicine of the National Academy of Sciences, and serves on the Scientific Advisory Board for the NCI Pancreatic Cancer Task Force.

↑ Diane M. Simeone, MD

TIM STRAWDERMAN, PhD, joined Perlmutter Cancer Center as executive director, following 10 years of service as the founding director for Cancer Center Administration at the Harold C. Simmons Comprehensive Cancer Center at the University of Texas Southwestern Medical Center in Dallas. He brings a wealth of experience in budget and finance, grants management, program planning and evaluation, public policy, and research administration to his new role at NYU Langone.

↑ Tim Strawderman, PhD

JEFFREY S. WEBER, MD, PhD, immunotherapy expert, joined Perlmutter Cancer Center as professor of medicine and deputy director in November 2015, following distinguished tenures at USC Norris Comprehensive Cancer Center and Moffitt Cancer Center. Dr. Weber also serves as co-director of the center's melanoma program and director of experimental therapeutics.

Dr. Weber's research, which has been continuously funded by the NCI for more than 20 years, focuses on experimental therapeutics and drug development, particularly in the area of immunotherapy for melanoma and other types of cancer. Dr. Weber has led or played a major role in numerous practice-changing clinical trials for immune checkpoint agents (CTLA-4, PD-1) in melanoma. At Perlmutter Cancer Center, Dr. Weber oversees drug development efforts and leads clinical trials aimed at new combination therapies and biomarkers for melanoma and other immunotherapy-responsive malignancies.

↑ Jeffrey S. Weber, MD, PhD

THEODORE H. WELLING III, MD, hepatobiliary and liver transplant surgeon, will join Perlmutter Cancer Center in spring 2017 as director of its Liver Tumor Program. Dr. Welling is currently co-director of the Multidisciplinary Liver Tumor Clinic at the University of Michigan Health System.

Dr. Welling's clinical interests include the use of surgery for treatment of hepatic or biliary malignancies and for treatment of metastases to the liver. In his clinical and translational research, he investigates new therapies for cholangiocarcinoma and hepatocellular carcinoma and the role of the immune system and cancer stem cells on hepatic malignancy development and progression. Dr. Welling's work has been published in a variety of journals, including *Nature Immunology*, *Gastroenterology*, and *Cancer Discovery*.

↑ Theodore H. Welling III, MD

KWOK-KIN WONG, MD, PhD, internationally renowned physician-scientist, joined Perlmutter Cancer Center in January 2017 as the Anne Murnick Cogan and David H. Cogan Professor in Oncology and chief of hematology and medical oncology. Dr. Wong joined the cancer center faculty following a distinguished decades-long career at Harvard Medical School and the Dana-Farber Cancer Institute. Dr. Wong's research has provided new insights into the genetic and environmental causes of lung cancer, which have enabled the testing of novel therapies. He has received acclaim for clarifying the role of lung cancer–associated mutations in *EGFR*, *ALK*, and *PIK3CA* (PI3 kinase). His more recent work focuses on improving strategies for targeted and immune-based therapies in genetically stratified lung cancer patients. In his new role, Dr. Wong will continue this research, focusing on understanding sensitivity and resistance to targeted therapies and immunotherapy in lung cancer patients.

↑ Kwok-Kin Wong, MD, PhD

ITAI YANAI, PhD, whose analysis of gene composition and expression in embryos has been internationally recognized, joined NYU Langone in May 2016 as inaugural director of the new Institute for Computational Medicine (ICM). Dr. Yanai joined NYU Langone from the Technion-Israel Institute of Technology, where he was a member of the biology faculty. Combining experimental approaches in embryology, molecular biology, and computational biology, Dr. Yanai has explored the principles by which developmental pathways evolve. From these investigations, Dr. Yanai's laboratory pioneered a powerful method for single-cell gene expression analysis that it will use to explore the progression of cancer and the process of infection. Dr. Yanai currently leads the ICM's efforts to reveal patterns in medical data that aid in disease diagnosis and the design of new treatments.

"We are tremendously excited to welcome Dr. Yanai, who will help many research teams at NYU Langone to take advantage of the rapidly evolving field of computational biology," says Dr. Bar-Sagi.

↑ Itai Yanai, PhD

Awards & Recognition

→ **Dafna Bar-Sagi, PhD,** appointed to board of directors of American Association for Cancer Research; received the Outstanding Investigator Award, National Cancer Institute.

→ **Martin J. Blaser, MD,** received the Cura Personalis Award, Georgetown University Medical Center; received the Thermo-Fisher New Frontiers in Science and Technology Award; delivered the Benning Public Lecture in Medicine, University of Utah School of Medicine.

→ **Kenneth H. Cadwell, PhD,** received the Ann Palmenberg Junior Investigator Award, American Society for Virology; received the Howard Hughes Medical Institute Faculty Scholars Award; received the Innovator Award, the Kenneth Rainin Foundation.

→ **Corita R. Grudzen, MD,** selected as co-chair of the National Cancer Institute–sponsored Comprehensive Oncologic Emergencies Research Network.

→ **Hannah L. Klein, PhD,** elected Fellow of the American Association for the Advancement of Science.

→ **Paul Krebs, PhD,** accepted for the NIH Early Career Reviewer Program at the Center for Scientific Review.

→ **Douglas A. Levine, MD,** appointed to the Cancer Biomarkers Study Section, Center for Scientific Review, National Institutes of Health; appointed chair of the peer review panel of the FY16 Ovarian Cancer Research Program for the Department of Defense Congressionally Directed Medical Research Programs.

→ **Dan R. Littman, MD, PhD,** received the Breakthrough Award, the Kenneth Rainin Foundation.

→ **Mark R. Philips, MD,** elected Fellow to the American Association for the Advancement of Science.

→ **Dimitris G. Placantonakis, MD, PhD,** elected to Executive Committee, American Association of Neurological Surgeons/ Congress of Neurological Surgeons Section on Tumors; received the Preuss Award, The Preuss Foundation.

→ **Joseph E. Ravenell, MD,** elected to the Steering Committee of the National Colorectal Cancer Roundtable.

→ **William N. Rom, MD,** elected Fellow of the American Association for the Advancement of Science.

→ **Daniel K. Sodickson, MD, PhD,** elected vice president, International Society for Magnetic Resonance in Medicine; appointed National Institutes of Health study section chair, Biomedical Imaging Technology A; served as vice chair, Gordon Research Conference on In Vivo Magnetic Resonance.

Cancer Center Leadership Announcements

→ **Arjun V. Balar, MD,** appointed head, Genitourinary Medical Oncology Program.

→ **Catherine S. M. Diefenbach, MD,** appointed clinical director, Lymphoma Program.

→ **Jennifer J. Wu, MD,** appointed director, Bellevue Cancer Center.

A Year of Groundbreaking Discovery

A GROWING ROSTER OF TOP TALENT AND A REDOUBLED COMMITMENT TO CLINICAL TRIALS HAVE FUELED A NEW MOMENTUM TO CONQUER CANCER.

↑ Benjamin G. Neel, MD, PhD

Expanding Exploration: Clinical Trials Portfolio Grows by Nearly 50 Percent

Over the last year, research generated at Perlmutter Cancer Center has fueled the development of immunotherapies and personalized treatments that have dramatically changed the landscape of cancer care. To better connect patients with best available therapies, the cancer center significantly expanded the capacity of its Clinical Trials Office (CTO).

To further support investigators in the development and implementation of their investigator-initiated trials, the CTO has also expanded the available resources in its Quality Assurance Unit. In addition to restructuring the CTO, the cancer center has recruited some of the nation's most prolific clinical trialists, such as thoracic oncologist Leena Gandhi, MD, PhD, and neuro-oncologist Andrew S. Chi, MD, PhD, who will bolster the exponential growth experienced over the last year. Additionally, to smooth and speed the path from trial inception to patient recruitment, the CTO will launch its Rapid Activation Program in early 2017, with the goal of reducing the average activation time to 60 days for up to 12 high-priority trials per year.

Under the direction of Daniel C. Cho, MD, assistant professor of medicine, the Phase I Drug Development Program at Perlmutter Cancer Center has committed personnel and resources to help patients with limited conventional treatment options access therapies that have shown potential to treat their cancer. In the last year, the center's phase I program has grown substantially, with 20 new trials under way this year and at least 10 additional trials expected to begin accruing patients in 2017. This expansion has significantly enhanced the diversity of the cancer center's trial portfolio: now, nearly one-fourth of available trials are early-phase. Of these early-phase trials, approximately one in five are investigator-initiated.

With these clinical studies on the horizon, many unique in the Northeast, Perlmutter Cancer Center is on the front lines of our nation's redoubled efforts to defeat cancer.

48%
INCREASE
in the number of interventional clinical trials open

19%
INCREASE
in the number of patients participating in interventional trials

PHASE I TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
I	s15-00941	Daniel Cho	A Platform Study Exploring the Safety, Tolerability, Effects on the Tumor Microenvironment, and Efficacy of Pembrolizumab (MK-3475) + INCB Combinations in Advanced Solid Tumors
I	s15-01357	Daniel Cho	A Phase I, Open-Label Study of GSK3174998 Administered Alone and in Combination with Anti-cancer Agents including Pembrolizumab in Subjects with Selected Advanced Solid Tumors
I	s16-00949	Leena Gandhi, Abraham Chachoua	A Phase I, Two-Part, Multi-Center, Non-Randomized, Open-Label, Multiple Dose First-In-Human Study of DS-6051b, an Oral ROS1 and NTRK Inhibitor, in Subjects with Advanced Solid Tumors
I	S13-00686	Catherine Diefenbach	A Pilot Study of a Novel Multimodality Immuno-Chemotherapy Platform for Patients with Advanced Cutaneous T Cell Lymphoma
I	s15-00107	Catherine Diefenbach	An Open-Label, Multicenter, Phase I/IB Dose Escalation Study Evaluating the Pharmacokinetics, Safety, Tolerability, and Preliminary Efficacy of DCDS0780A, Alone or in Combination with Rituximab, in Patients with Relapsed/Refractory B-cell Non-Hodgkin's Lymphoma
I	s15-01418	Catherine Diefenbach	A Phase 1, Open-Label, Dose-Escalation Study of SGN-CD19B in patients with Relapsed or Refractory Aggressive B-cell Non-Hodgkin Lymphoma
I	s15-01497	Mohammad Maher Abdul Hay	A Phase 1 Study Evaluating Safety, Tolerability, and Pharmacokinetics of Escalating Doses of AGS67E Given as Monotherapy in Subjects with Acute Myeloid Leukemia (AML)

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

New Paths Toward More Effective Breast Cancer Treatment

Immunotherapy trials, genomics, novel metabolic pathways, and innovative imaging techniques highlight a banner year in breast cancer treatment and research.

TAKING AIM AT NEW TARGETS FOR BREAST CANCER TREATMENT

Led by researchers from Perlmutter Cancer Center and the Princess Margaret Cancer Centre in Toronto, the largest ever "big data" analysis of breast cancer cells suggested dozens of new uses for existing drugs, new targets for drug discovery, and new drug combinations. Among many findings, the team found that the survival of most luminal/HER2+ cancer cells, as well as a subset of triple-negative breast cancer cells, depends on a member of the bromodomain and extra-terminal domain (BET) protein family, BRD4. These results suggest that BET inhibitors, currently in clinical trials for leukemia, might help treat some types of breast cancer.

The researchers also noted that resistance to these drugs can be caused by mutations in the gene encoding the enzyme phosphatidylinositol 3-kinase. This resistance, they suggest, might be countered by combining BET inhibitors with the drug everolimus, an agent already approved for the treatment of some forms of breast cancer. The findings appeared in the journal *Cell* in January 2016.

Finding new molecular targets is crucial for the development of new breast cancer treatments. "The ultimate goal of researchers worldwide is to finally understand each cancer cell's wiring diagram well enough to clarify both the molecular targets against which therapeutics should be developed and the patient groups most likely to respond," says lead author Benjamin G. Neel, MD, PhD, professor of medicine and Laura and Isaac Perlmutter Director of Perlmutter Cancer Center.

RECENT INSIGHTS ON CANCER CELL RESPONSE TO LOW OXYGEN

Low oxygen conditions within the tumor micro-environment force cancer cells to adapt for survival, and they often evolve multiple mechanisms for doing just that. But a new metabolic pathway linked to both a subset of breast cancer and a rare genetic condition may now offer a way to shut down all of these coping mechanisms in some cancers. Researchers at Perlmutter Cancer Center, the Princess Margaret Cancer Centre, the University of Toronto, Harvard Medical School, and Oxford University have identified a pathway that may shed light on both adaptation to low oxygen and why people with a rare condition called Moyamoya disease experience abnormal blood vessel growth in the brain.

Led by Robert Banh, a graduate student in Dr. Neel's lab, the investigators found that signals sent by an enzyme known as protein tyrosine phosphatase 1B, or PTP1B, help cancer cells survive by shutting down oxygen-intensive processes in cells deprived of oxygen. Their finding, published in the journal *Nature Cell Biology* in June 2016, showed that PTP1B-deficient HER2+ breast cancer cells die rapidly in low oxygen because they can no longer shut off those oxygen-utilizing pathways. In short, targeting PTP1B could help cancer cells burn themselves out.

The findings could also help researchers understand Moyamoya disease, which is caused by blocked arteries in the brain. "In the cancer field, we have seen many times that studies of rare syndromes can be important in explaining mechanisms by which cells respond to stresses," says Dr. Neel. "We hope our new study will provide insights into Moyamoya disease that then feed back into our work in cancer biology."

↑ Sylvia Adams, MD

IMMUNOTHERAPY OFFERS A NEW TREATMENT PARADIGM FOR TRIPLE-NEGATIVE BREAST CANCERS

Immunotherapy has paved the way for FDA approval of drugs such as atezolizumab and pembrolizumab, which treat cancers of the skin, lung, and bladder by targeting the PD-1/PD-L1 pathway and reinvigorating the patient's already primed immune system to kill tumor cells. Although breast cancer historically was not considered immunogenic, work by Sylvia Adams, MD, associate professor of medicine, not only established that subsets of breast cancer are highly immunogenic, but that the immune response actually impacts survival in early triple-negative breast cancer (TNBC). These discoveries effectively extended the use of PD-1/PD-L1 immunotherapies as single agents to treat TNBC.

Now, Dr. Adams's efforts are focused on enhancing the efficacy of these immunotherapies to further improve TNBC outcomes, by testing them as part of combination therapies. In a multicenter, multi-arm phase Ib study, sponsored by Genentech Inc. and presented by Dr. Adams at the 2016 American Society of Clinical Oncology meeting, the safety and preliminary efficacy of PD-L1 inhibitor atezolizumab were examined in combination with nab-paclitaxel chemotherapy in patients with metastatic (advanced) TNBC (mTNBC). Responses observed among a significant subset of patients were, at times, dramatic.

"As we often see with immunotherapy, there were 'pseudo-progressors,' which means by conventional RECIST imaging criteria, patients would have come off the trial due to interval development of new metastases—but in this case they were allowed to continue," says Dr. Adams. "One of these women had resolution of all metastases later on. Importantly, even after stopping chemotherapy—not usually an option for women with mTNBC—this patient remains in remission two years later, while continuing on single-agent atezolizumab without side effects."

The overall result of treatment with atezolizumab plus nab-paclitaxel showed a confirmed objective tumor response in 46 percent of patients treated front-line for metastatic TNBC, some of which are durable, a remarkable result in a form of breast cancer that has remained recalcitrant to targeted therapies. Based on these results, Dr. Adams helped design and now oversees an international phase III study to evaluate this combination therapy in patients with previously untreated mTNBC.

Separately, earlier this year, Dr. Adams launched an institutional trial of the combination nab-paclitaxel with the PD-1 inhibitor pembrolizumab to further study the efficacy of these therapies in patients with breast cancer and to investigate predictive biomarkers in patients' tumors and blood. These correlative studies are made possible through close collaboration among several NYU Langone core facilities, including the Genome Technology Center, the Immune Monitoring Core, and the Center for Biospecimen Research and Development (CBRD), with the ultimate goal of both individualizing treatments for patients and identifying new treatment targets for resistant tumors.

Research led by Dr. Neel has suggested

dozens

OF NEW THERAPEUTIC USES, TARGETS, AND COMBINATIONS

for breast cancer treatment

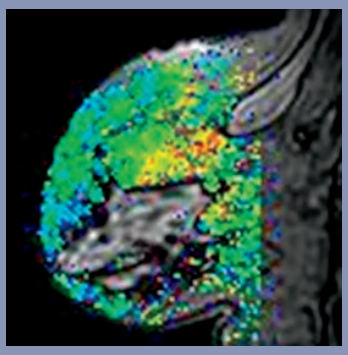
MULTIDISCIPLINARY PARTNERSHIP AT CORE OF BREAST CANCER TREATMENT

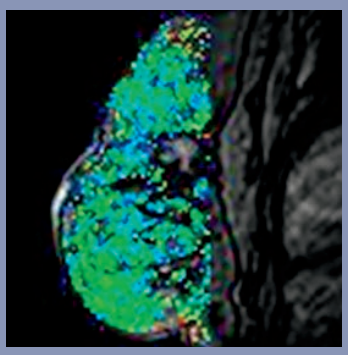
By partnering with NYU Langone's Hansjörg Wyss Department of Plastic Surgery, Perlmutter Cancer Center breast cancer physicians are able to offer comprehensive, multidisciplinary care to all patients. In addition to being the largest group of board-certified breast reconstruction surgeons in New York City, the highly specialized team performs every available and evidence-based surgical technique. This seamless partnership allows breast cancer physicians to address the full spectrum of patients as they navigate a breast cancer diagnosis.

RULING OUT BREAST CANCER THROUGH BETTER IMAGING

Because breast tissue is dynamic and changes throughout a woman's monthly menstrual cycle, discriminating abnormal tissue from normal monthly changes often confounds the best efforts of imaging diagnosticians. Suspicious lesions in mammary ducts often lead to biopsy, but in two-thirds of those cases, the lesions are not cancerous. Using a high-resolution MRI that can accurately measure changes in mammary ducts and the surrounding tissue, Sungheon G. Kim, PhD, associate professor of radiology, hopes to help clinicians better differentiate between changes brought on by hormonal cycles and changes that signal the cellular transformations of cancer. In ongoing research, Dr. Kim and his Perlmutter Cancer Center colleagues are evaluating whether MRI scans of the breast vascularity and tissue microstructure can be used as a baseline measure for normal monthly tissue changes.

"We have seen that benign lesions change throughout the normal monthly cycle while cancerous tumors do not," says Dr. Kim. "We are hopeful that this technology will help rule out suspicious but benign lesions so we can lower the biopsy and false positive rates."





Collaborative Team Devises Innovative Breast Imaging Apps

MRI IMAGES REVEAL HIGH SATURATED FAT CONTENT AS POTENTIAL NEW BREAST CANCER RISK FACTOR

High saturated fatty acids stored in breast adipose tissue may signal higher breast cancer risk in postmenopausal women. That's the finding of Dr. Kim, working with Perlmutter Cancer Center colleagues. Dr. Kim and his colleagues made the connection by devising a novel method called gradient-echo spectroscopic imaging that provides information on various types of fatty acids using a series of three-dimensional MRI images. The technique is the first of its kind with the potential to be practical for clinical use. Previously, similar MRI techniques took too long and were too cumbersome, says Dr. Kim.

The preliminary research evaluated 58 premenopausal and 31 postmenopausal women. The breast tissue in postmenopausal women with invasive ductal carcinoma had higher saturated fatty acids and lower monounsaturated fatty acids than women with benign lesions. In women with benign lesions, postmenopausal women had higher polyunsaturated fatty acids and lower saturated fatty acids than premenopausal women. Furthermore, fat composition in the breast did not correlate with body mass, suggesting that the total fat amount might not be related to body fat composition.

"There is a clear need for methods that can accurately measure fat composition of the breast tissue within a short scan time, and our study takes a first step toward addressing this critical gap," says Dr. Kim.

↑ Gradient-echo spectroscopic images of a breast with high saturated fatty acids (yellow) before (top) and after (bottom) surgery to remove invasive duct carcinoma

BREAST CANCER CLINICAL TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
0	s14-01311	Sylvia Adams	Pre-surgical Evaluation of Denosumab in Patients with Operable Invasive Breast Cancer
II	s15-00441	Sylvia Adams	Phase II Study of Pembrolizumab and Nab-paclitaxel in HER-2 Negative Metastatic Breast Cancer
II	s15-01511	Francisco Esteva	A Randomized, Multicenter, Double-Blind, Placebo-Controlled Phase II Study of the Efficacy and Safety of Trastuzumab Emtansine in Combination with Atezolizumab or Atezolizumab-Placebo in Patients with HER2-Positive Breast Cancer

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

Perlmutter Cancer Center Spearheads Immunotherapy Offerings for Melanoma Patients

Physician-scientists harness melanoma through the power and promise of immunotherapy.

Only a few years ago, a diagnosis of metastatic melanoma would have meant planning for hospice care for nearly all patients. Today, advances in training the immune system to recognize and target melanoma cells enable Perlmutter Cancer Center oncologists to offer many more options to patients, including innovative clinical trials available only at NYU Langone.

With the 2015 addition of immunotherapy pioneer Jeffrey S. Weber, MD, PhD, to the Perlmutter Cancer Center faculty, the already strong Melanoma Research Program has stretched its wings in new directions that are already affecting patient care.

IMMUNOTHERAPY EXPERT RECEIVES NATIONAL RECOGNITION

Jeffrey S. Weber, MD, PhD, professor of medicine, has provided national leadership in bringing melanoma immunotherapy from the lab to clinical practice. Chosen by a distinguished panel of peers to receive the 2016 "Giants of Cancer Care" award, Dr. Weber serves as deputy director of the Perlmutter Cancer Center and co-director of its Melanoma Research Program, where he oversees its work in experimental therapeutics. Under the co-direction of Dr. Weber, the Melanoma Research Program has continued its string of advances in the understanding of how melanoma can be targeted by the immune system.

EXPANDING THE TREATMENT TOOLKIT FOR NONRESPONDERS

Although immunotherapy has helped many patients, others have not benefited. In 2016, research led by David M. Woods, PhD, a postdoctoral fellow in Dr. Weber's laboratory, revealed that some patients have genetic and epigenetic modifications that suppress the T cells (tumor infiltrating lymphocytes, or TILs) largely responsible for making immunotherapy work. Dr. Woods presented his findings at the 2016 American Society of Clinical Oncology annual meeting in June.

"If our research is confirmed, it suggests that by modifying the genetic or epigenetic alterations we have identified, we can potentially turn treatment nonresponders into responders and broaden the success that immunotherapies are having against melanoma and other cancers," says Dr. Woods.

Continuing that work, Dr. Weber and Dr. Woods, along with collaborators at Moffitt Cancer Center in Tampa, found that the status of key signaling pathways in T lymphocytes represents potentially clinically

COLLABORATIVE IMMUNOTHERAPY GRANT AWARDED TO FACULTY

Dr. Jeffrey Weber, and George Washington University investigators Alejandro Villagra, PhD, and Eduardo Sotomayor, MD, received a 2016 "Team Science" award from the Melanoma Research Foundation for their research project aimed at improving antibody blockade immunotherapy through the use of histone deacetylase (HDAC) inhibitors—now a phase I clinical trial at Perlmutter Cancer Center.

significant biomarkers for melanoma relapse after immunotherapy. They found that patients whose regulatory T cells had higher levels of STAT3 responded to immunotherapy, while those whose T cells have higher levels of STAT1 and STAT2 relapsed. These research findings, presented at the Society for Immunotherapy of Cancer annual meeting in November 2016, reinforce the importance of T regulatory cells in mediating the benefit of PD-1 checkpoint inhibitors, such as the PD-1 antibody nivolumab. Anti–PD-1 antibodies have become the stars of melanoma immunotherapy, as they have shown in a series of clinical trials that their blockade can trigger an immune response against melanoma cells.

Ipilimumab, an antibody that blocks the cytotoxic T lymphocyte antigen 4 (CTLA-4) receptor on T cells, was the first to show clinical benefit in patients. Currently, a number of innovative clinical trials are combining these medications, often with other targeted therapies, in an effort to further boost survival.

NYU Langone and its Perlmutter Cancer Center are at the forefront in offering these innovative therapeutic approaches to melanoma patients, many of whom have exhausted other treatment options *(see clinical trials table on page 22)*. Reports from several recent trials, including one led by Dr. Weber and published in the June 2016 issue of *Lancet Oncology*, have concluded, for example, that combination therapy of the immune checkpoint inhibitor nivolumab followed by ipilimumab has shown greater efficacy than the reverse sequence in patients with advanced melanoma.

Taking combination therapy to the next level, "Perlmutter Cancer Center will have the only triple combination adjuvant immunotherapy trial going on the United States," says Dr. Weber. The trial is based on last year's discovery by Dr. Weber, Dr. Woods, and colleagues, published in *Cancer Immunology Research*, that drugs targeting the cell's epigenetic modification apparatus (HDAC inhibitors) assist immunotherapy in combating amelanoma.

↑ Anna C. Pavlick, DO

"Because of our robust phase I clinical trials program, we can offer patients novel treatment options if their first line of treatment fails."

— Anna C. Pavlick, DO

FIRST-LINE COMBINATION THERAPY ELICITS DRAMATIC RESPONSE

As one of the early participants in expanded clinical trials for what was then known as MDX 010, now known as ipilimumab, medical oncologist Anna C. Pavlick, DO, professor of medicine and co-director of the multi-disciplinary Melanoma Research Program, witnessed her advanced patients having durable responses to treatment for the first time.

In a clinical report looking at combination immuno-therapy as a first-line therapy for metastatic melanoma, her study team reported in the *New England Journal of Medicine* in mid-2015 that among patients with *BRAF* wild-type tumors, 61 percent (44 of 72 patients) in the ipilimumab and nivolumab combination group responded versus 11 percent (4 of 37 patients) in the group that received ipilimumab plus placebo. Notably, 16 patients (22 percent) in the combination group had complete responses.

"We saw dramatic responses," says Dr. Pavlick. "Suddenly, metastatic melanoma wasn't a death sentence anymore."

Perlmutter Cancer Center now offers six combination immunotherapy trials for patients with metastatic melanoma. "Many of the options that we are now exploring in phase I trials are immune modulators, targeted therapy, and metabolic inhibitors, which are not as toxic as traditional chemotherapy," Dr. Pavlick adds. "Because of our robust phase I clinical trials program, we can offer patients novel treatment options if their first line of treatment fails."

MELANOMA CLINICAL TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
I	s15-00906	Jeffrey Weber	A Phase 1 Study of TRAIL-DR5 Antibody DS-8273a Administered in Combination with Nivolumab in Subjects with Unresectable Stage III or Stage IV Melanoma
IB	s15-01490	Jeffrey Weber	A Phase 1b Study of the Selective HDAC6 Inhibitor ACY-241 in Combination with Ipilimumab and Nivolumab in Patients with Unresectable Stage III or Stage IV Melanoma
I/II	s15-01315	Jeffrey Weber	A Phase 1/2 Dose Escalation and Cohort Expansion Study of the Safety and Tolerability of Urelumab Administered in Combination with Nivolumab in Advanced/Metastatic Solid Tumors and B Cell Non-Hodgkins Lymphoma
II	s14-01284	Anna Pavlick	A Phase II, Open-label, Multicenter, Randomized Study of CDX-1401, a Dendritic Cell Targeting NY-ESO-1 Vaccine, in Patients with Malignant Melanoma Pre-Treated with Recombinant CDX-301, a Recombinant Human Flt3 Ligand

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

Mining the Secrets of Pancreatic Cancer

At Perlmutter Cancer Center, collaborative teams are revealing how pancreatic cancer cells use the process of autophagy to their advantage.

The subject of the 2016 Nobel Prize in Physiology and Medicine was the discovery of mechanisms for autophagy, a fundamental cellular process that has been shown to be critical in normal physiology and disease.

"Autophagy plays a key role in a variety of biological processes, including tumor growth and survival," says Alec Kimmelman, MD, PhD, professor of radiation oncology and chair of the Department of Radiation Oncology. "Our research has demonstrated how autophagy contributes to pancreatic cancer growth and how targeting this pathway may be an effective therapeutic approach."

In 2016, a multi-institutional research team led by Dr. Kimmelman discovered that pancreatic ductal adenocarcinomas (PDAC), one of the most aggressive and lethal of all cancers, engage neighboring cells and use autophagy to supply them with nutrients. The finding appeared in the August 25, 2016, issue of *Nature*.

Their study was the first to reveal that pancreatic cancer cells send signals to stellate cells, a type of supporting cell in the pancreatic environment, causing them to break down their own cell parts into various building blocks, including the amino acid alanine. The research team established that the PDAC cells specifically use the amino acid alanine as a fuel source when sugars like glucose become scarce in the nutrient-poor tumor microenvironment. When researchers selectively disrupted autophagy in the stellate cells using mouse models, tumor growth was largely blocked.

"This work establishes the existence of a new kind of metabolic crosstalk between pancreatic cancer and stellate cells," says Dr. Kimmelman. "Understanding this unique metabolism may allow us to design approaches to impair the ability of these tumors to grow and survive."

Dafna Bar-Sagi, PhD, professor of medicine, biochemistry, and molecular pharmacology, and senior vice president, vice dean for science, and chief scientific officer, had previously found that pancreatic cancer cells create vesicles on their own surfaces to capture nutrients nearby, pulling those nutrients into the cells through a process called macropinocytosis. Now, Dr. Bar-Sagi and Dr. Kimmelman are working collaboratively to determine if macropinocytosis and autophagy cooperate to deliver scavenged proteins and lipids to lysosomes in starving cancer cells. If such cooperation is demonstrated, the two processes could become a joint therapeutic target for this typically fatal disease.

Pancreatic cancer protects itself from destruction by the immune system, according to a series of

groundbreaking

RESEARCH STUDIES

by Perlmutter Cancer Center researchers published in *Nature*, *Cell*, and *Cancer Discovery* in 2016

HOW PANCREATIC CANCER SHIELDS ITSELF FROM THE IMMUNE SYSTEM

Two separate but complementary studies from Perlmutter Cancer Center have revealed that pancreatic cancer cells employ multiple mechanisms to shield themselves from attempts by the immune system to destroy them.

Pancreatic cancers are known to be complex and resistant to immunotherapy approaches that have shown success in other types of cancer. By using a mouse model to study the complex interplay of pancreatic cancer cells and immune cells in the tumor microenvironment, George Miller, MD, the H. Leon Pachter, MD Associate Professor of Surgery and associate professor of cell biology, and his research team discovered that some tumor cells undergo a specific type of orchestrated cell death termed necroptosis. Paradoxically, as these cells die, they help ensure survival of the remaining cancer cells—and even accelerate their growth.

The team's report, published in the journal *Nature*, pinpoints specific proteins released during necroptosis that attract tumor-associated macrophages, which reduce the immune system's ability to recognize and destroy the cancer.

"The phenomenon of apoptosis, or programmed cell death, is well known and very important in cancer, but necroptosis had never been studied in this context. Our findings are the first to show that cancer cell death via necroptosis can actually promote tumor growth, as it suppresses the body's immune response against the cancer," says Dr. Miller, the study's senior investigator.

Dr. Miller is now collaborating with Deirdre J. Cohen, MD, assistant professor of medicine, to investigate the anticancer potential of an investigational compound that inhibits necroptosis. The team is exploring the possibility of a clinical trial that would combine a necroptosis inhibitor with immunotherapy.

↑ George Miller, MD, and Donnele Daley, MD

Another team, led by Dr. Miller and Donnele Daley, MD, a Bernard and Irene Schwartz Gastrointestinal Oncology Fellow and surgical resident, identified a specific subset of T cells called γδ T cells that prevent other tumor-fighting T cells from attacking pancreatic tumors, possibly explaining why immunotherapy hasn't produced meaningful outcomes. The September 8, 2016 paper, published in *Cell*, demonstrated that unless γδ T cells—which make up 40 percent of T cells in pancreatic tumors—can be blocked, immunotherapy will have limited impact on the disease.

Further complicating the situation, B cells, a critical part of the adaptive immune response and potential ally in targeting tumors for destruction, have the opposite effect in pancreatic cancer. In the March 2016 issue of *Cancer Discovery*, Dr. Bar-Sagi and her Perlmutter Cancer Center colleagues reported that certain B cells recruited to pancreatic tumors secrete the growth-promoting substance IL-35, resulting in tumor cell proliferation. The findings, say Dr. Bar-Sagi, point to new treatment approaches that target this subset of B cells.

SMOKING, MOUTH BACTERIA LINKED WITH PANCREATIC CANCER RISK

A simple spit sample might help identify people at greater risk of developing pancreatic cancer. While the link between poor oral health and pancreatic cancer has been known for some time, recent research by Jiyoung Ahn, PhD, associate professor of population health and environmental medicine, and associate director of Population Sciences at Perlmutter Cancer Center, and her team ties certain oral bacteria directly to disease risk—and could help flag patients for screening.

"Perlmutter Cancer Center's seamless approach to pancreatic cancer care brings together basic science and multidisciplinary expertise across medical, surgical, and radiation oncology. These powerful clinical and scientific collaborations help optimize treatment options and connect patients with novel clinical trials."

— Elliot Newman, MD

The findings were presented at the American Association for Cancer Research annual meeting in April 2016 and published online in October 2016 in *Gut*. Using oral wash samples obtained from healthy patients who ultimately developed cancer, along with data from two prospective cohort studies—the American Cancer Society Cancer Prevention Study II and the NCI Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial—the team showed that participants carrying the bacteria *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans* had at least twice the risk of developing pancreatic cancer. Both varieties of bacteria have also been tied to periodontal disease. In contrast, the bacterial family *Fusobacteria*, and its genus *Leptotrichia*, was associated with decreased risk of pancreatic cancer.

In a separate study, the most comprehensive of its kind to date, Dr. Ahn and colleagues have found that smoking significantly alters the bacterial species in the mouth—the oral microbiome—with health effects researchers are only beginning to understand. Following these findings published in the *International Society for Microbial Ecology Journal* in March 2016, further research will be needed to determine whether these smoking-linked oral microbiome changes influence subsequent risk of developing cancer, says Dr. Ahn.

GASTROINTESTINAL CANCER CLINICAL TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
I	s14-01317	Jennifer Wu	A Phase I Study of Immune Checkpoint inhibition (Anti-CTLA4 and/or Anti-PD-L1) in Combination with Radiation Therapy in Patients with Unresectable and Non-metastatic Pancreatic Cancer
I	s14-01168	Deirdre Cohen	A Phase Ib Study Combining Irinotecan with AZD1775, a Selective WEE 1 inhibitor, in RAS (KRAS or NRAS) or BRAF Mutated Metastatic Colorectal Cancer Patients Who Have Progressed on First Line Therapy
II	s16-00695	Deirdre Cohen	A Phase II, Multicenter, Single-Arm Study of Oral Ceritinib in Adult Patients with ALK and ROS1 Activated Gastrointestinal Malignancies
II	s15-00236	Lawrence Leichman	Perioperative Therapy for Resectable Adenocarcinoma and Borderline Resectable Pancreatic Adenocarcinoma with Molecular Correlates

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

Experience and Evidence Form Foundation of Prostate Cancer Care

Physicians develop individualized, targeted prostate treatments to eliminate cancers while preserving function.

Prostate cancer screening continues to be controversial. Historically, men with PSA above the threshold value underwent random transrectal ultrasound (TRUS)-guided biopsy followed by curative treatment of all screen-detected cancers. This screen, detect, and treat paradigm has decreased prostate cancer mortality by 40 percent. But in the process, many men have been subjected to risks associated with unnecessary biopsy and treatment of low-risk lesions.

Under the leadership of Herbert Lepor, MD, professor of urology, biochemistry, and molecular pharmacology, the Martin Spatz Chair of the Department of Urology, and director of the Smilow Comprehensive Prostate Cancer Center, NYU Langone urologists have raised the bar in prostate care. Perlmutter Cancer Center and the Department of Urology are testing novel prostate cancer biomarkers, performing evidence-based MRI-guided target biopsies, as well as teaching others the technique, and pioneering focal ablation of cancers. NYU Langone's motto is "Screen, detect, and treat prostate cancer *smarter*," with the goal of further decreasing prostate cancer mortality while minimizing the burden of overdiagnosis, overdetection, and overtreatment.

INNOVATIVE BIOMARKERS MAY HELP STRATIFY RISK

While the PSA test remains the standard for prostate cancer risk assessment, the search for more specific and predictive biomarkers continues, with several commercially available tests vying to be the next PSA. Stacy Loeb, MD, assistant professor of urology and population health, conducted pioneering work on the new biomarker Prostate Health Index (*phi*), a test that combines total, free, and [-2]proPSA into a single score as part of a multivariable risk assessment tool. In a study published in *BJU International* in October 2016, Dr. Loeb and colleagues showed that the *phi* test outperformed the PSA test in predicting which men were more likely to harbor aggressive prostate cancers and also which men with low-risk disease were best managed with active surveillance or curative intervention. They developed a nomogram using *phi* values along with other risk factors to predict "aggressive" prostate cancer. A test called the 4Kscore analyzes PSA-related proteins and calculates the likelihood that a "random" prostate biopsy would find an aggressive cancer. According to Dr. Loeb, *phi* and 4K are two of several tests currently being used in clinical practice to help make biopsy decisions.

MRI-GUIDED BIOPSY PROVES ITSELF OVER TIME

Pioneering work by Samir S. Taneja, MD, the James M. Neissa and Janet Riha Neissa Professor of Urologic Oncology, professor of radiology, and co-director of the Genitourinary Cancer Program at Perlmutter Cancer Center, and Andrew B. Rosenkrantz, MD, associate professor of radiology and urology, and director of

NYU Langone urologists have performed MRI-guided prostate biopsies on

2,000+ men

SINCE PIONEERING

the method in 2010

prostate imaging, has demonstrated the value of MRI in detecting prostate cancers. While ultrasound cannot detect the presence of cancer and biopsy performed under direct MRI guidance is cumbersome and costly, combining the two has proven benefits. Dr. Taneja and James S. Wysock, MD, assistant professor of urology, performed one of the first studies using computer software to co-register and fuse the images of the static MRI to the live ultrasound, which enabled biopsying of the MRI-suspicious lesions under ultrasound guidance. The predictive value of negative 3T multiparametric MRI of the prostate on 12-core biopsy results was reported by Dr. Wysock, Dr. Taneja, and colleagues in 2016 in *BJU International*. NYU Langone urologists have performed more than 2,000 such MRI-fusion targeted biopsies. A robust patient database provides the evidence to identify which patients most benefit from the MRI-fusion biopsy procedure in the detection of prostate cancers.

"Our experience at NYU Langone with MRI-guided biopsy has now been replicated nationwide. The procedure has been shown to provide superior results and better outcomes for patients," says Dr. Taneja.

ABLATION TARGETS PROSTATE CANCER WHILE PRESERVING FUNCTION

Approximately one in five men in Dr. Lepor's series of nearly 5,000 men who underwent radical prostatectomy have a single site of prostate cancer. For those with both a single dominant site of cancer and sites of insignificant cancer, focal ablation, which eradicates only those significant regions, offers targeted, minimally invasive treatment. Together with several urologists worldwide, Dr. Lepor recently completed a comprehensive review of the literature on focal therapy. The review, described in the January 2017 issue of *European Urology*, included all energy sources used for focal ablation, including laser, cryotherapy, high-intensity focused ultrasound (HIFU), radiation, and photodynamic therapy.

One of the few national cancer centers with multiple options for targeted prostate cancer treatment, the Smilow Comprehensive Prostate Cancer Center takes a personalized, prostate-preserving approach. "Our goal is to select the right energy source for the right patient," says Dr. Taneja. "We are learning that each energy source has different strengths and weaknesses along a spectrum."

↑ Samir S. Taneja, MD, and Herbert Lepor, MD

↓ 3D-printed model of prostate with tumor

3D PRINTING AIDS MINIMALLY INVASIVE SURGERY

The case: A 66-year-old patient required surgery to destroy a tumor in his prostate the size of a gumball. Lead surgeon Dr. Taneja determined that the best course of treatment was to ablate the cancerous tissue with targeted radio-frequency energy. In order to be successful, this type of minimally invasive therapy required a detailed understanding of the tumor's position in relation to the urethra, surrounding nerve tissue, and other structures. Dr. Taneja and his team used this relatively simple 3D model of the patient's prostate to guide them before and during the procedure. "We found the model to be extremely helpful in fully destroying the tumor while sparing healthy adjacent tissue," says Dr. Taneja.

Because laser treats a small area, Dr. Taneja continues, it carries risk of undertreatment in the surrounding tissues and may be best targeted to small tumors adjacent to the urethra. On the other hand, cryosurgery is the most reliable in terms of region of destruction, most appropriate for larger tumors away from the nerves and the rectum. HIFU may be most appropriate for larger tumors located in the posterior half of the prostate, near the rectum. HIFU, approved by the FDA in fall 2015 and employed since early 2016 at NYU Langone—the second U.S. academic institution to employ it—is used in patients with intermediate-risk prostate cancer. "This technology provides important, minimally invasive outpatient treatment for a niche group of men with prostate cancer who otherwise have limited options for care," explains Dr. Wysock.

In the December 2015 issue of *European Urology*, Dr. Lepor and colleagues reported no complications or adverse impact of laser ablation on quality of life in a longitudinal outcomes study of 25 consecutive men, underscoring its promise as a targeted therapy. Studies evaluating longer-term cancer control are required to confirm its efficacy.

INTEGRATING NEW BIOMARKERS AND MRI INTO CLINICAL PRACTICE

At a plenary session of the American Urological Association (AUA) 2016 Annual Meeting, Dr. Lepor presented recommendations for integrating new biomarkers, MRI screening, and MRI-fusion targeted biopsy into clinical practice. He emphasized the importance of addressing the risks and benefits in a shared decision-making process between the patient and the doctor. For men with a slightly elevated PSA level and no other risk factors for prostate cancer, he typically recommends a biomarker test such as *phi* or 4Kscore. If the risk of an aggressive cancer is greater than 10 percent on these tests, a prostate biopsy is indicated. An MRI is obtained to determine feasibility of performing an MRI-fusion targeted biopsy. By contrast, if the PSA is very high or has been progressively rising, MRI and biopsy should be performed, rendering *phi* or 4K testing unnecessary. In cases with equivocal risk for aggressive cancer based on the PSA level and other risk factors, both a biomarker test (such as *phi* or 4Kscore) and an MRI should be performed. If there is an MRI lesion or the *phi*/4Kscore demonstrates a risk of significant cancer greater than 10 percent, a biopsy is generally recommended. Since MRI does miss some aggressive prostate cancers if a negative MRI is associated with other significant risk factors, a random biopsy should be performed. Dr. Lepor concluded that these recommendations will likely be subject to continued refinement over time.

LONG-TERM STUDIES INFORM PRACTICE

In 2015, Dr. Taneja and his colleagues published the first research data showing that men with low suspicion scores on MRI have very few cancers and may be spared future biopsies. That study also showed that MRI-targeted biopsy detects more high-grade cancers than systematic biopsy, indeed 50 percent more. The MRI-fusion biopsy allows NYU Langone urologists to better assess who is an appropriate candidate for active surveillance and who needs surgery. Currently, NYU Langone has 250 to 300 men enrolled in its active surveillance program.

The required intensity of active surveillance follow-up is a hot topic for urologists nationwide. NYU Langone is playing a leading role in shedding light in this area by studying the use of active surveillance in men treated at NYU Langone and how the method is practiced in the community. Dr. Loeb, along with NYU Langone colleagues Dr. Lepor and Dr. Makarov, recently completed a retrospective analysis of 5,192 patients undergoing active surveillance from 2001 to 2009 using SEER (Surveillance, Epidemiology, and End Results)-Medicare data. They found that most men are not receiving the recommended frequency of PSA tests or surveillance biopsies. The findings, published in the September 2016 issue of the *Journal of Urology*, highlight the paucity of data on how active surveillance is being practiced at the community level nationwide. To address these issues, Dr. Loeb currently has an NIH grant to study the best type, sequence, and interval of follow-up testing, and create patient education tools for carrying out active surveillance.

$1.1 MILLION AWARD CAPS YEARS OF RESEARCH HELPING VA PHYSICIANS TO "CHOOSE WISELY"

The goal of radical prostatectomy or radiation therapy is typically to "cure" localized prostate cancer. In the days before PSA screening, men used to present with advanced disease and needed advanced imaging to demonstrate that they were candidates for local therapy. In the modern era, routine imaging to exclude metastatic disease has become obsolete, as the overwhelming majority of men with clinically localized disease will not have demonstrable metastasis on routine imaging. In spite of guidelines from the AUA and the American Society of Clinical Oncology, up to half of men with localized prostate cancer still undergo unnecessary bone scans, CT scans, and MRIs to stage newly diagnosed disease. To improve guidelines adherence for the staging of incident prostate cancer, Danil V. Makarov, MD, MHS, assistant professor of urology and population health and director of surgical research, has been studying patterns of imaging use among physicians in the Veterans Health Administration (VA) and what generates them. Dr. Makarov's recent research shows that physicians' attitudes are the primary driver of overuse of imaging, while patients have little interest in this aspect of care. The study, published in 2016 in *Implementation Science*, also suggested that physicians would be receptive to an electronic medical record–linked support tool to guide them in deciding whether or not to use imaging. This evidence-based approach formed the basis for a 10-site, $1.1 million VA Merit Review Award to implement just such a tool designed by Dr. Makarov. For this work, Dr. Makarov was named a 2016 Choosing Wisely Champion by the AUA and the American Board of Internal Medicine.

PROSTATE CANCER CLINICAL TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
II	s14-01042	Arjun Balar	Phase 2 Randomized, 3-Arm Study of Abiraterone Acetate Alone, Abiraterone Acetate Plus Degarelix, a GnRH Antagonist, and Degarelix Alone For Patients with Prostate Cancer with a Rising PSA or a Rising PSA and Nodal Disease Following Definitive Radical Prostatectomy

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

Immunotherapy Rapidly Changing Treatment Paradigm for Bladder Cancer

Immune checkpoint inhibitors show promise in both first-line and second-line treatment settings.

In rapid succession, a series of results of immunotherapy clinical trials reported at international oncology meetings by Arjun V. Balar, MD, assistant professor of medicine and director of Perlmutter Cancer Center's Genitourinary Medical Oncology Program, have made waves in the urothelial cancer community.

Presented at the American Society of Clinical Oncology Annual Meeting this past June and recently published in *The Lancet*, Dr. Balar reported the first-ever results of the efficacy and safety of programmed death ligand 1 (PD-L1) blockade with atezolizumab, an anti–PD-L1 antibody, as first-line treatment in cisplatin-ineligible patients with metastatic or locally advanced urothelial cancer. Based on data from cohort 1 of the IMvigor 210 trial, an international multicenter phase II study, Dr. Balar reported that tumors shrank by at least 30 percent and new tumor growth stalled in 27 of 119 (23 percent) of patients. The FDA approved atezolizumab as a second-line treatment for bladder cancer in 2016.

At the European Society for Medical Oncology October 2016 Congress in Copenhagen, Dr. Balar presented the first-ever report of the efficacy and safety of PD-1 blockade with pembrolizumab in cisplatin-ineligible patients with metastatic or locally advanced bladder cancer. The findings of the so-called KEYNOTE-052 trial showed that, of the first 100 patients enrolled, 24 percent had an objective response. Of the 30 patients with 10 percent or greater total expression of the biomarker PD-L1, in immune cells or tumor cells, 37 percent responded to treatment. Furthermore, the treatment was well tolerated, with very few side effects.

"Atezolizumab is the first new therapy to be approved in more than three decades for bladder cancer, and is now the standard of care in the second-line setting," says Dr. Balar. "The activity and safety data from these two trials make an argument for this class of drugs also to become the new standard of care in first-line metastatic bladder cancer."

Even more dramatic changes are expected in the coming years with the use of immunotherapy in other clinical stages and as combination therapy.

"As an institution, Perlmutter Cancer Center was one of the very first to test this class of drugs, PD-1 and PD-L1 antibodies, in bladder cancer," says Dr. Balar. "Since early 2014, we have led accrual both nationally and internationally on the KEYNOTE-052 and IMvigor 210 trials."

NIH GRANT SPURS BLADDER CANCER RESEARCH

NYU Langone's urology research program has shown outstanding productivity in 2016, leading the nation in efforts to better understand and treat bladder cancer. The program's five-year, $8.2 million National Cancer Institute program project grant in bladder cancer is the only active grant in the nation that focuses on the fundamental mechanisms underlying the occurrence and progression of bladder cancer. Xue-Ru Wu, MD, the Bruce and Cynthia Sherman Professor of Urological Research and Innovation, professor of urology and pathology, and vice chair of Urological Research, and his team of investigators published more than 20 articles on their research in 2016. The multidisciplinary team includes contributors from urology, pathology, medical oncology, and environmental medicine.

↓ Arjun V. Balar, MD, and Deborah Koeppel, LCSW-R

"Perlmutter Cancer Center has led accrual both nationally and internationally on the KEYNOTE-052 clinical trial, providing evidence for immunotherapy as the new standard of care for metastatic bladder cancer."

— Arjun V. Balar, MD

BLADDER CANCER CLINICAL TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
II	s15-00220	Arjun Balar	A Phase II Trial of MK3475 in Combination with Gemcitabine and Concurrent Hypofractionated Radiation Therapy as Bladder Sparing Treatment for Muscle-Invasive Urothelial Cancer of the Bladder
II	s14-01913	Arjun Balar	A Phase II Clinical Trial to Study the Efficacy and Safety of Pembrolizumab (MK-3475) in Subjects with High-Risk Non-muscle Invasive Bladder Cancer (NMIBC) Unresponsive to Bacillus Calmette-Guerin (BCG) Therapy
II	s16-01918	Arjun Balar	A Phase II Randomized Study of Atezolizumab with or without Bevacizumab in Cisplatin-Ineligible Patients with Advanced Urothelial Cancer

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

Kidney-Conserving Surgery Comes of Age

William C. Huang, MD, was the lead author on a seminal research study in *Lancet Oncology* establishing partial nephrectomy as the standard of care for localized kidney cancers more than a decade ago. Now, more than 9,000 kidney cancer patients in the United States have been treated using this approach.

In 2015, Dr. Huang, associate professor of urology, chief of Urology Service at Tisch Hospital, and co-director of the Robotic Surgery Center, published a retrospective study in *JAMA Surgery*, looking at the evolution and expansion of the management options for small kidney tumors. Dr. Huang, co-author Marc A. Bjurlin, DO, clinical assistant professor of urology and director of urologic oncology at NYU Lutheran, and collaborators at other institutions evaluated changes in the use of kidney-sparing approaches and nonsurgical options. They found that use of partial nephrectomy has risen dramatically but the nonoperative management of these cancers has remained stable. For some people, especially the elderly or those who are sick, these masses pose little risk to their longevity. Says Dr. Huang, "Over the past decade, the needle has not moved in either direction. Most tumors are still being removed."

Overall survival was excellent, with only 249 patients (4.2 percent) who had surgery and 44 (6.6 percent) who did not have surgery dying of kidney cancer. "We know many people could be spared surgery, but we don't know how to identify the small number of patients whose tumors will become aggressive," says Dr. Huang.

Today, suspected kidney tumors are one of the few cancers not routinely biopsied. "Right now, kidney tumors are diagnosed on imaging alone," says Dr. Huang, "and the decision to treat is frequently based more on the patient's health and not on the risks of the tumor itself. We want to change that dynamic, preoperatively identifying which tumors may behave aggressively, prompting treatment." Working at this frontier, Dr. Huang and his colleagues at Perlmutter Cancer Center are studying how to use novel imaging techniques to differentiate malignant tumors from benign tumors and to identify patients who are most likely to benefit from removal of their tumor. At NYU Langone, the same imaging is also used to assess the kidney function of patients with kidney tumors to help predict their kidney functional outcomes following treatment.

NYU Langone offers

advanced

RENAL FUNCTION IMAGING

including intraoperative ultrasound, near-infrared fluorescence imaging, and 3D printing

In 2016, NYU Langone offered a

live kidney

SURGERY COURSE

as part of a large multi-specialty robotics course with over 20 visiting faculty

There were over 360 attendees from 38 states and 11 foreign countries

The case: A 59-year-old patient required surgery to remove a tumor the size of a golf ball on his right kidney. With this 360-degree view, Dr. Huang chose to approach the tumor from behind the abdominal cavity instead of in front of it. The model also allowed him to better explain the surgery to the patient and to navigate more easily during the procedure than with an intraoperative ultrasound probe.

← 3D-printed model of kidney with tumor

3D-PRINTED KIDNEY MODELS AID SURGICAL PLANNING

Dr. Huang regularly removes tumors in cases where it is critical to spare the delicate nephrons and avoid the arterial structures. For assistance in surgical planning, Dr. Huang has partnered with NYU Langone's Department of Radiology to produce 3D-printed models based on MRI or CT scans. These models have been a valuable asset that has altered surgical planning in about half the cases in which they have been used, says Dr. Huang. He adds, "For example, using the models, we can preoperatively determine the best surgical approach and intraoperatively preserve normal healthy renal tissue without compromising cancer control. For a partial nephrectomy, it is particularly helpful to have a model."

William C. Huang, MD, is a member of several

international

KIDNEY CANCER TREATMENT GUIDELINE PANELS

including the American Society of Clinical Oncology guideline panel for the management of kidney cancer

KIDNEY CANCER CLINICAL TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
IB	s15-01164	Daniel Cho	A Phase 1b, Open-label, Dose-finding Study to Evaluate Safety, Pharmacokinetics and Pharmacodynamics of Avelumab (msb0010718c) in Combination with Axitinib (Ag-013736) in Patients with Previously Untreated Advanced Renal Cell Cancer

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

New Genetic Clues Unlock Targeted Treatment Options

Achievements in research and patient care at the NYU Langone Brain Tumor Center, part of Perlmutter Cancer Center, are supported by cross-disciplinary collaboration and fostered by co-directors John G. Golfinos, MD, and Andrew S. Chi, MD, PhD. Working as a team, Dr. Golfinos and Dr. Chi combine their expertise in neurosurgery and neuro-oncology with colleagues from neuropathology, neuroradiology, radiation oncology, and other divisions to find new treatment approaches for patients.

GENE SEQUENCING MATCHES MUTATIONS WITH TUMOR TREATMENTS

At the Brain Tumor Center, the lack of effective drug therapies for malignant brain tumors is a hurdle researchers are eager to overcome. In a new initiative driven by Andrew S. Chi, MD, PhD, assistant professor of medicine, neurology, and neurosurgery, chief of neuro-oncology, and co-director of the center, each patient's upfront treatment is being tailored to the genetic profile of their tumor tissue. "Each malignant brain tumor is defined by specific genetic mutations," explains Dr. Chi. "By identifying those mutations, we can select treatments that target those genetic subtypes."

Leveraging the sequencing expertise of neuropathologists to analyze brain tissue samples, the Brain Tumor Center conducts genetic testing on every one of its brain tumor patients. This approach enables the center to cultivate two categories of novel treatments: experimental drugs and existing cancer drugs repurposed for brain tumors.

GENETICALLY TAILORED THERAPIES MOVE TO THE FRONT LINES

Although genetically tailored drug therapies are typically used in combination with standard chemotherapy and radiation treatment or to treat tumor recurrences, the Brain Tumor Center is also beginning to investigate their use as first-line monotherapy for selected brain cancers.

"Genetic testing has been a paradigm in cancer drug therapy, but its adoption for the management of brain cancer has been slow," adds Dr. Chi. "It's not a 'one drug fits all gliomas' world anymore. In the future, it will be all about determining the specific genetic profile of each patient's tumor and matching the right treatment to that genetic subtype."

GLIOMA VACCINE CLINICAL TRIAL

Based on the success of a pediatric trial, Sharon L. Gardner, MD, associate professor of pediatrics, is leading a new clinical trial of a combination immunotherapy developed at Perlmutter Cancer Center for adults with their first recurrence of a glioblastoma. An example of a "tumor vaccine," the injection contains a cocktail of tumor-associated peptides and bevacizumab, an immune system stimulant approved for the treatment of recurrent malignant gliomas. The trial will test whether the therapy induces an immune response against brain cancer cells and extends the lives of patients with tumors that have transformed to a lethal stage.

↓ Andrew S. Chi, MD, PhD

"It's not a 'one drug fits all gliomas' world anymore. In the future, it will be all about determining the specific genetic profile of each patient's tumor and matching the right treatment to that genetic subtype."

— Andrew S. Chi, MD, PhD

EXPLOITING METABOLIC VULNERABILITIES IN SPECIFIC GENETIC SUBTYPES

In December 2015, a research team co-led by Dr. Chi published a study in *Cancer Cell* on their efforts to exploit a metabolic abnormality in gliomas with mutations of the *IDH1* gene. The team discovered that this mutation causes low cellular levels of the chemical nicotinamide adenine dinucleotide (NAD), which is critical for maintaining sufficient energy levels in the cell. When the researchers administered NAD-lowering nicotinamide phosphoribosyltransferase (NAMPT) inhibitors to mice implanted with *IDH1*-mutant glioma cells in their brains, they found the drugs extended the animals' lives with no significant side effects.

"Our findings suggest that NAMPT inhibitors might be effective against *IDH1*-mutant gliomas, which are impervious to current anticancer drugs," notes Dr. Chi. The center is also preparing to launch and lead multisite human trials testing two other gene-based therapies—a drug that targets *IDH1*-mutant glioma subtypes and an immunotherapy treatment for late-stage *IDH1/2* mutant gliomas.

BRAIN TUMOR CLINICAL TRIALS CURRENTLY RECRUITING

Phase	Study ID	Investigator	Study Title
II	s16-00126	Andrew Chi	Phase II Trial of SMO/AKT/NF2 Inhibitors in Progressive Meningiomas with SMO/AKT/NF2 Mutations
II	s16-00135	Andrew Chi	Randomized Phase II Study: Corticosteroids + Bevacizumab vs. Corticosteroids + Placebo (BEST) for Radionecrosis After Radiosurgery for Brain Metastases

To learn more about our clinical trials, contact us at PCC-CTO@nyumc.org.

Radiation Oncologists Leverage Cross-Disciplinary Expertise to Develop Innovative Therapies

New partnerships link the Department of Radiation Oncology with multidisciplinary expertise—within NYU Langone and beyond—to expand effective options for patients.

MULTI-DEPARTMENT COLLABORATION YIELDS NIH GRANT TO CURB ORAL MUCOSITIS

A collaboration among several NYU Langone departments could result in a new kind of oral care protocol to help relieve mucositis, a chronic oral inflammation that cancer patients develop during chemoradiation treatment. Often debilitating, oral mucositis (OM) can result in the formation of infected ulcers. Currently, there are no effective therapies or preventive treatments for OM; instead, most suggested treatments merely reduce the severity of the symptoms.

Supported by Constance and Martin Silver, two NYU Langone researchers recently conducted a study whose findings suggest a new technique for battling OM. Nicholas J. Sanfilippo, MD, associate professor of radiation oncology and clinical medical director of the Department of Radiation Oncology, and Patricia M. Corby, DDS, associate professor of radiation oncology and population health at NYU School of Medicine and clinical associate professor of peridontology and implant dentistry at NYU College of Dentistry, evaluated how the severity of OM might be affected by periodontal cleaning during cancer treatment. Their pilot investigation of 14 head and neck cancer patients showed that patients who received periodontal cleaning had less local tissue inflammation than those who did not. The results were promising enough to garner a $267,000 grant from the National Institutes of Health in 2016 to expand the work.

"Our multidisciplinary care program for cancer patients at the NYU Langone Head and Neck Center and

↑ Dafna Bar-Sagi, PhD, and Alec Kimmelman, MD, PhD

our proximity to investigators at our medical, dental, nursing, and social work schools allow us to apply our expertise to a wide variety of subjects," says Dr Sanfilippo. "We believe our early results indicate many patients will benefit from this intervention."

M-CSF BLOCKADE MAY UNLOCK RADIATION'S POTENTIAL FOR PANCREATIC CANCER TREATMENT

Radiation therapy has characteristically provided modest benefits to pancreatic cancer patients, and increasing its efficacy could dramatically improve outcomes. A collaborative research project between the departments of Radiation Oncology and Surgery may have uncovered a critical mechanism behind this treatment's inefficacy: radiation-induced local immune suppression. The study in mice, published in June 2016 in *Gastroenterology*, revealed that pancreatic tumors treated with high-dose radiation were filled with macrophages and T cells, indicating an immunosuppressive tumor microenvironment.

Examination of pancreatic tumor cells treated with radiation showed increased production of macrophage colony-stimulating factor (M-CSF), a chemical signal that induces macrophage proliferation. When researchers inhibited this signal by administering M-CSF antibodies in combination with radiation, tumor response was dramatically increased. Researchers further demonstrated the role of M-CSF by transferring T cells from irradiated tumors to untreated control mice, which caused an increase in tumor growth that they could again restrict using M-CSF blockade.

To further assess the M-CSF blockade's effectiveness, the investigators administered M-CSF antibodies at the time of radiation. This blockade reduced both the development of new cancers from radiation exposure and the degree of radiation-induced fibrosis.

"This blockade is a targeted therapy that has the very exciting potential improve the therapeutic effect of radiation for pancreatic cancer patients," says Kevin L. Du, MD, PhD, assistant professor of radiation oncology and co-senior study investigator.

To build on these results, the team is now collaborating with medical oncologist Deirdre J. Cohen, MD, assistant professor of medicine, to develop a clinical trial combining radiation therapy and an M-CSF inhibitor for patients with pancreatic cancer, says the study's senior author, George Miller, MD, the H. Leon Pachter, MD Associate Professor of Surgery and associate professor of cell biology.

METABOLOMICS CORE FACILITY TO EXPAND RESEARCH ON TUMOR FUNCTION

NYU Langone and Perlmutter Cancer Center gained unique expertise in metabolomics with the 2016 recruitment of Michael E. Pacold, MD, PhD, assistant professor of radiation oncology. Increasingly, identification and validation of new drug targets, as well as monitoring the effects of anticancer agents in clinical trials, rely not only on genomic data but also on metabolomics, the analysis of the chemical composition inside cells under varying conditions.

Dr. Pacold will oversee the building of a metabolomics core facility that will reinforce NYU Langone's system-wide research infrastructure. Says Alec Kimmelman, MD, PhD, professor of radiation oncology and chair of the Department of Radiation Oncology, "The metabolomics core facility will strengthen our ability to carry out critical research on the role of metabolism in cancer. In my own group, we look forward to extending our research on the metabolism of pancreatic cancer cells. Moreover," he adds, "the creation of this state-of-the-art facility will provide a platform for investigators across a multitude of disciplines to study the role of cellular metabolism."

"In addition to providing world-class clinical care across New York City, we have an elite basic and translational science research program that works with the clinical investigators to develop the next generation of novel clinical trials."

— Alec Kimmelman, MD, PhD

Doctor, Redefined

AS AN ACADEMIC MEDICAL CENTER, OUR CORE MISSION IS NOT ONLY TO ADVANCE CLINICAL CARE. WE ARE ALSO COMMITTED TO EDUCATING AND TRAINING THE NEXT GENERATION OF PHYSICIAN-SCIENTISTS.

↑ Mark R. Philips, MD

Physician-Scientists Lay Their Foundations

NYU Langone's transformative educational opportunities provide unparalleled training experiences, both bench- and bed-side, to the next generation of physician-scientists. Three of them are presented here.

ARAM S. MODREK

Current Student, Medical Scientist Training Program (MSTP)

MD/PhD Candidate, Molecular Oncology and Tumor Immunology

Aram Modrek knew from adolescence that he wanted to be a clinical oncologist. In college, though, he discovered a new love: the science underlying cancer biology. NYU School of Medicine's MD/PhD program, known as the Medical Scientist Training Program (MSTP), has given him "the best of both worlds" and the opportunity to complete his medical degree in only three years through the Medical Center's new MD/PhD Accelerated Pathway.

Mr. Modrek was recently accepted into NYU School of Medicine's radiation oncology residency program, where he can merge his interests in clarifying cancer's mechanisms and uncovering more patient-focused solutions. NYU Langone's rich, collaborative research environment and its fully funded MSTP were major draws for Mr. Modrek. Despite the time commitment of the dual-track program, he says, "There's nothing else I'd rather be doing right now."

As a graduate research assistant for Dimitris G. Placantonakis, MD, PhD, assistant professor of neurosurgery and graduate of NYU School of Medicine's MSTP, Mr. Modrek is using genetically modified neural stem cells to model the earliest stages of *IDH1*-linked gliomagenesis.

Mr. Modrek, who will begin his medical clerkship in 2017, has supplemented his bench work with multiple clinical research projects. In 2015, he was first author of a study led by Kevin L. Du, MD, PhD, assistant professor of radiation oncology, which showed that radiation therapy improved the survival of patients with rectal small cell carcinoma.

Beyond the invaluable guidance of his mentors, Mr. Modrek has been inspired by regular interactions with specialists throughout the Medical Center and at local and national meetings. "It's pretty exciting as a student thinking that one day you might be the colleague of all these people whom you look up to," he says.

↑ First-year medical students in anatomy lab

NYU School of Medicine received the first Medical Scientist Training Program grant from the NIH in 1964, making the school's MSTP

the oldest

PROGRAM OF ITS TYPE IN THE U.S.

DONNELE DALEY, MD

2014–2016 Bernard and Irene Schwartz Gastrointestinal Cancer Postdoctoral Fellow, Perlmutter Cancer Center

4th Year General Surgery Resident, Department of Surgery

Donnele Daley, MD, first encountered the field of surgery in one of the most unlikely places: an undergraduate engineering class. As she worked alongside surgeons to design organ implants, she had her first glimpse into what medicine—and research—might hold for her.

Upon completing her medical degree, Dr. Daley applied to academic residency programs that would allow her to both hone her general surgery skills and engage in basic science research. She matched at NYU Langone's Department of Surgery and trained with George Miller, MD, the H. Leon Pachter, MD Associate Professor of Surgery, and associate professor of cell biology, one of the few surgeons in the nation with a basic science research laboratory.

"Our residents are just as diverse as the patients we treat."

— Donnele Daley, MD

Dr. Daley's work with Dr. Miller sparked her interest in tumor immunology and its integration with surgery. To capitalize on this interest, she briefly paused her surgical residency to undertake research as a Bernard and Irene Schwartz Gastrointestinal Cancer Postdoctoral Fellow. Over two years, Dr. Daley investigated how a specific subset of T lymphocytes can actually protect a tumor from the immune system. This work culminated in a first-author publication in *Cell* in September 2016 (*see page 24*).

Working in the Department of Surgery has allowed Dr. Daley to intellectually thrive among her peers. "Our residents are just as diverse as the patients we treat," says Dr. Daley, "which has been essential to my growth as a physician-scientist." As she embarks on a surgical oncology fellowship after completing her residency in general surgery, Dr. Daley is confident in her ability to deliver exceptional care because of the broad spectrum of patients she has treated at NYU Langone and her additional training as a physician-scientist.

IAN AHEARN, MD, PhD

Attending Physician and Postdoctoral Fellow, Ronald O. Perelman Department of Dermatology

2012 Graduate, Medical Scientist Training Program (MSTP)

Understanding the underlying mechanisms of disease has been central to the success of *RAS* biologist Ian Ahearn, MD, PhD, who recently completed his training as a dermatologist. During his PhD research with Mark R. Philips, MD, professor of medicine, cell biology, biochemistry and molecular pharmacology, associate director of Perlmutter Cancer Center, and director of the Medical Scientist Training Program (MSTP), Dr. Ahearn discovered the mechanisms that modify *HRAS*, which, like its cousin *KRAS*, is a key driver gene in cancer. In addition to his thesis work published in *Molecular Cell*, Dr. Ahearn published an update to the existing cannon of *RAS* trafficking in *Nature Reviews Molecular Cell Biology* with Dr. Philips and Dafna Bar-Sagi, PhD, professor of medicine, biochemistry, and molecular pharmacology, and senior vice president, vice dean for science, and chief scientific officer. "Thanks to the support of Dr. Philips, I was able to pursue a range of hypotheses that unfolded as I learned more about *RAS* trafficking," says Dr. Ahearn.

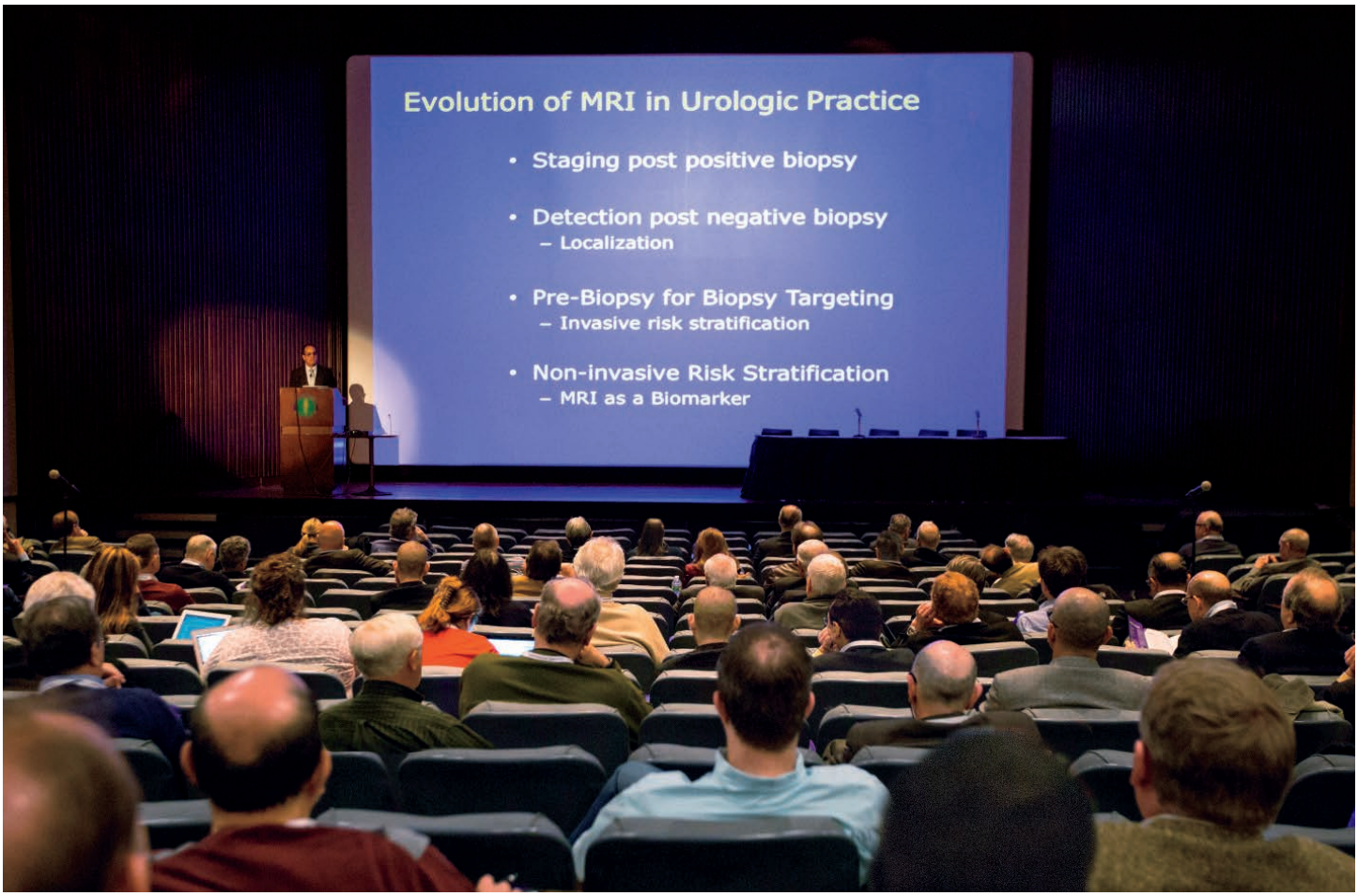
Following graduation from NYU School of Medicine and an internship at Greenwich Hospital in Connecticut, Dr. Ahearn secured a coveted position in NYU School of Medicine's Residency Program in the Department of Dermatology—one of the most competitive programs in the nation. Now a board-certified dermatologist, Dr. Ahearn continues to apply his knowledge of cell signaling to research the function of mutant *NRAS*, which is responsible for approximately 20 percent of melanoma cases and represents a potentially novel therapeutic target. Looking back on his journey, which he initially began as a technician in an NYU School of Medicine laboratory, Dr. Ahearn says "I feel truly honored and privileged to be both a physician and a scientist."

The NYU School of Medicine's Medical Scientist Training Program has produced

300+

MD/PhDs SINCE ITS INCEPTION

↓ Annual Continuing Medical Education course offered by NYU Langone's Department of Urology



Oncology Continuing Medical Education Courses Offered in 2017

We invite you to join us for one of our upcoming courses:

→ **Optimizing Outcomes for Cancer Survivorship** May 13, 2017

→ **Advances in Prostate Imaging and Ablative Treatment of Prostate Cancer** June 16–17, 2017

→ **Women and Cancer: From Screening to Survivorship** September 8–9, 2017

All courses are accredited by the Council for Continuing Medical Education.

For more information and to register, visit **med.nyu.edu/cme.**

Select Publications

Aranda-Orgilles B, Saldana-Meyer R, Wang E, Trompouki E, Fassl A, Lau S, Mullenders J, Rocha PP, Raviram R, Guillamot M, Sanchez-Diaz M, Wang K, Kayembe C, Zhang N, Amoasii L, Choudhuri A, Skok, JA, Schober M, Reinberg D, Sicinski P, Schrewe H, Tsirigos A, Zon LI, Aifantis I. MED12 regulates HSC-specific enhancers independently of mediator kinase activity to control hematopoiesis. *Cell Stem Cell*. 2016;19(6):784–799.

Balar AV, Galsky MD, Rosenberg JE, Powles T, Petrylak DP, Bellmunt J, Loriot Y, Necchi A, Hoffman-Censits J, Perez-Gracia JL, Dawson NA, van der Heijden MS, Dreicer R, Srinivas S, Retz MM, Joseph RW, Drakaki A, Vaishampayan UN, Sridhar SS, Quinn DI, Durán I, Shaffer DR, Eigl BJ, Grivas PD, Yu EY, Li S, Kadel EE 3rd, Boyd Z, Bourgon R, Hegde PS, Mariathasan S, Thåström A, Abidoye OO, Fine GD, Bajorin DF; IMvigor210 Study Group. Atezolizumab as first-line treatment in cisplatin-ineligible patients with locally advanced and metastatic urothelial carcinoma: a single-arm, multicentre, phase 2 trial. *The Lancet*. 2016; doi: 10.1016/S0140-6736(16)32455-2.

Banh RS, Iorio C, Marcotte R, Xu Y, Cojocari D, Rahman AA, Pawling J, Zhang W, Sinha A, Rose CM, Isasa M, Zhang S, Wu R, Virtanen C, Hitomi T, Habu T, Sidhu SS, Koizumi A, Wilkins SE, Kislinger T, Gygi SP, Schofield CJ, Dennis JW, Wouters BG, Neel BG. PTP1B controls non-mitochondrial oxygen consumption by regulating RNF213 to promote tumour survival during hypoxia. *Nature Cell Biology*. 2016;18(7):803–813.

Berg JM, Bhalla N, Bourne PE, Chalfie M, Drubin DG, Fraser JS, Greider CW, Hendricks M, Jones C, Kiley R, King S, Kirschner MW, Krumholz HM, Lehmann R, Leptin M, Pulverer B, Rosenzweig B, Spiro JE, Stebbins M, Strasser C, Swaminathan S, Turner P, Vale RD, VijayRaghavan K, Wolberger C. Preprints for the life sciences. *Science*. 2016;352(6288):899–901.

Blaser MJ. Antibiotic use and its consequences for the normal microbiome. *Science*. 2016;352(6285):544–545.

Boeke JD, Church G, Hessel A, Kelley NJ, Arkin A, Cai Y, Carlson R, Chakravarti A, Cornish VW, Holt L, Isaacs FJ, Kuiken T, Lajoie M, Lessor T, Lunshof J, Maurano MT, Mitchell LA, Rine J, Rosser S, Sanjana NE, Silver PA, Valle D, Wang H, Way JC, Yang L. The genome project-write. *Science*. 2016;353(6295):126–127.

Bokulich NA, Chung J, Battaglia T, Henderson N, Jay M, Li H, Lieber A, Wu F, Perez-Perez GI, Chen Y, Schweizer W, Zheng X, Contreras M, Dominguez-Bello MG, Blaser MJ. Antibiotics, birth mode, and diet shape microbiome maturation during early life. *Science Translational Medicine*. 2016;8(343):343ra82.

Bonilla X, Parmentier L, King B, Bezrukov F, Kaya G, Zoete V, Seplyarskiy VB, Sharpe HJ, McKee T, Letourneau A, Ribaux PG, Popadin K, Basset-Seguin N, Chaabene RB, Santoni FA, Andrianova MA, Guipponi M, Garieri M, Verdan C, Grosdemange K, Sumara O, Eilers M, Aifantis I, Michielin O, de Sauvage FJ, Antonarakis SE, Nikolaev SI. Genomic analysis identifies new drivers and progression pathways in skin basal cell carcinoma. *Nature Genetics*. 2016;48(4):398–406.

Borghesi M, Ahmed H, Nam R, Schaeffer E, Schiavina R, Taneja S, Weidner W, Loeb S. Complications after systematic, random, and image-guided prostate biopsy. *European Urology*. 2016; doi: 10.1016/j.eururo.2016.08.004.

Bourguignon J-P, Slama R, Bergman A, Demeneix B, Ivell R, Kortenkamp A, Panzica GC, Trasande L, Zoeller RT. Science-based regulation of endocrine disrupting chemicals in Europe: Which approach? *The Lancet Diabetes & Endocrinology*. 2016;4(8):643–646.

Cadwell K. Crosstalk between autophagy and inflammatory signalling pathways: Balancing defence and homeostasis. *Nature Reviews Immunology*. 2016;16(11):661–675.

Criscito MC, Polsky D, Stein JA. The genetic evolution of melanoma. *New England Journal of Medicine*. 2016;374(10):993–996.

Daley D, Zambirinis CP, Seifert L, Akkad N, Mohan N, Werba G, Barilla R, Torres-Hernandez A, Hundeyin M, Mani VRK, Avanzi A, Tippens D, Narayanan R, Jang J-E, Newman E, Pillarisetty VG, Dustin ML, Bar-Sagi D, Hajdu C, Miller G. γδ T cells support pancreatic oncogenesis by restraining αβ T cell activation. *Cell*. 2016;166(6):1485–1499.e15.

Fan X, Alekseyenko AV, Wu J, Peters BA, Jacobs EJ, Gapstur SM, Purdue MP, Abnet CC, Stolzenberg-Solomon R, Miller G, Ravel J, Hayes RB, Ahn J. Human oral microbiome and prospective risk for pancreatic cancer: A population-based nested case-control study. *Gut*. 2016; doi: 10.1136/gutjnl-2016-312580.

Freed M, Storey P, Lewin AA, Babb J, Moccaldi M, Moy L, Kim SG. Evaluation of breast lipid composition in patients with benign tissue and cancer by using multiple gradient-echo MR imaging. *Radiology*. 281(1):43–53.

Fu MR, Axelrod D, Guth AA, Wang, Y, Scagliola, J, Hiotis, K, Rampertaap, K, El-Shammaa, N. Usability and feasibility of health IT interventions to enhance self-care for lymphedema symptom management in breast cancer survivors. *Internet Interventions*. 2016;5:56–64.

Hodi FS, Hwu W, Kefford R, Weber JS, Daud A, Hamid O, Patnaik A, Ribas A, Robert C, Gangadhar TC, Joshua AM, Hersey P, Dronca R, Joseph R, Hille D, Xue D, Li XN, Kang SP, Ebbinghaus S, Perrone A, Wolchok JD. Evaluation of immune-related response criteria and RECIST v1.1 in patients with advanced melanoma treated with pembrolizumab. *Journal of Clinical Oncology*. 2016;34(13):1510–1517.

Honda K, Littman DR. The microbiota in adaptive immune homeostasis and disease. *Nature*. 2016;535(7610):75–84.

Huang W, Thomas B, Flynn RA, Gavzy SJ, Wu L, Kim SV, Hall JA, Miraldi ER, Ng CP, Rigo F, Meadows S, Montoya NR, Herrera NG, Domingos AI, Rastinejad F, Myers RM, Fuller-Pace FV, Bonneau R, Chang HY, Acuto O, Littman DR. Corrigendum: DDX5 and its associated lncRNA Rmrp modulate TH17 cell effector functions. *Nature*. 2016;533(7601):130.

Huang WC, Atoria CL, Bjurlin M, Pinheiro LC, Russo P, Lowrance WT, Elkin EB. Management of small kidney cancers in the new millennium: Contemporary trends and outcomes in a population-based cohort. *JAMA Surgery*. 2015;150(7):664–672.

Inoue S, Li WY, Tseng A, Beerman I, Elia AJ, Bendall SC, Lemonnier F, Kron KJ, Cescon DW, Hao Z, Lind EF, Takayama N, Planello AC, Shen SY, Shih AH, Larsen DM, Li Q, Snow BE, Wakeham A, Haight J, Gorrini C, Bassi C, Thu KL, Murakami K, Elford AR, Ueda T, Straley K, Yen KE, Melino G, Cimmino L, Aifantis I, Levine RL, De Carvalho DD, Lupien M, Rossi DJ, Nolan GP, Cairns RA, Mak TW. Mutant IDH1 downregulates ATM and alters DNA repair and sensitivity to DNA damage independent of TET2. *Cancer Cell*. 2016;30(2):337–348.

Jain IH, Zazzeron L, Goli R, Alexa K, Schatzman-Bone S, Dhillon H, Goldberger O, Peng J, Shalem O, Sanjana NE, Zhang F, Goessling W, Zapol WM, Mootha VK. Hypoxia as a therapy for mitochondrial disease. *Science*. 2016;352(6281):54–61.

Larsen EC, Devidas M, Chen S, Salzer, WL, Raetz, EA, Loh ML, Mattano LA, Cole C, Eicher A, Haugan M, Sorenson M, Heerema NA, Carroll AA, Gastier-Foster JM, Borowitz MJ, Wood BL, Willman CL, Winick NJ, Hunger SP, Carroll WL. Dexamethasone and high-dose methotrexate improve outcome for children and young adults with high-risk B-acute lymphoblastic leukemia: A report from Children's Oncology Group study AALL0232. *Journal of Clinical Oncology*. 2016;34(20):2380–2388.

Laxminarayan R, Sridhar D, Blaser M, Wang M, Woolhouse M. Achieving global targets for antimicrobial resistance. *Science*. 2016;353(6302):874–875.

Lazzerini-Denchi E, Sfeir A. Stop pulling my strings — what telomeres taught us about the DNA damage response. *Nature Reviews Molecular Cell Biology*. 2016;17(6):364–378.

Lee SB, Frattini V, Bansal M, Castano AM, Sherman D, Hutchinson K, Bruce JN, Califano A, Liu G, Cardozo T, Iavarone A, Lasorella A. An ID2-dependent mechanism for VHL inactivation in cancer. *Nature*. 2016;529(7585):172–177.

Leijen S, van Geel RMJM, Pavlick AC, Tibes R, Rosen L, Razak ARA, Lam R, Demuth T, Rose S, Lee MA, Freshwater T, Shumway S, Liang LW, Oza AM, Schellens JHM, Shapiro GI. Phase I study evaluating WEE1 inhibitor AZD1775 as monotherapy and in combination with gemcitabine, cisplatin, or carboplatin in patients with advanced solid tumors. *Journal of Clinical Oncology*. 2016;34(36):4371-4380.

Lepor H, Llukani E, Sperling D, Fütterer JJ. Complications, recovery, and early functional outcomes and oncologic control following in-bore focal laser ablation of prostate cancer. *European Urology*. 2015;68(6):924–926.

Levine DA, Karlan BY, Strauss JF. Evolving approaches in research and care for ovarian cancers. *JAMA*. 2016;315(18):1943.

Liu C, Yang W, Devidas M, Cheng C, Pei D, Smith C, Carroll WL, Raetz EA, Bowman WP, Larsen EC, Maloney KW, Martin PL, Mattano LA, Winick NJ, Mardis ER, Fulton RS, Bhojwani D, Howard SC, Jeha S, Pui C-H, Hunger SP, Evans WE, Loh ML, Relling MV. Clinical and genetic risk factors for acute pancreatitis in patients with acute lymphoblastic leukemia. *Journal of Clinical Oncology*. 2016;34(18):2133–2140.

Loeb S, Folkvaljon Y, Robinson D, Lissbrant IF, Egevad L, Stattin P. Evaluation of the 2015 Gleason grade groups in a nationwide population-based cohort. *European Urology*. 2016;69(6):1135–1141.

Loeb S, Shin SS, Broyles DL, Wei JT, Sanda M, Klee G, Partin AW, Sokoll L, Chan DW, Bangma CH, van Schaik RH, Slawin KM, Marks LS, Catalona WJ. Prostate Health Index improves multivariable risk prediction of aggressive prostate cancer. *BJU International*. 2016; doi: 10.1111/bju.13676.

Loeb S, Walter D, Curnyn C, Gold HT, Lepor H, Makarov DV. How active is active surveillance? Intensity of followup during active surveillance for prostate cancer in the United States. *Journal of Urology*. 2016;196(3):721–726.

Makarov DV, Sedlander E, Braithwaite RS, Sherman SE, Zeliadt S, Gross CP, Curnyn C, Shedlin M. A qualitative study to understand guideline-discordant use of imaging to stage incident prostate cancer. *Implementation Science*. 2016;11(1):118.

Marcotte R, Sayad A, Brown KR, Sanchez-Garcia F, Reimand J, Haider M, Virtanen C, Bradner JE, Bader GD, Mills GB, Pe'er D, Moffat J, Neel BG. Functional genomic landscape of human breast cancer drivers, vulnerabilities, and resistance. *Cell*. 2016;164(1-2):293–309.

Masri S, Papagiannakopoulos T, Kinouchi K, Liu Y, Cervantes M, Baldi P, Jacks T, Sassone-Corsi, P. Lung adenocarcinoma distally rewires hepatic circadian homeostasis. *Cell*. 2016;165(4):896–909.

Matsumura H, Mohri Y, Binh NT, Morinaga H, Fukuda M, Ito M, Kurata S, Hoeijmakers J, Nishimura EK. Hair follicle aging is driven by transepidermal elimination of stem cells via COL17A1 proteolysis. *Science*. 2016;351(6273):aad4395-1–aad4395-13.

Mayers JR, Torrence ME, Danai LV, Papagiannakopoulos, T, Davidson SM, Bauer, MR, Lau AN, Ji BW, Dixit PD, Hosios AM, Muir A, Chin CR, Freinkman E, Jacks T, Wolpin BM, Vitkup D, Vander Heiden MG. Tissue of origin dictates branched-chain amino acid metabolism in mutant Kras-driven cancers. *Science*. 2016;353(6304):1161–1165.

Ménager MM, Littman DR. Actin dynamics regulates dendritic cell-mediated transfer of HIV-1 to T cells. *Cell*. 2016;164(4):695–709.

Mertins P, Mani DR, Ruggles KV, Gillette MA, Clauser KR, Wang P, Wang X, Qiao JW, Cao S, Petralia F, Kawaler E, Mundt F, Krug K, Tu Z, Lei JT, Gatza ML, Wilkerson M, Perou CM, Yellapantula V, Huang K, Lin C, McLellan MD, Yan P, Davies SR, Townsend RR, Skates SJ, Wang J, Zhang B, Kinsinger CR, Mesri M, Rodriguez H, Ding L, Paulovich AG, Fenyo D, Ellis MJ, Carr SA. Proteogenomics connects somatic mutations to signalling in breast cancer. *Nature*. 2016;534(7605):55–62.

Mittakanti HR, Thomas I, Chung BI, Sonn GA, Brooks JD, Leppert JT, Shelton JB, Cooperberg MR, Makarov DV, Skolarus TA. Accuracy of prostate-specific antigen values in prostate cancer registries. *Journal of Clinical Oncology*. 2016;34(29):3586–3587.

Ng CP, Littman DR. Tcf1 and Lef1 pack their own HDAC. *Nature Immunology*. 2016;17(6):615–616.

Ntziachristos P, Abdel-Wahab O, Aifantis I. Emerging concepts of epigenetic dysregulation in hematological malignancies. *Nature Immunology*. 2016;17(9):1016–1024.

Papagiannakopoulos T, Bauer MR, Davidson SM, Heimann M, Subbaraj L, Bhutkar A, Bartlebaugh J, Vander Heiden MG, Jacks T. Circadian rhythm disruption promotes lung tumorigenesis. *Cell Metabolism*. 2016;24(2):324–331.

Postow MA, Chesney J, Pavlick AC, Robert C, Grossmann K, McDermott D, Linette GP, Meyer N, Giguere JK, Agarwala SS, Shaheen M, Ernstoff MS, Minor D, Salama AK, Taylor M, Ott PA, Rollin LM, Horak C, Gagnier P, Wolchok JD, Hodi FS. Nivolumab and ipilimumab versus ipilimumab in untreated melanoma. *New England Journal of Medicine*. 2015;372(21):2006–2017.

Ramanan D, Bowcutt R, Lee SC, Tang MS, Kurtz ZD, Ding Y, Honda K, Gause WC, Blaser MJ, Bonneau RA, Lim YA, Loke P, Cadwell K. Helminth infection promotes colonization resistance via type 2 immunity. *Science*. 2016;352(6285):608–612.

Ramaswamy V, Hielscher T, Mack SC, Lassaletta A, Lin T, Pajtler KW, Jones DTW, Luu B, Cavalli FMG, Aldape K, Remke M, Mynarek M, Rutkowski S, Gururangan S, McLendon RE, Lipp ES, Dunham C, Hukin J, Eisenstat DD, Fulton D, van Landeghem FKH, Santi M, van Veelen M-LC, Van Meir EG, Osuka S, Fan X, Muraszko KM, Tirapelli DPC, Oba-Shinjo SM, Marie SKN, Carlotti CG, Lee JY, Nageswara RAA, Giannini C, Faria CC, Nunes S, Mora J, Hamilton RL, Hauser P, Jabado N, Petrecca K, Jung S, Massimi L, Zollo M, Cinalli G, Bognar L, Klekner A, Hortobagyi T, Leary S, Ermoian RP, Olson JM, Leonard JR, Gardner C, Grajkowska WA, Chambless LB, Cain J, Eberhart CG, Ahsan S, Massimino M, Giangaspero F, Buttarelli FR, Packer RJ, Emery L, Yong WH, Soto H, Liau LM, Everson R, Grossbach A, Shalaby T, Grotzer M, Karajannis MA, Zagzag D, Wheeler H, von Hoff K, Alonso MM, Tunon T, Schuller U, Zitterbart K, Sterba J, Chan JA, Guzman M, Elbabaa SK, Colman H, Dhall G, Fisher PG, Fouladi M, Gajjar A, Goldman S, Hwang E, Kool M, Ladha H, Vera-Bolanos E, Wani K, Lieberman F, Mikkelsen T, Omuro AM, Pollack IF, Prados M, Robins HI, Soffietti R, Wu J, Metellus P, Tabori U, Bartels U, Bouffet E, Hawkins CE, Rutka JT, Dirks P, Pfister SM, Merchant TE, Gilbert MR, Armstrong TS, Korshunov A, Ellison DW, Taylor MD. Therapeutic impact of cytoreductive surgery and irradiation of posterior fossa ependymoma in the molecular era: A retrospective multicohort analysis. *Journal of Clinical Oncology*. 2016;34(21):2468–2477.

Ran H, Tsutsumi R, Araki T, Neel BG. Sticking it to cancer with molecular glue for SHP2. *Cancer Cell*. 2016;30(2):194–196.

Ribas A, Hamid O, Daud A, Hodi, F Stephen, Wolchok JD, Kefford R, Joshua AM, Patnaik A, Hwu W-J, Weber JS, Gangadhar TC, Hersey P, Dronca R, Joseph RW, Zarour H, Chmielowski B, Lawrence DP, Algazi A, Rizvi NA, Hoffner B, Mateus C, Gergich K, Lindia JA, Giannotti M, Li XN, Ebbinghaus S, Kang SP, Robert C. Association of pembrolizumab with tumor response and survival among patients with advanced melanoma. *JAMA*. 2016;315(15):1600–1609.

Rosenberg JE, Hoffman-Censits J, Powles T, van der Heijden MS, Balar AV, Necchi A, Dawson N, O'Donnell PH, Balmanoukian A, Loriot Y, Srinivas S, Retz MM, Grivas P, Joseph RW, Galsky MD, Fleming MT, Petrylak DP, Perez-Gracia JL, Burris HA, Castellano D, Canil C, Bellmunt J, Bajorin D, Nickles D, Bourgon R, Frampton GM, Cui N, Mariathasan S, Abidoye O, Fine GD, Dreicer R. Atezolizumab in patients with locally advanced and metastatic urothelial carcinoma who have progressed following treatment with platinum-based chemotherapy: A single-arm, multicentre, phase 2 trial. *The Lancet*. 2016;387(10031):1909–1920.

Sánchez I, Dynlacht BD. Cilium assembly and disassembly. *Nature Cell Biology*. 2016;18(7):711–717.

Sawai CM, Babovic S, Upadhaya S, Knapp DJHF, Lavin Y, Lau CM, Goloborodko A, Feng J, Fujisaki J, Ding L, Mirny LA, Merad M, Eaves CJ, Reizis B. Hematopoietic stem cells are the major source of multilineage hematopoiesis in adult animals. *Immunity*. 2016;45(3):597–609.

Schmitt AD, Hu M, Ren B. Genome-wide mapping and analysis of chromosome architecture. *Nature Reviews Molecular Cell Biology*. 2016;17(12):743–755.

Seifert L, Werba G, Tiwari S, Giao Ly NN, Alothman S, Alqunaibit D, Avanzi A, Barilla R, Daley D, Greco SH, Torres-Hernandez A, Pergamo M, Ochi A, Zambirinis CP, Pansari M, Rendon M, Tippens D, Hundeyin M, Mani VR, Hajdu C, Engle D, Miller G. The necrosome promotes pancreatic oncogenesis via CXCL1 and mincle-induced immune suppression. *Nature*. 2016;532(7598):245–249.

Seifert L, Werba G, Tiwari S, Giao Ly NN, Nguy S, Alothman S, Alqunaibit D, Avanzi A, Daley D, Barilla R, Tippens D, Torres-Hernandez A, Hundeyin M, Mani V, Hajdu C, Pellicciotta I, Oh P, Du K, Miller G. Radiation therapy induces macrophages to suppress T-cell responses against pancreatic tumors in mice. *Gastroenterology*. 2016;150(7):1659–1672.e5.

Singer M, Wang C, Cong L, Marjanovic ND, Kowalczyk MS, Zhang H, Nyman J, Sakuishi K, Kurtulus S, Gennert D, Xia J, Kwon JYH, Nevin J, Herbst RH, Yanai I, Rozenblatt-Rosen O, Kuchroo VK, Regev A, Anderson AC. A distinct gene module for dysfunction uncoupled from activation in tumor-infiltrating T cells. *Cell*. 2016;166(6):1500–1511.e9.

Sousa CM, Biancur DE, Wang X, Halbrook CJ, Sherman MH, Zhang L, Kremer D, Hwang RF, Witkiewicz AK, Ying H, Asara JM, Evans RM, Cantley LC, Lyssiotis CA, Kimmelman AC. Pancreatic stellate cells support tumour metabolism through autophagic alanine secretion. *Nature*. 2016;536(7617):479–483.

Strikoudis A, Lazaris C, Trimarchi T, Galvao Neto AL, Yang Y, Ntziachristos P, Rothbart S, Buckley S, Dolgalev I, Stadtfeld M, Strahl BD, Dynlacht BD, Tsirigos A, Aifantis I. Regulation of transcriptional elongation in pluripotency and cell differentiation by the PhD-finger protein Phf5a. *Nature Cell Biology*. 2016;18(11):1127–1138.

Sturm D, Orr BA, Toprak UH, Hovestadt, V, Jones DTW, Capper D, Sill M, Buchhalter I, Northcott PA, Leis I, Ryzhova M, Koelsche C, Pfaff E, Allen SJ, Balasubramanian G, Worst BC, Pajtler KW, Brabetz S, Johann PD, Sahm F, Reimand J, Mackay A, Carvalho DM, Remke M, Phillips JJ, Perry A, Cowdrey C, Drissi R, Fouladi M, Giangaspero F, Lastowska M, Grajkowska W, Scheurlen W, Pietsch T, Hagel C, Gojo J, Lotsch D, Berger W, Slavc I, Haberler C, Jouvet A, Holm S, Hofer S, Prinz M, Keohane C, Fried I, Mawrin C, Scheie D, Mobley BC, Schniederjan MJ, Santi M, Buccoliero AM, Dahiya S, Kramm CM, von Bueren AO, von Hoff K, Rutkowski S, Herold-Mende C, Fruhwald MC, Milde T, Hasselblatt M, Wesseling P, Rossler J, Schuller U, Ebinger M, Schittenhelm J, Frank S, Grobholz R, Vajtai I, Hans V, Schneppenheim R, Zitterbart K, Collins VP, Aronica E, Varlet, P, Puget S, Dufour C, Grill J, Figarella-Branger D, Wolter M, Schuhmann MU, Shalaby T, Grotzer M, van Meter T, Monoranu C-M, Felsberg J, Reifenberger G, Snuderl M, Forrester LA, Koster J, Versteeg R, Volckmann R, van Sluis P, Wolf S, Mikkelsen T, Gajjar A, Aldape K, Moore AS, Taylor MD, Jones C, Jabado N, Karajannis MA, Eils R, Schlesner M, Lichter P, von Deimling A, Pfister SM, Ellison DW, Korshunov A, Kool M. New brain tumor entities emerge from molecular classification of CNS-PNETs. *Cell*. 2016;164(5):1060–1072.

Sujino T, London M, Hoytema van Konijnenburg DP, Rendon T, Buch T, Silva HM, Lafaille JJ, Reis BS, Mucida D. Tissue adaptation of regulatory and intraepithelial CD4+ T cells controls gut inflammation. *Science*. 2016;352(6293):1581–1586.

Tateishi K, Wakimoto H, Iafrate AJ, Tanaka S, Loebel F, Lelic N, Wiederschain D, Bedel O, Deng G, Zhang B, He T, Shi X, Gerszten RE, Zhang Y, Yeh JR, Curry WT, Zhao D, Sundaram S, Nigim F, Koerner MV, Ho Q, Fisher DE, Roider EM, Kemeny LV, Samuels Y, Flaherty KT, Batchelor TT, Chi AS, Cahill DP. Extreme vulnerability of *IDH1* mutant cancers to NAD+ depletion. *Cancer Cell*. 2015;28(6):773–784.

Torres-Hernandez A, Miller G. TIMPing fate: Why pancreatic cancer cells sojourn in the liver. *Gastroenterology*. 2016;151(5):807–808.

Trasande L. Updating the toxic substances control act to protect human health. *JAMA*. 2016;315(15):1565.

Trent CM, Blaser MJ. Microbially produced acetate: A "missing link" in understanding obesity? *Cell Metabolism*. 2016;24(1):9–10.

Tu S, Narendra V, Yamaji M, Vidal SE, Rojas LA, Wang X, Kim SY, Garcia BA, Tuschl T, Stadtfeld M, Reinberg D. Co-repressor CBFA2T2 regulates pluripotency and germline development. *Nature*. 2016;534(7607):387–390.

Vaeth M, Eckstein M, Shaw PJ, Kozhaya L, Yang J, Berberich-Siebelt F, Clancy R, Unutmaz D, Feske S. Store-operated Ca2+ entry in follicular T cells controls humoral immune responses and autoimmunity. Immunity. 2016;44(6):1350–1364.

Valerio M, Cerantola Y, Eggener SE, Lepor H, Polascik TJ, Villers A, Emberton M. New and established technology in focal ablation of the prostate: A systematic review. European Urology. 2017;71(1):17–34.

Weber JS, Gibney G, Sullivan RJ, Sosman JA, Slingluff CL, Lawrence DP, Logan TF, Schuchter LM, Nair S, Fecher L, Buchbinder EI, Berghorn E, Ruisi M, Kong G, Jiang J, Horak C, Hodi FS. Sequential administration of nivolumab and ipilimumab with a planned switch in patients with advanced melanoma: An open-label, randomised, phase 2 trial. *The Lancet Oncology*. 2016;17(7):943–955.

Wentzensen N, Poole EM, Trabert B, White E, Arslan AA, Patel AV, Setiawan VW, Visvanathan K, Weiderpass E, Adami H-O, Black A, Bernstein L, Brinton LA, Buring J, ButlerLM, Chamosa S, Clendenen TV, Dossus L, Fortner R, Gapstur SM, Gaudet MM, Gram IT, Hartge P, Hoffman-Bolton J, Idahl A, Jones M, Kaaks R, Kirsh V, Koh W-P, Lacey JV, Lee I-M, Lundin E, Merritt MA, Onland-Moret NC, Peters U, Poynter JN, Rinaldi S, Robien K, Rohan T, Sandler DP, Schairer C, Schouten LJ, Sjoholm LK, Sieri S, Swerdlow A, Tjonneland A, Travis R, Trichopoulou A, van den Brandt PA, Wilkens L, Wolk A, Yang HP, Zeleniuch-Jacquotte A, Tworoger SS. Ovarian cancer risk factors by histologic subtype: An analysis from the ovarian cancer cohort consortium. *Journal of Clinical Oncology*. 2016;34(24):2888–2898.

Wu J, Peters BA, Dominianni C, Zhang Y, Pei Z, Yang L, Ma Y, Purdue MP, Jacobs EJ, Gapstur SM, Li H, Alekseyenko AV, Hayes RB, Ahn J. Cigarette smoking and the oral microbiome in a large study of American adults. *Journal of the International Society of Microbial Ecology*. 2016;10(10):2435–2446.

Wu X-R. Attention to detail by single-cell sequencing. *European Urology*. 2017;71(1):13–14.

Wysock JS, Mendhiratta N, Zattoni F, Meng X, Bjurlin M, Huang WC, Lepor H, Rosenkrantz AB, Taneja SS. Predictive value of negative 3T multiparametric magnetic resonance imaging of the prostate on 12-core biopsy results. *BJU International*. 2016;118(4):515–520.

Zhang H, Liu T, Zhang Z, Payne, SH, Zhang B, McDermott JE, Zhou J-Y, Petyuk VA, Chen L, Ray D, Sun S, Yang F, Chen L, Wang J, Shah P, Cha SW, Aiyetan P, Woo S, Tian Y, Gritsenko MA, Clauss TR, Choi C, Monroe ME, Thomas S, Nie S, Wu C, Moore RJ, Yu K-H, Tabb DL, Fenyo D, Bafna V, Wang Y, Rodriguez H, Boja ES, Hiltke T, Rivers RC, Sokoll L, Zhu H, Shih I-M, Cope L, Pandey A, Zhang B, Snyder MP, Levine DA, Smith RD, Chan DW, Rodland KD. Integrated proteogenomic characterization of human high-grade serous ovarian cancer. *Cell*. 2016;166(3):755–765.

Zhang J, McCastlain K, Yoshihara H, Xu B, Chang Y, Churchman ML, Wu G, Li Y, Wei L, Iacobucci I, Liu Y, Qu C, Wen J, Edmonson M, Payne-Turner D, Kaufmann KB, Takayanagi SI, Wienholds E, Waanders E, Ntziachristos P, Bakogianni S, Wang J, Aifantis I, Roberts KG, Ma J, Song G, Easton J, Mulder HL, Chen X, Newman S, Ma X, Rusch M, Gupta P, Boggs K, Vadodaria B, Dalton J, Liu Y, Valentine ML, Ding L, Lu C, Fulton RS, Fulton L, Tabib Y, Ochoa K, Devidas M, Pei D, Cheng C, Yang J, Evans WE, Relling MV, Pui C-H, Jeha S, Harvey RC, Chen I-ML, Willman CL, Marcucci G, Bloomfield CD, Kohlschmidt J, Mrozek K, Paietta E, Tallman MS, Stock W, Foster MC, Racevskis J, Rowe JM, Luger S, Kornblau SM, Shurtleff SA, Raimondi SC, Mardis ER, Wilson RK, Dick JE, Hunger SP, Loh ML, Downing JR, Mullighan CG. Deregulation of DUX4 and ERG in acute lymphoblastic leukemia. *Nature Genetics*. 2016,48(12):1481–1489.

Perlmutter Cancer Center Locations

1
160 East 34th Street
New York, NY

2
240 East 38th Street
18th and 19th Floors
New York, NY

3
160 East 31st Street
New York, NY

4
160 East 32nd Street
New York, NY

5
221 Lexington Avenue
New York, NY

6
550 First Avenue
New York, NY

Includes NYU Langone Medical Center and Radiation Oncology services

7
97-85 Queens Boulevard
Rego Park, NY

Includes a medical practice and an infusion center

8
902 Quentin Road
Brooklyn, NY

Includes a medical practice and an infusion center

9
1300 Avenue P
Brooklyn, NY

10
8714 5th Avenue
Brooklyn, NY

11
8721 5th Avenue
Brooklyn, NY

12
9920 4th Avenue
Brooklyn, NY

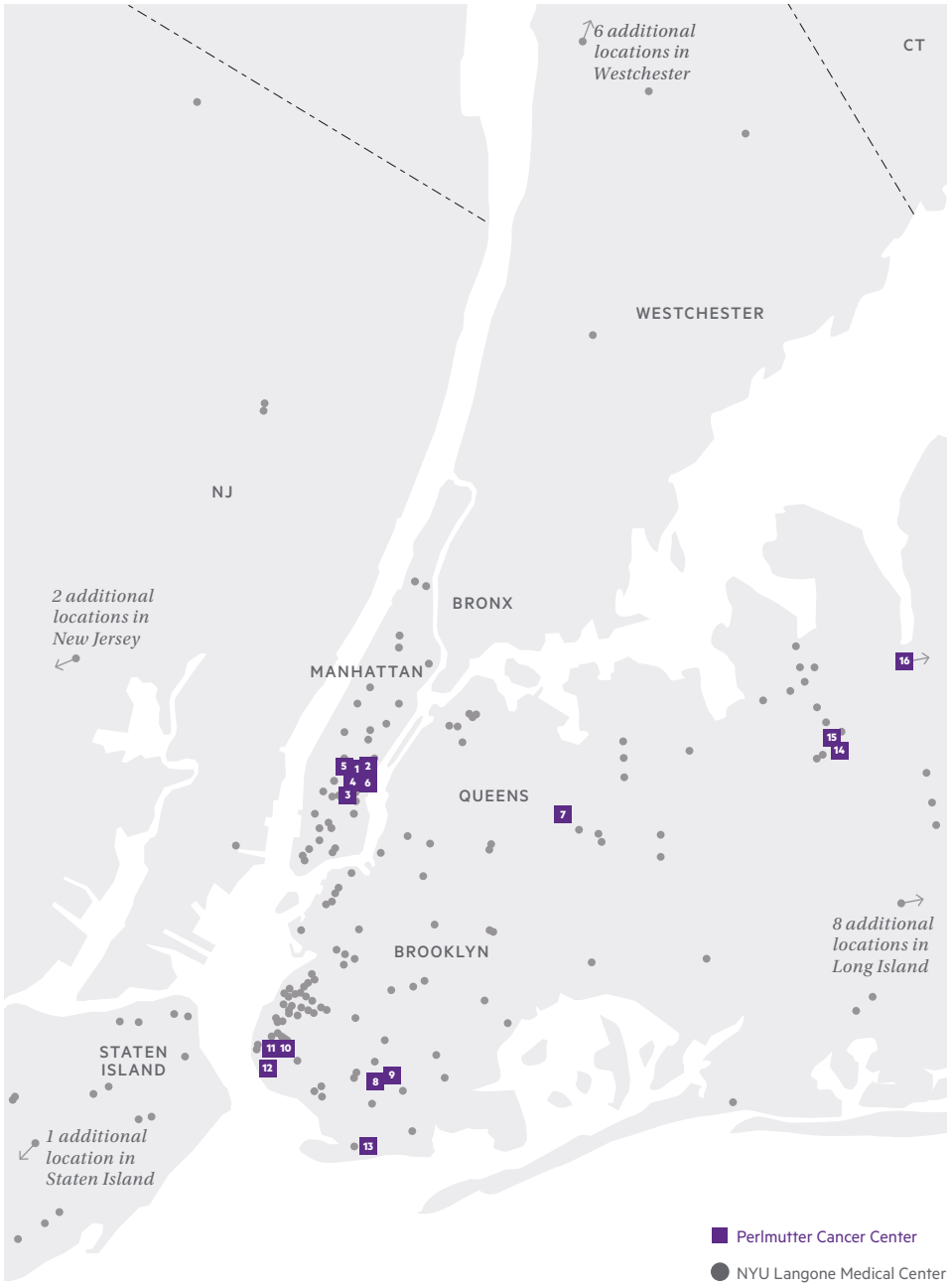
13
3048 Brighton 1st Street
Brooklyn, NY

14
1999 Marcus Avenue
Lake Success, NY

Includes 2 medical practices and an infusion center

15
2001 Marcus Avenue
Lake Success, NY

16
180 East Pulaski Road
Huntington Station, NY



Leadership

Laura and Isaac Perlmutter Cancer Center

Benjamin G. Neel, MD, PhD
Laura and Isaac Perlmutter Director
Professor of Medicine

Jeffrey S. Weber, MD, PhD
Deputy Director
Co-Director, Melanoma Research Program
Director, Experimental Therapeutics
Professor of Medicine

Tim Strawderman, PhD
Executive Director

Jiyoung Ahn, PhD, MS, RD
Associate Director, Population Sciences
Associate Professor of Population Health and Environmental Medicine

Abraham C. Chachoua, MD
Associate Director, Cancer Services
Jay and Isabel Fine Professor of Oncology
Professor of Urology

Francisco J. Esteva, MD
Associate Director, Clinical Research
Director, Breast Medical Oncology Program
Co-Director, Phase 1 Drug Development Program (Hematology/Medical Oncology)
Professor of Medicine

Eva M. Hernando-Monge, PhD
Associate Director, Basic Sciences
Associate Professor of Pathology

Alec Kimmelman, MD, PhD
Chair, Radiation Oncology
Professor of Radiation Oncology

David E. Levy, PhD
Associate Director, Core Facilities
Director, Molecular Oncology and Immunology Graduate/Postdoctorate Training Program
Associate Dean, Collaborative Science
Dr. Louis A. Schneider Professor of Molecular Pathology
Professor of Microbiology

Mark R. Philips, MD
Director, Medical Scientist Training Program
Associate Director, Emerging Programs and Education
Professor of Medicine, Cell Biology, and Biochemistry and Molecular Pharmacology

Robert J. Schneider, PhD
Associate Dean, Therapeutics Alliances
Albert B. Sabin Professor of Microbiology and Molecular Pathogenesis
Professor of Radiation Oncology

Diane M. Simeone, MD
Associate Director, Translational Research
Director, Pancreatic Cancer Center
Professor of Surgery and Pathology

Kwok-Kin Wong, MD, PhD
Director, Division of Hematology and Medical Oncology
Anne Murnick Cogan and David H. Cogan Professor in Oncology

Michael J. Zeller
Senior Administrative Director

James Loos
Senior Director of Finance and Operations

Joan Scagliola, RN
Senior Director of Outpatient Oncology

Board of Advisors

Lori Fink, Chair
Ellen Banner
Phyllis Putter Barasch
Susan Block Casdin
Norman M. Feinberg
Roberta Greenberg
Celeste Guth
James M. Kenny
Rita Kwiat
Kenneth G. Langone
Edward J. Minskoff
Laura Perlmutter
Joshua Samuelson
Stanley Shopkorn
Constance Silver, PhD
Debora Staley
Joseph S. Steinberg
Beatrice W. Welters

For more information about our physicians, services, and locations, visit **nyulangone.org/locations**

Leadership

New York University

William R. Berkley
Chair, Board of Trustees

Andrew Hamilton, PhD
President

Robert Berne, MBA, PhD
Executive Vice President for Health

NYU Langone Medical Center

Kenneth G. Langone
Chair, Board of Trustees

Robert I. Grossman, MD
Saul J. Farber Dean and
Chief Executive Officer

Steven B. Abramson, MD
Senior Vice President and
Vice Dean for Education, Faculty,
and Academic Affairs

Dafna Bar-Sagi, PhD
Senior Vice President and
Vice Dean for Science, Chief Scientific Officer

Andrew W. Brotman, MD
Senior Vice President and
Vice Dean for Clinical Affairs and Strategy,
Chief Clinical Officer

Michael T. Burke
Senior Vice President and
Vice Dean, Corporate Chief Financial Officer

Richard Donoghue
Senior Vice President
for Strategy, Planning,
and Business Development

Annette Johnson, JD, PhD
Senior Vice President and Vice Dean,
General Counsel

Grace Y. Ko
Senior Vice President for
Development and Alumni Affairs

Kathy Lewis
Senior Vice President for
Communications and Marketing

Joseph Lhota
Senior Vice President and
Vice Dean, Chief of Staff

Vicki Match Suna, AIA
Senior Vice President and Vice Dean
for Real Estate Development and Facilities

Nader Mherabi
Senior Vice President and Vice Dean,
Chief Information Officer

Robert A. Press, MD, PhD
Senior Vice President and Vice Dean,
Chief of Hospital Operations

Nancy Sanchez
Senior Vice President and Vice Dean
for Human Resources and Organizational
Development and Learning

NYU Langone By the Numbers*

1,519 Beds	**100** Operating Rooms	**145,907** Emergency Room Visits	**68,602** Patient Discharges	**3,850,000** Outpatient Faculty Practice Visits	**9,649** Births
3,584 Physicians	**4,899** Nurses	**574** MD Candidates	**80** MD/PhD Candidates	**233** PhD Candidates	**397** Postdoctoral Fellows	**1,472** Residents and Fellows
4,381 Original Research Papers**	**550,500** Square Feet of Research Space	**$334M** NIH Funding	**$328M** Total Grant Revenue		

*Numbers represent FY16 (Sept 2015–Aug 2016) and include NYU Lutheran
**Calendar year 2015

Produced by the Office of Communications and Marketing,
NYU Langone Medical Center
Writer: Karyn Hede
Design: Ideas On Purpose, www.ideasonpurpose.com
Photography: John Abbott, Andrew McCaul, Karsten Moran,
University of Michigan Health System
Printing: Allied Printing Services, Inc.

On the cover: T cell

NYU Langone
MEDICAL CENTER

NYU LANGONE MEDICAL CENTER
550 First Avenue, New York, NY 10016

NYULANGONE.ORG