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LINEBERGER COMPREHENSIVE CANCER CENTER

UNIVERSITY CANCER RESEARCH FUND
2018 LEGISLATIVE REPORT

Annual Financial Report to the Joint Legislative Education Oversight Committee and the Office of State Budget and Management

Submitted November 1, 2018 in accordance with G.S. 116-29.1

www.UNCLineberger.org/ucrf

MESSAGE FROM THE CHAIR

As chair of the Cancer Research Fund Committee overseeing our state's investment in the University Cancer Research Fund (UCRF), I am pleased to share our annual legislative report This report details the many ways this landmark investment continues to help patients across North Carolina. From underwriting the recruitment, retention and research of faculty who are experts in their fields to supporting innovative technologies extending cancer prevention and therapeutic advances, the UCRF is helping cancer patients and their families in all of our 100 counties.

The UCRF helps spark the life-saving work conducted by researchers at the University of North Carolina at Chapel Hill. Thanks to UCRF support, our researchers are developing better tools and methods to diagnose cancers. They are able to treat tumor cells more precisely and effectively while minimizing harm to nearby healthy cells. This support also includes funding for a growing number of clinical trials, an expanded patient navigation network and large-scale data studies that improve our understanding of cancer. UNC Lineberger Comprehensive Cancer Center, which plays a leadership role in national and international cancer research and treatments, is creating breakthroughs aimed at eradicating cancer thanks to UCRF funding.

The UCRF also helps our faculty members leverage additional funding from other sources. For example, one of our researchers recently received a $3.7 million grant from the National Cancer Institute's Moon Shot initiative to address colorectal cancer disparities in North Carolina. This builds on the work of the Carolina Cancer Screening Initiative, originally a UCRF-supported program.

In addition to these health and research benefits, the UCRF continues to generate increasing benefits for our state's economy, including:

- Creating an economic impact of $432 million in North Carolina. This is a return of more than $9 for every UCRF dollar invested;
- Producing and supporting more than 1,105 jobs in North Carolina and an additional 1,515 jobs through both the indirect and induced impacts of those direct jobs and the spending generated from the UCRF; and
- Attracting $156.9 million in federal research grants – and $183.3 in external grants overall – to support UNC Lineberger's research initiatives, and creating nearly $14.8 million in local and state tax revenue.

Since 2007, the UCRF has been a critical source of support for innovative, meaningful research that produces both health and economic benefits for our state. On behalf of our scientists and clinicians working across North Carolina to improve cancer research and care – and on behalf of all the citizens we serve – we thank you for your ongoing support.

Sincerely,

CAROL L. FOLT, PHD
Chair, Cancer Research Fund Committee

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INTRODUCTION

UNIVERSITY CANCER RESEARCH FUND
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INTRODUCTION

In 2007, the year cancer overtook heart disease as North Carolina's leading cause of death, the North Carolina General Assembly created the University Cancer Research Fund – a landmark investment in cancer research intended to defeat a disease that affects almost 40 percent of North Carolina residents.

The UCRF funds the recruitment, retention and research of UNC faculty members who are world-class experts in their fields. These researchers lead the UNC Lineberger Comprehensive Cancer Center's efforts to better understand, prevent, diagnose, and treat cancer. Additionally, the UCRF supports innovative technologies, infrastructure, basic and patient-oriented research and other core resources that enable UNC Lineberger to help reduce or eliminate the burden cancer can place upon North Carolinians through clinical research and prevention, early detection, and survivorship education.

Given UNC's historical mission of education, research and public service, ensuring that UCRF resources are benefiting patients and communities statewide has been a top priority. UCRF funding has supported research projects, clinical trials, outreach efforts, and community-based interventions that have touched all 100 counties.

Originally funded by a combination of state appropriations, tobacco settlement funds, and taxes on non-cigarette tobacco products such as snuff, the UCRF received $25 million in 2007 and $40 million in 2008 before reaching its fully authorized funding amount of $50 million in 2009. In 2013, the legislature consolidated all earmarked tobacco settlement monies into the General Fund, eliminating one source of UCRF support and thereby reducing the UCRF's funding stream. The portion of UCRF revenue from non-cigarette tobacco product sales has risen over the years. In FY 2018, the state's total allocation to the UCRF was $47.8 million.

Since 2008, the Cancer Research Fund Committee has published regular reports on the UCRF's supported activities. In 2011, the General Assembly mandated an annual financial report that includes the UCRF's effects on the state's economy, details on expenditures of UCRF monies and outside funds leveraged by UCRF support, and other performance measures.

This is the eighth financial report submitted pursuant to the 2011 legislative requirement. It demonstrates that the University Cancer Research Fund continues to generate significant economic benefits for the state of North Carolina, such as:

- Directly supporting 1,105 research-related employees in FY 2018.
- Creating the equivalent of 1,515 new induced or indirect jobs, based on an independent economic evaluation.

- Having an overall economic impact that increases each year, reaching $432.2 million in FY 2018.
- Leveraging more than $183.3 million in outside funding in 2018 that is directly linked to faculty who were recruited or retained by UCRF funds, or attributable to innovation grants, technology and infrastructure investments from the UCRF.
- Generating an increased return on investment each year, exceeding a 9 to 1 return in FY 2018.

In addition to these economic impacts, the UCRF benefits patients and providers in North Carolina, and supports ongoing advancements in cancer research and care. This report details several research and clinical highlights that would not be possible without the UCRF.

The Cancer Research Fund Committee, created by the General Assembly to provide continued oversight and to ensure that UCRF resources are invested responsibly, adopted a Strategic Plan in 2009 to target UCRF resources in areas where they can have maximum impact:

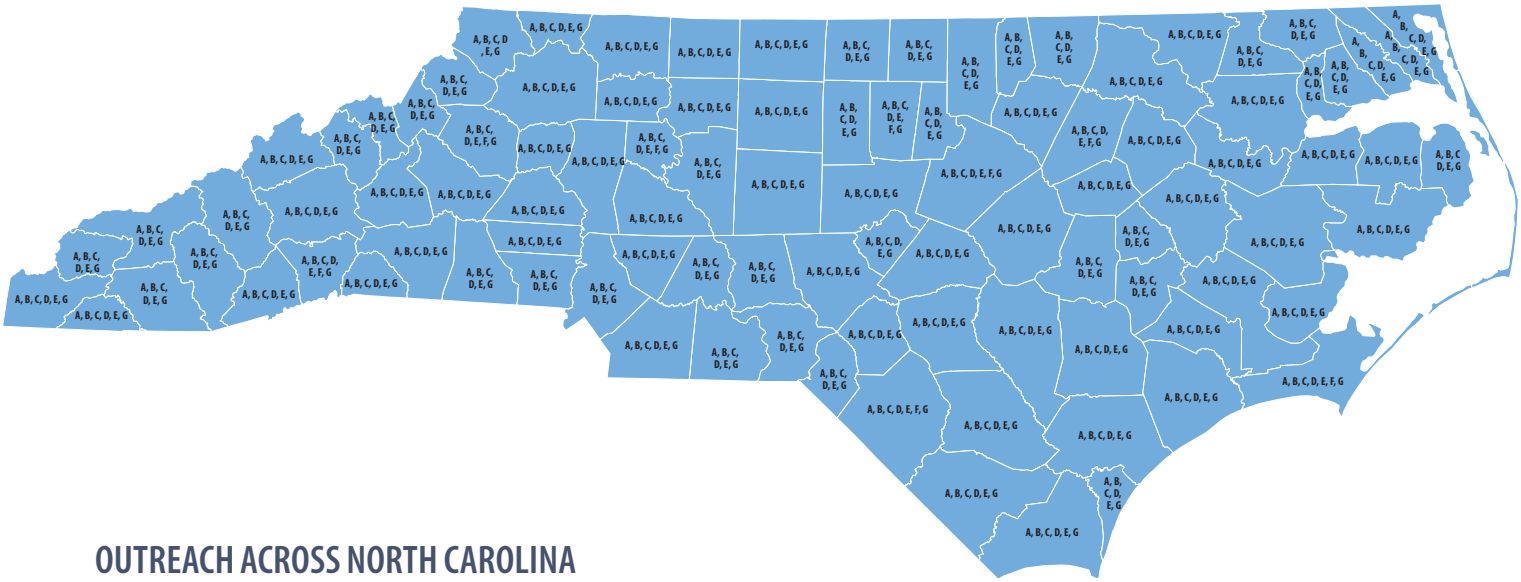
- Strategic research priorities in genetics, novel therapies, and North Carolina cancer outcomes;
- Clinical excellence through selective opportunities that enables UNC to continue to be a leader in a rapidly changing field of research; and
- Critical infrastructure such as technology, training, outreach and other core resources.

A strategic plan refresh in 2014 endorsed and updated these directives. A new plan to guide progress during the next five years has been initiated.

UNC Lineberger has been a National Cancer Institute-designated cancer center for more than 40 years. In 2016 the NCI gave Lineberger an "exceptional" rating – the highest that a cancer center can earn – and cited the UCRF as a significant reason for UNC's top ranking.

Complementing the UCRF's significance in ongoing research, infrastructure and public service are the state's two major capital investments in cancer care. The North Carolina Cancer Hospital, which opened in 2009 and is UNC Lineberger's clinical home, serves patients from all 100 counties. More than 198,000 patient visits were made to the cancer hospital and its affiliated clinics in FY 2018. Marsico Hall opened in 2014 to serve as a cross-disciplinary collaborative research facility, with cutting-edge equipment and technology that further accelerates research capabilities.

The UCRF has been an important investment that has generated significant economic and health benefits that will only continue to grow as UNC remains a global leader in the fight against cancer.



OUTREACH ACROSS NORTH CAROLINA

A. Cancer Data Resources

- Carolina Breast Cancer Study, Phase 3
- Cancer Information and Population Health Resource (CIPHR) *
- Lung Cancer Screening Registry
- UNC Health Registry *

B. Understanding Cancer Disparities

- Comparative effectiveness of breast cancer screening and diagnostic evaluation by extent of breast density *
- Comparative effectiveness and survivorship health in bladder cancer *
- Economic burden of metastatic breast cancer across life course
- Evaluating the effect of the breast density legislation on supplemental screening
- Geographic Variation of Colorectal Cancer Mortality in North Carolina: A Spatial Analysis Approach
- GMaP: Geographic Management of Cancer Health Disparities Program *
- Healthcare utilization for patients with brain metastases *
- Molecular, treatment and behavioral factors in breast cancer race disparities *
- Racial difference in financial impact of prostate cancer treatment and outcome
- Reproductive health after adolescent and young adult cancer
- Risk-based breast cancer screening and surveillance in community practice *
- Rural/urban and distance to care disparities in stage of diagnosis and treatment of cervical cancer in North Carolina *
- Trends and quality of testicular cancer care in North Carolina *

C. Cancer Screening

- Carolina Cancer Screening Initiative
- Improving targeted colorectal cancer screening in the elderly *
- Mailed reminders plus fecal immunochemical testing (FIT) to increase colorectal cancer screening among patients of Roanoke Chowan Community Health Center
- Randomized trial of a culturally-adapted colorectal cancer screening decision aid designed for American Indians

D. Cancer Survivorship

- Adolescent/Young Adult Horizon Study *
- Efficacy of a couple-focused, tailored, symptom self-management mHealth intervention for prostate cancer patients and partners
- Improving cancer survivorship care across North Carolina: Training group intervention leaders
- mHealth Physical Activity Intervention for survivors of adolescent/young adult cancers

E. Clinic-based Prevention

- My Body My Test
- Normalizing preteen HPV vaccination with practice-based communication strategies *
- Duke – UNC Tobacco Treatment Specialist Credentialing Program

F. Community-based Prevention

- Cancer Conversations
- Communication strategies to increase HPV vaccine intentions
- Get Real & HEEL: Remote Video Participation
- North Carolina BEAUTY and Health Project 2

G. Improving Treatment Outcomes

- ACCURE - Accountability for Cancer Care through Undoing Racism and Equity
- Get Real & HEEL
- Impact of geographic region, treating facility, and physician network characteristics on outcomes for patients with acute leukemia and multiple myeloma in North Carolina *
- NC ProCESS *
- Surgical Treatment of Early-Stage Breast Cancer and the Impact on Cancer-Related Treatment Costs
- Tobacco cessation for cancer patients
- UNC Cancer Network Lay patient navigation program
- UNC Cancer Network Telehealth Lectures *

* All counties

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FACULTY IMPACT: RESEARCH AND SERVICE

UNIVERSITY CANCER RESEARCH FUND
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FACULTY IMPACT: RESEARCH AND SERVICE

Lisa A. Carey, MD, physician-in-chief of the N.C. Cancer Hospital, was appointed to the Susan G. Komen's Scientific Advisory Board. In this position, Carey is responsible for helping guide Komen's $956 million research program – second only to the U.S. government in funding of breast cancer research. The Richardson and Marilyn Jacobs Preyer Distinguished Professor in Breast Cancer Research at UNC School of Medicine and Division Chief of Hematology and Oncology, Carey is internationally recognized for her research investigating the genetic underpinnings of the molecular subtypes of breast cancer, especially triple negative and HER2-positive breast cancer.

Blossom Damania, PhD, was named a fellow by the American Association for the Advancement of Science, the world's largest general scientific society, in honor of her landmark discoveries and contributions to biomedical sciences in the fields of virology, cancer biology and immunology, involving both basic science and translational research. Damania, co-director of the UNC Lineberger Virology and Global Oncology programs, is the Boshamer Distinguished Professor in the UNC School of Medicine's Department of Microbiology and Immunology, and the school's vice dean for research.

Paul A. Dayton, PhD, a professor in the UNC-Chapel Hill and North Carolina State University Joint Department of Biomedical Engineering, was inducted into the American Institute for Medical Engineering College of Fellows in recognition of his contributions to biomedical engineering in the areas of contrast-enhanced ultrasound imaging and ultrasound-targeted therapeutics. Dayton and his team are researching a non-invasive form of ultrasound technology that can image the abnormal blood vessels feeding tumors. He recently won a $3 million National Cancer Institute grant to support this research in collaboration with NC State College of Veterinary Medicine.

Joseph DeSimone, PhD, the Chancellor's Eminent Professor of Chemistry in the College of Arts and Sciences at UNC-Chapel Hill and the William R. Kenan, Jr. Distinguished Professor of Chemical Engineering at North Carolina State University, was presented with the 22nd Heinz Award in the Technology, the Economy and Employment category. DeSimone was recognized for his achievements in developing and commercializing advanced technologies in green chemistry, nanoparticle fabrication, precision medicine and 3-D printing.

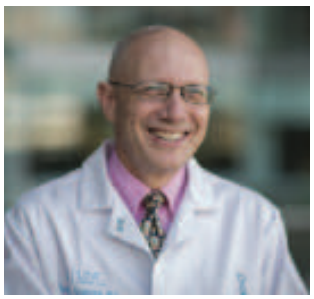
Gianpietro Dotti, MD, received a grant from the Rivkin Center for Ovarian Cancers to conduct early laboratory studiesusing genetically engineered immune cells, called T-cells, to treat ovarian cancer, the fifth-deadliest cancer among U.S. women. Dotti, internationally recognized for his design and development of immunotherapeutic approaches to treating cancer, and his colleagues discovered that an antigen is present on most ovarian cancer cells, and they are studying whether they can modify the T cells to recognize the antigen and then direct an attack against the cancer.

Jack Griffith, PhD, was elected into the National Academy of the Sciences, which is considered one of the highest scientific honors in the United States. Griffith, the Kenan Distinguished Professor in the UNC School of Medicine Department of Microbiology and Immunology and Department of Biochemistry and Biophysics, has conducted extensive research utilizing high-resolution electron microscopy to visualize protein-DNA interactions. His laboratory's work seeks to answer basic questions of how DNA and proteins interact in cancer and other diseases.

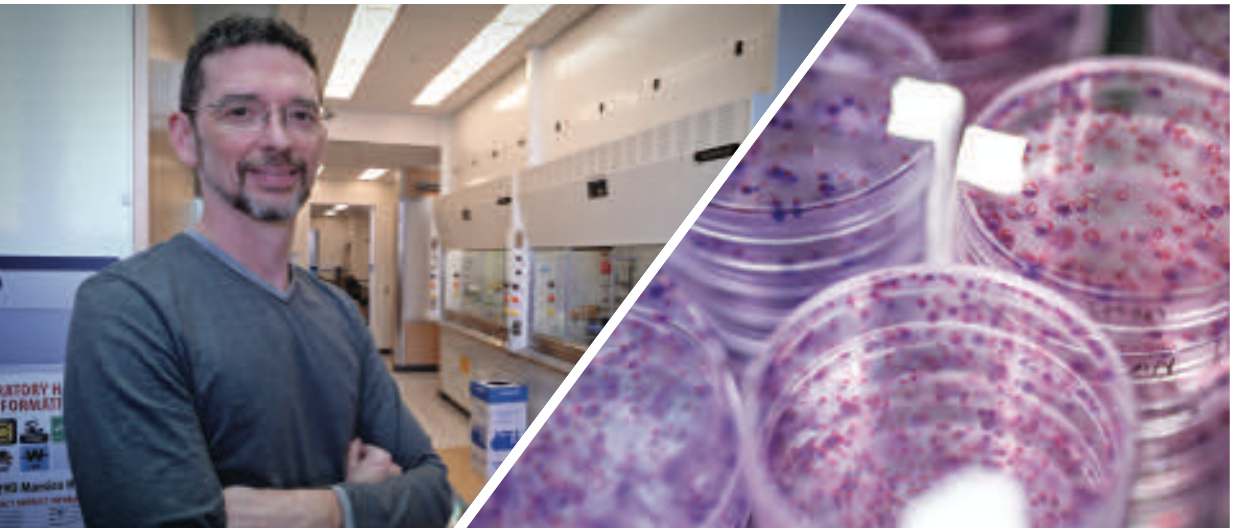
Gary Johnson, PhD, received a $14 million, six-year award from the National Institutes of Health as part of its "Illuminating the Druggable Genome" initiative. This NIH initiative awarded only three grants of this type in 2017. Johnson, the Kenan Distinguished Professor of Pharmacology and former chair of the department, is leading the studies on protein kinases, key regulators of cell function that influence the development of cancer.

Deborah K. Mayer, PhD, RN, AOCN, FAAN, was appointed to an advisory role with the National Cancer Institute on issues related to cancer survivorship. She will serve as interim director of the NCI's survivorship program for a year. Mayer, director of cancer survivorship at UNC Lineberger and a professor at the School of Nursing, is nationally recognized for her expertise in cancer survivorship research. Mayer is providing insight on current and future research projects with the NCI's Division of Cancer Control and Population Sciences (DCCPS), and will partner with colleagues across DCCPS, the NCI and the National Institutes of Health to address issues in cancer survivorship.

Matthew Milowsky, MD, was elected as co-chair of the Bladder Cancer Task Force of the National Cancer Institute's Genitourinary Cancers Steering Committee, which promotes the best clinical and translational research for patients with genitourinary cancers. Milowsky, co-director of the Urologic Oncology Program and section chief of Genitourinary Oncology at UNC Lineberger and associate professor in medicine at UNC School of Medicine, conducts clinical and translational research, with a particular interest in the design of clinical trials that utilize novel immunotherapies and those that use an integrated genomics approach to guide new therapies.



Donald Rosenstein, MD, was elected president of the American Psychosocial Oncology Society, the only inter disciplinary professional organization in the United States dedicated to psychosocial cancer care, education and research. Rosenstein is director of the UNC Lineberger Comprehensive Cancer Support Program and professor of psychiatry at the UNC School of Medicine.



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ECONOMIC IMPACTS

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ECONOMIC IMPACTS

To assess whether the UCRF is achieving its goal of stimulating North Carolina's economy, UNC Lineberger again hired Tripp Umbach, a nationally respected consulting firm, to estimate the UCRF's economic impact for Fiscal Year 2018. Tripp Umbach examined the UCRF's immediate impact on state income growth and employment, and the UCRF's overall economic impact was estimated as the sum of its direct and indirect and induced impacts (see the full report in the Appendix). Direct impact resulted from two major sources: expenditures from the UCRF itself, and the expenditure of UCRF-attributable research funds awarded to UNC by federal, foundation and other sources. The indirect and induced impact was calculated by applying standard multipliers to direct expenditures.

For Fiscal Year 2018, UCRF's total allocation was almost $47.8 million. Using standard methodologies, Tripp Umbach estimated that in FY 2018 the UCRF:

- Had an overall economic impact of $432.2 million, including $231.1 million in direct spending and $201.1 million in indirect and induced impact attributable to external grant funding and downstream spending by employees, vendors and contractors.
- Generated more than $9 in economic impact for every UCRF dollar expended.
- Supported more than 2,620 jobs, including the direct support of 1,105 jobs and an additional 1,515 jobs through the increased extramural funding and the indirect and induced impacts of those direct jobs and the spending generated within North Carolina.
- Resulted in nearly $14.8 million in state and local tax revenues to North Carolina.

Tripp Umbach has been used for the UCRF economic analysis since FY 2013. Prior to that, economic impact analyses were performed by SRA International and the UNC Center for Competitive Economies (Frank Hawkins Kenan Institute of Private Enterprise) using slightly different methodologies. The FY 2018 amount brings the total economic impact of the UCRF since its inception to more than $2.8 billion.

Faculty Job Creation and Retention

Great faculty are at the core of the UCRF's successes. They spearhead the groundbreaking research that leads to important advancements in cancer treatment, prevention and early detection. They also hire staff, train students and fellows, purchase equipment, and earn research funding from other sources both inside and outside North Carolina. Since the UCRF was created in 2007, it has had a tremendous positive impact on cancer research faculty:

- **Recruitment:** The UCRF has supported the recruitment of 16 faculty this year, and 201 since its creation. These faculty are developing a wide range of research programs in cancer genomics, nanomedicine, quantitative biology, health outcomes, multiple cancer types, health communications, and other areas critical to improving cancer prevention, diagnosis and treatment in our state.
- **Retention:** UCRF support has enabled the retention of 7 UNC faculty this year, and 48 since its inception, allowing top talent to stay at UNC where they can continue their research and clinical care.

Extramural Funding Growth

Almost all extramural funds come to UNC from outside North Carolina, adding significantly to the state's economy. The UCRF's Strategic Plan establishes extramural research funding – particularly competitive federal funding – as a key measure for UCRF success. UCRF support is keeping the state at the forefront of research nationally and leveraging significant amounts of extramural research funds for North Carolina.

Faculty members have used UCRF support to underwrite research, and they have leveraged the findings from those studies to generate additional funding from outside sources. For example, Andrew Wang, MD, whose research has been supported by the UCRF, recently received a prestigious four-year, $2.09 million UNC Research Opportunities Initiative grant from the UNC system to support his work investigating pharmacoengineering approaches to enhance the immune response to neoantigens. And Daniel Reuland, MD, received an Accelerating Colorectal Cancer Screening and Follow-Up Through Implementation Science grant, which will provide $3.7 million over five years from the National Cancer Institute's Moon Shot Initiative. Reuland will use the grant to launch a project to address colorectal cancer disparities in North Carolina, building on the work of the UCRF-supported Carolina Cancer Screening Initiative.

FY 2018 funding from outside sources that is directly attributable to the UCRF totaled $183.3 million in annual total cost dollars. A complete list of the awards is included in the Appendix.

Intellectual Property, Innovation, and Entrepreneurship

By encouraging research innovation, the UCRF has promoted entrepreneurship and has created jobs and spinoff companies. The UCRF collaborates with UNC's North Carolina Translational and Clinical Sciences Institute to emphasize an entrepreneurial mindset at UNC, and supports specialized staff to maximize the development and licensing of university intellectual property. More than 45 startup companies have launched or expanded their reach thanks to the UCRF. These companies, including G1 Therapeutics, Genecentric, Epicypher, Epizyme, and Liquidia, to name a few, are attracting external grant support, drawing venture capital investments, and creating private-sector jobs as a result. Since 2009, UNC Lineberger startup companies have raised more than $300 million from the National Institutes of Health, angel investors, and venture capitalists.

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RESEARCH IMPACTS

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RESEARCH IMPACTS

Our faculty are the key to UNC Lineberger's national leadership in cancer research. Lineberger faculty and staff not only lead a variety of cutting-edge treatment and research efforts based at our clinical home in Chapel Hill – they also are partnering with hospitals, clinics and public health organizations in all 100 North Carolina counties to improve cancer outcomes across the state through better cancer screenings, survivorship support, and community-based prevention. They strive to improve treatment outcomes for all patients and reduce cancer disparities that are caused by barriers to care and other factors.

UNC Lineberger has been a National Cancer Institute-designated cancer center for more than 40 years. In 2016, the NCI awarded Lineberger an "exceptional" rating – the highest a cancer center can earn – and cited the UCRF as a significant reason.

The Cancer Research Fund Committee adopted a Strategic Plan in 2009 to guide the most effective and responsible use of the state's investment. This section of the annual report highlights some of our successes in each of the Strategic Plan's primary areas.

Research Priorities

The Plan prioritizes UCRF resources by targeting three specific research priorities where – with focused investment in major scientific programs, disease-based initiatives, or cutting-edge research platforms – UNC Lineberger could have meaningful impact and become a world leader:

- **Understanding the Role of Genetics in Cancer Causation and Treatment:** to discover the genes that predispose families to cancer and that predispose cancer patients to poor treatment outcomes – especially by looking for the various genetic mutations in specific cancer subtypes that lead to cancer therapy failure.
- **Developing Novel Therapeutics:** to devise new therapies that are targeted to the specific vulnerabilities of treatment-resistant cancers, and to develop new ways of delivering treatments that reduce toxic side effects for patients. This research priority relates closely to the genetics initiative, and makes key observations that will be utilized in clinical applications as quickly as possible. It also dramatically expanded UNC Lineberger's ability to take a national leadership role in the investigation and development of innovative, first-in-class immunotherapy approaches to cancers that failed to respond to standard therapies.
- **Optimizing NC Cancer Outcomes:** to enhance the quality of oncology and survivor care, and to build population-based datasets that track the occurrence and treatment of cancer across North Carolina in order to support research designed to improve community prevention, early detection and access to modern therapy. The ultimate goal is to understand North Carolina's cancer problem at a level unprecedented in the nation and to design research interventions aimed at rectifying these problems at the practice, health system and community levels.

Clinical Excellence and Infrastructure

Because the Cancer Research Fund Committee recognized the need for UNC Lineberger to be able to adapt to a rapidly changing field, the Strategic Plan highlighted the importance of establishing critical infrastructure and pursuing selective opportunities, outside of the three general research priorities, where UNC Lineberger could strive for clinical excellence and have a major impact.

This approach allows the UCRF to seize research or clinical opportunities as they arise and to provide the top minds in the field with the resources they need. Examples include seed funds to recruit top researchers; support of technology and equipment for use by multiple faculty members; competitive, innovative pilot projects; and the development of shared research resources. Thanks to the UCRF, UNC Lineberger has been able to recruit, retain and support outstanding faculty members with expertise and leadership in key clinical areas.

Investments in imaging, informatics and fundamental research techniques have given our clinician scientists the tools they need to improve patient outcomes, while virtual tumor boards and telemedicine connect doctors and hospitals across the state with UNC Lineberger's oncology experts. The UCRF provides the opportunity to grow our multidisciplinary excellence in cancer care and to develop a statewide infrastructure that helps bring leading-edge clinical research and applications into community engaged practices and research institutions across North Carolina.

RESEARCH PRIORITY 1: GENETICS IN CANCER CAUSATION AND TREATMENT

Unprecedented genetics collaboration yields key discoveries


Katherine Hoadley, PhD

UNC Lineberger's role as a leader in The Cancer Genome Atlas (TCGA), a large-scale collaborative effort to analyze more than 10,000 different tumor samples in order to gain a better understanding of cancer genomics, has put UNC Lineberger researchers at the national forefront of many new revelations about how genetic changes influence the growth and spread of various cancers.

Supported by the National Human Genome Research Institute and the National Cancer Institute, TCGA focused on identifying similarities between cancers based on changes in their genes and in the way their genes are expressed. The initiative involved more than 150 researchers at more than two dozen institutions across North America, and it is coming to a close after generating comprehensive, multi-dimensional maps of the key genomic changes in 33 different types of cancer.

The UCRF has been a major source of support for key investments in laboratory tools, infrastructure, and faculty that enabled UNC Lineberger to take a leadership role in TCGA. This positioned UNC Lineberger researchers to be authors on 26 TCGA papers published in multiple leading journals in April 2018. Katherine Hoadley, PhD, assistant professor in the UNC School of Medicine Department of Genetics, led teams that published two of the final TCGA studies that have revealed important new findings.

One study supports an additional classification for human tumors based on the individual cell type from the organ in which they started. Using a molecular-based approach to help classify cancers could help improve clinical care and lead to the development of more effective treatment methods.

More than 10 years ago, researchers found that cancer is not a single disease, but many. They also learned that different cancer subtypes can occur within a single anatomic location, such as the breast or liver. Hoadley's new study found that some cancers are very similar molecularly to others that originated from the same starting cell type, even if they originated in a different organ. For example, squamous cell cancers from the head and neck, lung, and bladder, cervix, and esophagus had strong molecular similarities despite their various locations.

"Tumor location has been the primary method for determining treatment for a given cancer patient," Hoadley said. "This study helps us get a better understanding of the relationship across and within different tumor types. If tumors are genetically diverse within an organ, we should rethink the way we treat them."

Hoadley's other study discovered the genetic and genomic characteristics that define testicular germ cell cancers after analyzing 137 testicular germ cell tumors for potential mutations and other molecular changes. They identified molecular features of testicular germ cell cancers that could inform future efforts to improve treatment decisions.

Hoadley and her colleagues also identified markers that could potentially be used to monitor patients to see if their cancer had come back. They discovered that certain microRNAs were expressed differently in the different types of testicular germ cell tumors, and could potentially be explored as markers of low risk, or cancer recurrence.

Blood mutations could contaminate genetic analyses of tumors


Catherine C. Coombs, MD

UNC Lineberger researchers have shown that blood cell mutations accounted for as many as 8 percent of the mutations identified in large-scale genetic sequencing efforts at two major academic centers – potentially leading to errors in interpreting sequencing results.

Catherine C. Coombs, MD, and her colleagues used genetic sequencing results to identify mutations within solid tumor tissue as a way to help guide personalized care decisions for patients. Genetic mutations in blood cells that have made their way into tumors could mislead physicians looking for genetic tumor changes, which could result in misinformed treatment decisions.

For the study, researchers reviewed data from patients with solid tumor cancers who had genetic sequencing tests performed by Foundation Medicine as part of their routine clinical care at the N.C. Cancer Hospital and the Moffitt Cancer Center between 2013 and 2017. They also analyzed sequencing results for blood samples. A subset of patients at the N.C. Cancer Hospital had their tumors and their blood sequenced through UNCseq, a UCRF-supported genetic sequencing clinical trial run by UNC Lineberger researchers.

The study shows an advantage to "paired" sequencing tests, which evaluate mutations in both the blood and the tumor. "It adds expense, but it can be useful in determining whether a suspicious mutation is blood-derived, or tumor-derived," said Coombs, an associate member of UNC Lineberger and an assistant professor of medicine in the division of hematology/oncology.

Researchers define structure, function of enzyme key to blood cancers


Greg Wang, PhD

UNC Lineberger researchers collaborated on a study to determine the structure and function of DNMT3A, an enzyme that is commonly mutated in blood disorders and cancers including acute myeloid leukemia.

Mutations in DNMT3A are thought to be one of the first mutations that set blood stem cells on a path to leukemia.

DNMT3A normally helps to maintain the patterns of "chemical tags" in the DNA to keep certain genes in check. UNC Lineberger's Greg Wang, PhD, working with scientists from University of California, Riverside, identified how DNMT3A places a type of chemical tag at specific DNA sequences, and how mutations in the enzyme can lead to a change in the development course for the cell, as seen in cancer and developmental disorders.

"Now, because we understand the structure of this enzyme and its interaction with DNA, we see where exactly the cancer-related mutations often occur," said Wang, an associate professor in the UNC School of Medicine Department of Biochemistry & Biophysics.

In 2016, this same group of UNC Lineberger researchers discovered that a specific mutation in the DNMT3A gene contributes to the progression of blood cancer by interfering with the way proteins within the enzyme interact with each other.

The new study builds on that understanding by showing that cancer cells also often gain somatic mutations to change DNMT3A's interaction with DNA. When a mutation affects the enzyme's ability to bind with DNA, it changes patterns of the chemical tags in DNA, which affects the cell's future development and can lead to cancer.

Genetic sequencing leads to new method of classifying cancers, treatment strategies based on immune response


Ben Vincent, MD


Jonathan Serody, MD

In a project that makes unprecedented strides in the understanding of how the immune system responds to cancer, UNC Lineberger researchers and colleagues from The Cancer Genome Atlas (TCGA) analyzed thousands of cancer samples across multiple different tumor types to classify them based on the body's defense response – showing a path toward more effective immunotherapy treatments.

Two TCGA studies led by UNC Lineberger's Ben Vincent, MD, assistant professor in the Division of Hematology/Oncology, have made breakthroughs in key areas in immunotherapy research. One study has revealed how patients' immune systems respond to a particularly aggressive breast cancer, providing a basis for improved treatment. The other study discovered that tumor cells produce an immune "microenvironment" around them that offers a new method for categorizing and may offer new therapeutic options, including immunotherapies, for some patients.

About half of patients with triple negative breast cancer will also develop cancer in the brain once the breast cancer has begun to spread. Vincent and colleagues hope to improve outcomes for patients with breast cancer brain metastases by using the immune system as a basis for treatment.

They analyzed samples of triple negative breast cancer that had spread to the brain along with matched primary tumors and used genetic sequencing to determine what types of immune cells were present in the tumors. The researchers found that triple negative breast cancer brain metastases typically had lower numbers of immune cells in them, but that the immune cells present were of a type that typically has responded to specific treatments: immune checkpoint inhibitors. These are new drugs that "remove the brakes" on immune cells to allow them to attack tumors. The researchers believe that if they can increase the numbers of immune cells that are able to get to the brain metastases, they would see a better response to checkpoint inhibitor therapies.

"This research is still early, but we think that if we can find a way to get immune cells there, they will be responsive there – they will do their job," Vincent said.

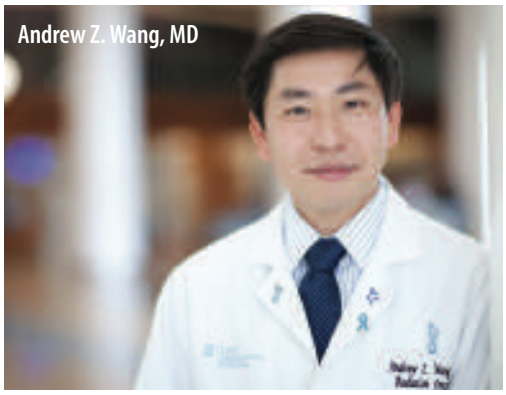
Vincent and colleagues also revealed a new method for categorizing cancers based on their findings about the characteristics of the immune "microenvironment," the collection of non-cancerous cells found in a tumor sample that are part of the immune system. Using different types of genetic sequencing methods, including analyzing DNA, gene expression, and other genomic approaches, the researchers identified different types of immune cells and signals within tumors. They found that not all cancers shared the same immune system features and determined there were six different subtypes of immune microenvironments.

Mapping the molecular complexity of tumors based on their immune responses will help design treatment strategies that can improve the immune system's ability to recognize and attack tumors, the researchers said.

"This new classification is associated with cross-talk between the genetic makeup of the tumor and the immune response," said paper co-author Jonathan Serody, MD, UNC Lineberger's associate director for translational sciences, and the Elizabeth Thomas Professor of Medicine, Microbiology and Immunology in the UNC School of Medicine. "These findings shed a lot of light on the interaction of the tumor and immune system and provide a rational approach for immune-targeted therapy."

RESEARCH PRIORITY 2: DEVELOPING NOVEL THERAPEUTICS

UNC researchers focus on nanoparticles to improve disease tracking, drug delivery


Andrew Z. Wang, MD

From tracking the spread of disease to precisely delivering or boosting the effectiveness of drug therapies, nanoparticles are small in size but can have a big impact on the way cancer is diagnosed and treated. The research of UNC Lineberger member Andrew Z. Wang, MD, utilizes these tiny particles in several different ways in an effort to improve cancer care.

In lab studies using nanoparticles to bind molecules that can unleash and stimulate immune cells, Wang and his colleagues found they can more effectively trigger the body's defenses against cancer – offering a promising new nanotechnology-based delivery method for an immunotherapy combination.

"Our immune cells have both positive and negative signals, like red lights and green lights," said Wang, associate professor in the UNC School of Medicine Department of Radiation Oncology. "It's part of the balance of the immune system -- if you get too much immune activation, you get autoimmune disease. If you go the other way, immune suppression can allow tumors to gain a foothold and grown. We are studying a combination of treatments that both send green light signals to attack, and to block red light signals. Our study suggests that if you're able to present two different therapeutics at the same time to immune cells to help them fight cancer, the effect is greater."

Immune cells called T-cells can fight and kill tumors, but they have regulatory signals that limit their effectiveness. Treatments called checkpoint inhibitors have been developed to block the "red light" regulatory signals so the T-cells are more effective in fighting cancer. Clinical trials have launched to test combining these checkpoint inhibitors with treatments designed to send "green light" signals to boost the immune response. UNC Lineberger researchers developed a mechanism that combines these two compound types on a single nanoparticle with the goal of producing better results.

Wang's findings have led the UNC System recently to award him and his colleagues a prestigious four-year, $2.09 million UNC Research Opportunities Initiative grant to support this work investigating pharmacoengineering approaches to enhance the immune response to neoantigens.

Wang is also using nanoparticles to "trap" cancer cells as they circulate around the body as a way to improve disease tracking. Free-floating cancer cells are cast off from tumors and circulate in the blood, but are often hard to find amid the billions of ordinary red blood cells and other cells found in the blood. Accurately counting these cast-off cells could provide an additional way to screen for disease or track the effectiveness of treatment.

Wang and his collaborators counted circulating cancer cells in the blood of 24 patients undergoing radiation treatment for head-and-neck, prostate, rectal or cervical cancer. By forcing the free-floating cancer cells to slow down and using

tree branching-like nanoparticles to develop stronger molecular traps, they captured an average of 200 circulating tumor cells from each milliliter of a patient's blood – giving them a more accurate picture of cancer in each patient. They found that the numbers of circulating tumor cells dropped while patients were undergoing radiation therapy, and the numbers subsequently rebounded in those patients that ended up requiring additional treatment — suggesting that this technology could supplement other techniques for tracking the progress of treatment.

"Oftentimes, post treatment, we end up scanning patients frequently," Wang said. "Maybe the future is, instead of doing expensive scans, we can do a blood test, and if the test result shows no change, we leave them alone. If it suggests there may be trouble, we may then do additional scans to locate the recurrent tumor."

By forming clots in tumors, immune cells aid lung cancer's spread


Chad Pecot, MD

UNC Lineberger's Chad Pecot, MD, a medical oncologist, and colleagues have found that immune cells that flock to a particular type of lung cancer and help form clots within tumors to promote healing are actually building a foundation for the tumor to spread within the body.

Squamous lung cancers, which account for about 30 percent of all lung cancers, make a signal called CCL2 to help recruit immune cells called inflammatory monocytes. These immune cells build fibrous clotting scaffolds in response to the wound – but these scaffolds also allow tumor cells to migrate and spread to other parts of the body. When looking at tumor samples from patients, the researchers found that tumors with high amounts of clotting fibers were associated with an increased risk of the tumor spreading.

Researchers genetically manipulated the expression of CCL2 in a metastasis model developed in their laboratory and found that low expression was linked to reduced metastasis, while high expression was linked to enhanced metastatic features. They also found that the presence of a clot made it easier for cancer cells to move and migrate. And by using a compound that blocks CCR2, a receptor on the surface of the inflammatory monocytes, researchers saw a significant decrease in lung metastases.

"We want to make progress for patients with lung squamous carcinoma and expand the therapeutic options available to these patients," said Pecot, an assistant professor in the UNC School of Medicine Division of Hematology/Oncology and the study's corresponding author. "The more we understand the progression of the disease, including how metastases occur, the more we'll be able to understand how we can regress this disease, or just keep it in check. We believe there are ways we can teach these tumors how to heal."

Bladder cancer model could pave the way for better drug efficacy studies


William Kim, MD

Not all bladder cancers are the same, and it has been difficult to for scientists to understand the biology of different bladder tumors – and, as a result, to develop therapies that work effectively on various cancer types.

But now, UNC Lineberger's William Kim, MD, Benjamin Vincent, MD, and colleagues have developed a new mouse model that may help them uncover why only a fraction of patients respond to new treatments that rely on checkpoint inhibitors, a class of immunotherapy drugs that "remove the brakes" that keep the immune system from attacking cancer cells.

Five checkpoint inhibitors have been approved for metastatic, or locally advanced, bladder cancer since May 2016, giving patients additional options after standard therapy fails. But studies have shown that less than a quarter of patients will respond to these drugs.

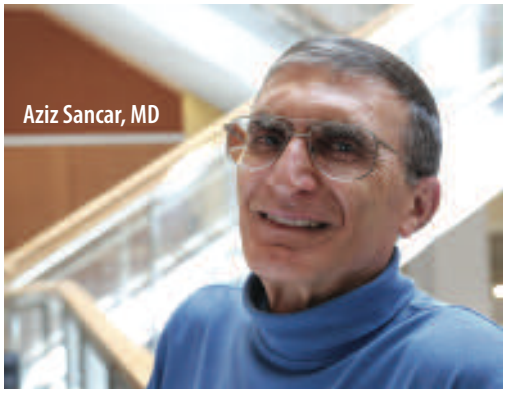
The new mouse model of luminal bladder cancer, one of the two subtypes of advanced bladder cancer, was used along with an existing model for basal-like bladder cancer (the other subtype of bladder cancer) to examine features that may determine the effectiveness of checkpoint inhibitors. Researchers studied the immune microenvironment – the immune cells in and around the tumor – for each subtype. They found lower levels of immune cells in and around luminal tumors, and that the new luminal model did not respond as well to the immune checkpoint inhibitors.

These are the type of studies that can help doctors predict who will – or will not – respond to the new expensive drugs.

Researchers also studied both subtypes' levels of neoantigens – proteins that sprout on the surface of cancer tumors as a result of DNA mutations or other changes in cancer cells. Scientists are interested in using neoantigens to predict response to immunotherapy treatments, or as drug targets.

The researchers used genetic sequencing to predict which abnormal proteins would appear on the surface of the cancer models, and then studied the extent to which the abnormal markers triggered the immune system. They found the luminal subtype had fewer markers that had the ability to trigger the immune system. Future research will investigate how neoantigens help elicit an immune response, and whether they can augment the activity of checkpoint inhibitors.

Timing treatments based on circadian clocks could optimize chemotherapy


Aziz Sancar, MD

Tiny protein-operated clocks inside our cells that run based on the 24-hour day cycle are important for the biological function of different organs. It is unclear, though, how these circadian clocks interact with other basic and crucial biology, such as DNA repair.

UNC Lineberger scientists led by Nobel laureate Aziz Sancar, MD, PhD, the Sarah Graham Kenan Distinguished Professor of Biochemistry and Biophysics, have developed a way to measure the repair of DNA damage caused by cisplatin – a common anti-cancer drug. Sancar's lab measured DNA repair after cisplatin treatment over a 24-hour circadian cycle throughout an entire genome of a mammal, determining for the first time which genes were repaired, where exactly, and when, laying the groundwork for a more precise use of anti-cancer drugs.

Cisplatin kills cancer cells by binding to particular parts of the cancer cell's DNA, but its toxic side effects on the kidneys, liver, and nervous system limit the drug's usefulness. Knowing how and when normal cells in various organs undergo DNA repair would help doctors understand the best times to administer drugs. Sancar's lab hopes to use chronotherapy – adjusting the timing of treatments according to a patient's biological clock – to ramp up cancer cell death while reducing side effects by taking into account when DNA repair occurs, which is a crucial aspect of cancer and normal health.

To discover how the circadian clock and DNA repair interact, the researchers treated mice with cisplatin over a 24-hour period and used a method they developed over several years to measure the repair of DNA damage throughout the genome of a mouse. They pinpointed nearly 2,000 genes that were repaired according to the circadian clock. Sancar's lab found that the DNA repair affected different parts of these genes – some repair processes peaked at pre-dawn or pre-dusk, but other repairs peaked only at pre-dusk.

"Our work suggests it could be best to give cisplatin to patients when their normal cell DNA repair is at its zenith," said Sancar, one of three scientists who won the 2015 Nobel Prize in Chemistry for showing how DNA is repaired

after damage. "Right now, we are still learning the basic mechanisms of DNA repair in relation to the circadian clock. But we think understanding the precise ways our circadian clocks work is key to slowing the progression of cancer. And we think it's possible to harness the power of chemotherapy while decreasing toxic side effects."

Researchers identify brain cancer target, develop immunotherapy approach to attack it


Gianpietro Dotti, MD

An international team of researchers led by UNC Lineberger's Gianpietro Dotti, MD, has genetically engineered immune cells to hunt and kill brain tumors – an approach that holds promise for a new immunotherapy treatment for glioblastoma, the most lethal primary brain tumor.

Conventional glioblastoma treatments, which typically include surgery, radiation and chemotherapy, typically produce a survival benefit of less than a year and a half. Only about one third of patients with brain and other nervous system cancers live five years.

UNC researchers, in collaboration with the Fondazione Istituto di Ricerca e Cura a Carattere Scientifico in Milan, Italy, have modified immune cells to hunt brain tumors displaying a new molecular target called CSPG4, which is highly prevalent on brain cancer cells. Their preclinical studies of immune cells engineered to recognize CSPG4 showed promise for controlling tumor growth in mouse and cell models for glioblastoma.

"Glioblastoma is a tumor of the brain that has a very low chance of being cured with current available therapies," said Dotti, a professor in the UNC School of Medicine Department of Microbiology and Immunology and the senior author of the study. "This is a potential new way to treat these tumors using the immune system."

The study is part of a research program launched at UNC Lineberger to develop personalized immune-based treatments called chimeric antigen receptor T-cell, or CAR-T, therapies. This approach involves removing a patient's immune cells and genetically engineering them to recognize and attack cancer. Other centers have launched CAR-T clinical trials for glioblastoma, but the UNC Lineberger team designed immune cells that hunt CSPG4, a different antigen on the surface of glioblastoma cells that they believe could be more potent than other targets.

The researchers found that T-cells genetically engineered to target CSPG4 controlled the growth of tumor cells in multiple models of the disease. They also found an immunosuppressive response by brain cancer cells that could limit response of CAR-T cells to glioblastoma – a problem that researchers hope to tackle in future studies.

UNC Lineberger researchers have already launched clinical trials for CAR-T cell-based therapies in patients with blood cancers, but Dotti said they are planning to try to investigate this approach for glioblastoma and other solid tumors as well. As envisioned, the glioblastoma clinical trial would focus on patients with advanced recurring disease that requires additional surgery. To further ensure patient safety, researchers plan to incorporate a so-called "safety switch" into the therapy so that T-cells can be eliminated rapidly if toxic effects are observed.

Narrowing the gap toward personalized medicine for pancreatic cancer

Pancreatic cancer is one of the deadliest types of cancer – the five-year survival rate is 8 percent in the United States. UNC Lineberger member Jen Jen Yeh, MD, is researching ways to improve survival rates by using molecular-based approaches to individualize treatment.

One of the challenges in treating pancreatic cancer is that while stroma – a web of connective tissue that can surround pancreatic cancer tumors – can block treatment from reaching the tumor, it may also prevent the tumor from spreading.


Jen Jen Yeh, MD

Yeh co-led a study in which researchers analyzed levels of stroma surrounding pancreatic cancer tumors, and in distant metastatic sites. They found the primary tumors had a significantly higher stromal density than the cancer that had spread to solid organs. Patients with dense stroma in their primary tumors had longer survival than other patients.

Since stroma appears to be important to survival, Yeh said physicians need to think before taking away the stroma on patients for whom their stroma is protective, which makes early detection of stroma density especially important.

"The vast majority of pancreatic cancer patients die with metastases, so therapies are targeted to metastatic disease," said Yeh, a professor in the UNC School of Medicine Division of Surgical Oncology and the vice chair for research in the Department of Surgery. "The finding that different sites of pancreatic cancer have different amounts of stroma may have therapeutic implications."

Previously, Yeh found that patients can have two different biological or molecular types of tumors and stroma. In a recent study she co-authored building on her previous discovery, Yeh found that patients with one subtype of pancreatic tumors were more responsive to treatment than were patients with a different subtype.

"These studies emphasize the potential importance of individualizing therapies for specific tumor characteristics, and the need to develop ways to identify these characteristics with either biopsies or noninvasive imaging approaches," Yeh said.

Timing could matter to how responsive cancer cells are to treatment, study suggests


Jeremy Purvis, PhD

DNA damage occurs routinely in cells due to sun exposure, smoking and sometimes during the normal process of making new DNA. Fortunately, cells have "checkpoints" that stop them from making more DNA and dividing before the damaged DNA is repaired. But in the case of cancer, cells may ignore these checkpoints, and go on to divide with damaged DNA, according to a study.

UNC Lineberger's Jeremy Purvis, PhD, has found that the timing of when DNA damage occurs within these different checkpoints matters to a cell's fate. The findings could be helpful in predicting the outcome of cancer treatment with radiation and chemotherapy, which can cause severe damage to cancer cells' DNA, triggering them to stop division.

For the study, the researchers used time-lapse microscopy to study cells as they moved through three cell cycle phases, tracking the fate of individual cells after they received DNA damage. They found that the cells' response to DNA damage during certain cell cycle phases was strong and completely halted the cell cycle. In other phases, however, cells were relatively less sensitive or showed delayed but steady progression.

They used the data to build a mathematical model of how timing affects checkpoint behavior. The model suggests that the precise timing of DNA damage not only determines checkpoint behaviors, but also alters the cellular outcomes for damaged cells.

Researchers say the findings could inform new treatment strategies for administering common cancer therapeutics. Their findings suggest the possibility of synchronizing cancer cells in more susceptible cell cycle phases before treatment.

"Conceptually, it makes sense that if you could get all of the cells in the same cycle at the same time, you could damage them all with one shot," said Purvis, an assistant professor in the UNC School of Medicine Department of Genetics. "The key will be finding ways to separate cancerous and healthy cells based on the timing and synchronization of their cell cycles."

Scientists lay the foundation for better research into anti-RAS therapies


Channing Der, PhD

UNC Lineberger's Channing Der, PhD, and colleagues have reported new findings that could help researchers identify treatments for cancers with mutations in the RAS gene family, which are among the most highly mutated genes in cancer.

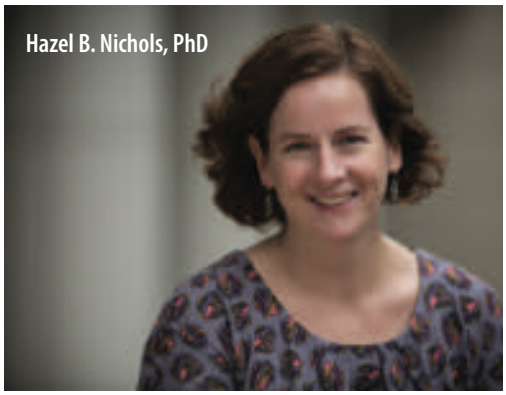
Despite more than three decades of research, treatments to target these cancer-driving RAS genes have remained elusive. In a recent study, Der and colleagues were able to screen chemical reagents to help researchers in the search for effective RAS-targeted therapies. They rigorously tested commercial antibodies to identify those that accurately recognized each of the four RAS proteins made by the three different RAS genes (KRAS, NRAS and HRAS).

"A successful anti-RAS drug has yet to reach the cancer patient," said Der, the Sarah Graham Kenan Distinguished Professor in the UNC School of Medicine Department of Pharmacology. "One factor that has compromised these efforts has been the lack of well-evaluated reagents to study the three RAS genes. In our study, we completed a careful and thorough validation of antibodies to study RAS. Our study will provide a critical guideline to improve future RAS studies."

Using unique scientific models, Der and colleagues were able to determine which of the commercial antibodies could properly identify the HRAS, NRAS, and KRAS proteins. If the antibody falsely identified a protein in their models, researchers knew it was not properly screening for RAS. By selecting the antibodies that work accurately against RAS, scientists can improve the quality of research. They plan to use their findings in their own research on pancreatic cancer. Der said his lab will study KRAS in pancreatic and lung cancer, NRAS in melanoma, and HRAS in head and neck cancers.

RESEARCH PRIORITY 3: OUTCOMES

Studies explore breast cancer risk factors, effects on survivors' newborns


Hazel B. Nichols, PhD

UNC Lineberger member Hazel B. Nichols, PhD, is working to better understand risk factors for breast cancer in younger women as well as possible effects on the babies of breast cancer survivors.

Nichols, assistant professor in the UNC Gillings School of Global Public Health, co-led a study showing that a higher body mass index is associated with lower breast cancer risk for younger women, in contrast to the link between obesity and cancer risk for women after menopause. These findings show the need to better understand breast cancer risk factors in younger women before menopause.

Breast cancer is most common in older women, with a median U.S. age of diagnosis at 62, and obesity has been linked to higher risk for breast cancer in women after menopause. Since breast cancer is less common in younger women, researchers pooled data from 19 studies to investigate breast cancer risk for a group of 758,592 women who were younger than 55 years. Their analysis linked a higher body mass index (BMI) to lower breast cancer risk for younger women across this age group, even for women within a normal weight range.

"Although breast cancer is more common at older ages, it's actually the most common type of cancer diagnosed among reproductive-aged women," Nichols said. "Understanding risk factors that may operate differently before menopause is critical to reducing breast cancer risk in young women, but these factors are hard to study in traditional settings where there are fewer young women in cancer research."

Nichols has also been part of a study on the effects of breast cancer on survivors' children – finding that for young breast cancer survivors, the risk of giving birth prematurely, and other health concerns for their newborns, may depend on the type of breast cancer they had.

"This study is one piece of a larger effort to understand the needs of women with breast cancer beyond their cancer treatment," Nichols said. "A breast cancer diagnosis can impact a lot of different aspects of your life, and building a family is one of them. Increasingly, research is focused on providing answers for those long-term questions that women have."

The study used N.C. Central Cancer Registry data to analyze the cases of 4,978 women diagnosed with breast cancer in North Carolina between 2000 and 2013. For the group overall, they found no significant difference in the prevalence of preterm birth, low birth weight, and other measures between women with or without breast cancer. But for women with estrogen receptor-negative breast cancer, 18 percent of births were preterm. That compares to a rate of about 10 percent of all births in North Carolina that are preterm, Nichols said. She cautioned that they need to ensure this is a real finding by examining a larger number of patients.

Compared to the general population, the birth rate for women with breast cancer in the study was about 57 percent lower than for women who did not have breast cancer, Nichols said. Births were less common in women who received chemotherapy, and in women who had breast cancer at more advanced stages.

The researchers plan to survey young women with breast cancer to probe possible explanations for the lower birth rate among breast cancer survivors. They hope to determine if it is a side effect of treatment or whether the women chose not to become pregnant. They also intend in a future study to evaluate whether preterm birth affects later outcomes for the child's health.

Home HPV test may be lifesaving for women who don't have cervical cancer screenings


Jennifer S. Smith, PhD

About 12,820 women in the United States will be diagnosed with invasive cervical cancer this year, and close to one third of them will die. The disease is highly preventable: Half of the cases in this country are in women who are never or rarely screened. But a new study finds that a convenient at-home test for human papillomavirus (HPV) is a promising tool for preventing cervical cancer in underscreened women.

Led by UNC Lineberger member Jennifer S. Smith, PhD, professor of epidemiology at the UNC Gillings School of Global Public Health, the study recruited 429 women in North Carolina who were overdue for a Pap test, which analyzes cervical cells for the presence of cancer. The participants received a kit by mail to self-collect a cervico-vaginal sample, return it by mail, and get their HPV results by telephone. Participants also received information about where to receive affordable Pap testing at a local clinic.

Of the 275 women who returned a sample, 15 percent tested positive for HPV. And of the women who had HPV, 82 percent followed through with a follow-up in-clinic appointment for Pap testing.

Lack of health insurance and poor access to medical services are major reasons that women do not receive screening. However, women also may be embarrassed or feel discomfort when undergoing a Pap test. The home self-test alleviates that barrier.

"Our study aimed to approximate a scalable model for increasing coverage among infrequently screened women by incorporating at-home HPV self-testing into a screening program," Smith said. "Mailing self-collection kits was feasible, with high return rates among women with infrequent screening histories. Our findings add to growing evidence that HPV self-testing can be a powerful tool to engage hard-to-reach women at higher risk of cervical cancer into preventative screening."

UNC focuses on young adult oncology patient research, co-hosts inaugural symposium


Andrew Smitherman, MD, MSc


Lauren Lux, LCSW

Improving care for adolescents and young adults with cancer and sparking collaborations to drive research in this field were the goals of the inaugural N.C. Adolescent and Young Adult Oncology Symposium, co-hosted by UNC Lineberger and the Mountain Area Health Education Center.

The symposium brought together multidisciplinary providers and researchers from around the state and included talks on many different aspects of care for this age group, including financial burden, fertility preservation, impact on caregivers and family, and issues of survivorship for patients who go on to live many years beyond their diagnosis.

Better educating health care providers on serving this population and encouraging collaboration in research efforts are both needed to improve care, said Andrew Smitherman, MD, MSc, the new medical director of UNC Lineberger's Adolescent and Young Adult (AYA) Program. Smitherman works collaboratively with Lauren Lux, LCSW, AYA program director, to provide personalized care and support for people ages 13-30 who are being treated for cancer at the N.C. Cancer Hospital and UNC Children's Hospital.

Smitherman said part of his charge is to grow the capacity of AYA-focused research at UNC Lineberger. Only in the past two decades have researchers started to systematically examine the needs specific to adolescents and young adults, and there are ongoing questions about side effects for young adult survivors of cancer, optimal treatment regimens, and mental and emotional support.

"Adolescents and young adults are in an extreme transition," Smitherman said. "They're establishing their independence, they're establishing their romantic relationships, they're establishing their self-identity and body image, and that all gets turned on its head when they get a cancer diagnosis. Their future is suddenly derailed. Because of this time of extreme developmental change and transition, it has the potential for a greater effect, and it means the needs are different, and require unique and tailored support."

UNC researchers report findings on e-cigarette toxicity, vendors; explore deterring teen use


Rebecca Williams, MHS, PhD


Seth Noar, PhD

Several UNC Lineberger members have been studying e-cigarettes, which are a major public health issue especially among adolescents and teenagers. Besides nicotine being a highly addictive substance and harmful to adolescent brain development, researchers are still discovering the hidden impacts of e-cigarette use.

Recent surveys suggest that roughly 15 to 25 percent of American high school 11th and 12th graders have used e-cigarettes. Other surveys showed that 10 to 15 percent of American adults have used the products. These numbers rise every year, but so far there have been few studies on the health effects of vaping.

One study, which created a new screening technique to test the different toxicity levels of the more than 7,700 types of e-liquid flavors available to consumers, found that e-liquids are far from harmless and contain ingredients that can vary widely from one type of e-cigarette to another. The researchers set up a database of e-liquid ingredients and their toxicity data at www.eliquidinfo.org.

E-liquid's main ingredients of propylene glycol and vegetable glycerin have been considered non-toxic when delivered orally, but e-cigarette vapors are inhaled. The UNC scientists found that even in the absence of nicotine or flavorings, small doses of these two organic compounds significantly reduced the growth of the test cells. E-liquids include small amounts of nicotine and flavoring compounds. The study found that these ingredients varied tremendously across the e-liquid products tested, and on the whole, more ingredients meant greater toxicity.

Other concerns about e-cigarettes – such as the increase in online vendors and marketing practices that make it easy for teens to buy these products – were the focus of studies led by Lineberger member Rebecca Williams, MHS, PhD. In these studies, researchers reported that the number of online e-cigarette vendors more than tripled between 2013 and 2014, and that low prices, a range of appealing flavors and ineffective age restrictions make these products easily accessible to youth.

"This study shows that e-cigarettes have been widely available online to minors and adults alike, at extremely cheap prices, with a wide variety of youth-appealing flavors, and making many unsubstantiated health claims to draw in customers," said Williams, a research associate for cancer prevention and control at the School of Medicine.

Based on a content analysis of the 283 most popular sites, they found that vendors made a wide range of social and health claims, including more than half citing health advantages to e-cigarettes compared to cigarettes. They also found online pricing starting as low as $1 for disposable e-cigarettes. A prior study found that vendors' age verification methods do not effectively block youth access, and that many e-cigarette sellers use payment, shipping, and delivery methods that are banned for cigarettes.

Other Lineberger members are examining teen use of e-cigarettes and how best to communicate the health risks to young users.

One study suggests that a lot of youth who are not interested in regular cigarettes are susceptible to using e-cigarettes, despite the fact that very little is known about long-term health consequences of vaping. It's estimated that there are 55,000 high school students in North Carolina at low risk of smoking cigarettes but at high risk for sustained e-cigarette use.

In what is believed to be one of the first studies to analyze correlates of e-cigarette use among adolescents not susceptible to smoking cigarettes, the researchers found that adolescents who are not susceptible to smoking cigarettes and who thought e-cigarettes were less harmful were more likely to use e-cigarettes, and that youth exposed to e-cigarette vapor in public places were also more likely to use e-cigarettes. The study also found that 26 percent of those surveyed were at high risk for future e-cigarette use.

"Knowing that e-cigarettes contain addictive nicotine made no difference in whether teens used e-cigarettes or not, but believing that using e-cigarettes would get them addicted did make a difference. In fact, adolescents who believed that using e-cigarettes could get them addicted were much less likely to use them," said UNC Lineberger's Seth Noar, PhD, a professor in the UNC School of Media and Journalism.

Noar said the findings are important to future efforts to communicate with adolescents about e-cigarette health risks. He said researchers are starting to test different types of messages to better communicate about e-cigarette health risks to prevent and deter their use. "We are testing a platform that adolescents know and love – text messaging," Noar said. "This is an important line of research given that e-cigarettes have become the tobacco product of choice among youth. We need to change that."

Chen awarded $11.9 million grant to study radiation treatments for prostate cancer


Ronald C. Chen, MD, MPH

The Patient-Centered Outcomes Research Institute has awarded UNC Lineberger's Ronald C. Chen, MD, MPH, a five-year, nearly $12 million grant to fund a national comparative study of two radiation treatments for prostate cancer: intensity-modulated radiation therapy (IMRT) and proton beam radiation. Chen, an associate professor of radiation oncology at the UNC School of Medicine, will lead the largest prospective study to date comparing IMRT to proton radiation for prostate cancer in order to examine side effects, quality of life, cure rates and survival.

More than 161,000 men in the United States will be diagnosed with prostate cancer this year, and the disease will cause 28,000 deaths, according to American Cancer Society estimations. About one in three men being treated for prostate cancer receive radiation, with IMRT as the most common form of treatment. Studies have shown that IMRT, which uses x-rays, is effective for many patients. But because some patients may experience short- and long-term side effects from IMRT, there is growing interest in using proton therapy – which is more expensive, and it is not yet known whether proton therapy has fewer side effects than IMRT.

"Radiation therapy is an effective treatment for prostate cancer, but we do not have perfect knowledge about what form of radiation therapy is most effective or the impact the various forms of radiation therapy may have on a patient's quality of life," said Chen, who will serve as a principal investigator for the national study along with Dr. Nancy Mendenhall, the medical director of the University of Florida Health Proton Therapy Institute in Jacksonville.

The study will involve a prospective comparison of IMRT and proton therapy, with a focus on patient quality of life, toxicity and the effectiveness of controlling disease. The researchers will enroll 1,500 patients treated with proton therapy and 1,500 patients treated with IMRT from 42 treatment centers in the United States. Chen said findings from the study will influence health policy. Many insurers currently do not cover proton therapy for prostate cancer due to its higher cost and the lack of scientific data measuring its effectiveness compared to IMRT.

DEVELOPING RESEARCH PARTNERSHIPS ACROSS THE UNIVERSITY OF NORTH CAROLINA SYSTEM

UNC Lineberger's leadership understands the value of developing research partnerships with investigators at other University of North Carolina System institutions. In 2017, the cancer center funded eight research projects at NC State and East Carolina, and are in addition to UNC Lineberger's decade-long collaboration with faculty at North Carolina Central University. These partnerships make it possible to bring together a wider array of insights and resources to bear on the causes of cancer, the development of novel therapies and approaches to prevent the disease.

2017 NC State Awards

Principal Investigator	Other	Project Title	Category
Yevgeny Brudno, PhD Assistant Professor	Paul Dayton, PhD; Shawn Hingtgen, PhD	Targeting Glioblastoma Recurrence Through Focused Ultrasound-Enabled Refillable Drug Depots	Basic Science
Heather Shive, DVM, PhD Assistant Professor		Identification of Microenvironmental Contributors to Carcinogenesis with a Zebrafish Model	Basic Science
Matthew Breen, PhD Oscar J. Fletcher Distinguished Professor		Genomic investigation of canine prostatecancer as a model for castration-resistant prostate cancer in men	Basic Science
Cathrine Hoyo, PhD Associate Professor		Cadmium exposure and Hepatocellular Carcinoma	Population Science
Melanie Simpson, PhD Professor and Head		Targeting hormone elimination to control prostate cancer	Basic Science

2017 East Carolina University Awards

Principal Investigator	Other	Project Title	Category
Rukiyah Van Dross, PhD Associate Professor		Tumor vaccination with 15dPMJ2: assessment of DAMP-ICD induction in melanoma	Basic Science

2017 UNC/NC State Collaborative Awards

Principal Investigator	Other	Project Title	Category
David Zaharoff, PhD Associate Professor	Ben Vincent, MD	Characterization of the neoantigen-specific T cell response following intravesical chitosan/IL-12 immunotherapy	Basic Science
Laurianne Van Landeghem, PhD Assistant Professor	Scott Magness, PhD	Remodeling of the Enteric Glial Network in Colon Cancer	Basic Science

CLINICAL EXCELLENCE AND INFRASTRUCTURE

A key function of the UCRF is to help ensure UNC Lineberger attracts world-class faculty who are the top experts in their fields and on the cutting edge of new discoveries. This year, we were able to recruit a group of outstanding faculty and retain those who received highly competitive offers from other institutions.

Faculty Recruitment

CRITICAL INFRASTRUCTURE

Alessandro Fichera, MD
Chief, Gastrointestinal Surgery
Professor
UNC School of Medicine
Department of Surgery
Colorectal cancer/surgery and research
University of Washington/ Seattle Cancer Care Alliance

Natalie Grover, MD
Assistant Professor
UNC School of Medicine
Division of Hematology/Oncology
Hematology malignancies/CAR-T therapy
University of North Carolina

Andrea Hayes-Jordan, MD
Chief, Division of Pediatric Surgery
Professor
UNC School of Medicine
Department of Surgery
Pediatric surgical oncology/sarcoma
MD Anderson Cancer Center

Ugwuji Maduekwe, MD
Assistant Professor
UNC School of Medicine
Department of Surgery
Minimally invasive pancreatic surgery
University of Massachusetts Medical School–Baystate

Colette Shen, MD, PhD
Assistant Professor
UNC School of Medicine
Department of Radiation Oncology
Pediatric cancer
Johns Hopkins University

Andrew Smitherman, MD, MS
Assistant Professor
UNC School of Medicine
Department of Pediatrics
Adolescent and young adult cancer support
University of North Carolina

Ray Tan, MD
Assistant Professor
UNC School of Medicine
Department of Urology
Urologic oncology outcomes
UCLA

Ashley Weiner, MD, PhD
Assistant Professor
UNC School of Medicine
Department of Radiation Oncology
Lung cancer
Washington University in St. Louis

DEVELOPING NEW TREAMENTS

Nicholas Brown, PhD
Assistant Professor
UNC School of Medicine
Department of Pharmacology
Structural biology/cell cycle
St. Jude Children's Research Hospital

George Hucks, MD
Assistant Professor
UNC School of Medicine
Department of Pediatrics
Pediatric CAR-T therapy
University of Pennsylvania/Children's Hospital of Philadelphia

CANCER GENETICS

Jason Merker, MD, PhD
Associate Professor
UNC School of Medicine
Department of Pathology & Laboratory Medicine
Molecular pathology
Stanford University School of Medicine

OPPORTUNITY

Benjamin Calhoun, MD, PhD
Associate Professor
UNC School of Medicine
Department of Pathology & Laboratory Medicine
Breast cancer pathology
Cleveland Clinic

Wesley Legant, PhD
Assistant Professor
UNC School of Medicine
Departments of Pharmacology
UNC and NCSU Joint Department of Biomedical Engineering
Cellular imaging
Howard Hughes Medical Institute

OPTIMIZING NC OUTCOMES

Melissa Gilkey, PhD
Assistant Professor
UNC Gillings School of Global Public Health
Department of Health Behavior
Behavioral change and intervention
Harvard Medical School

Megan Roberts, PhD
Assistant Professor
UNC Eshelman School of Pharmacy
Division of Pharmaceutical Outcomes and Policy
Cancer outcomes
National Cancer Institute

Angela Stover, PhD
Assistant Professor
UNC Gillings School of Global Public Health
Department of Health Policy & Management
Cancer outcomes
University of North Carolina

Institutions from which the faculty were recruited.

Retention

CLINICAL INFRASTRUCTURE

Autumn McRee, MD
Associate Professor
UNC School of Medicine
Division of Hematology/Oncology
GI Cancer

Kristalyn Gallagher, DO
Chief, Breast Surgery
Surgical Director, Breast Care Program
Assistant Professor
UNC School of Medicine
Department of Surgery
Breast cancer/surgical oncology

OPTIMIZING NC OUTCOMES

Ethan Basch, MD
Director, Cancer Outcomes Research Program
Professor
UNC School of Medicine
Division of Hematology/Oncology
Cancer Outcomes/Patient Reported Outcomes

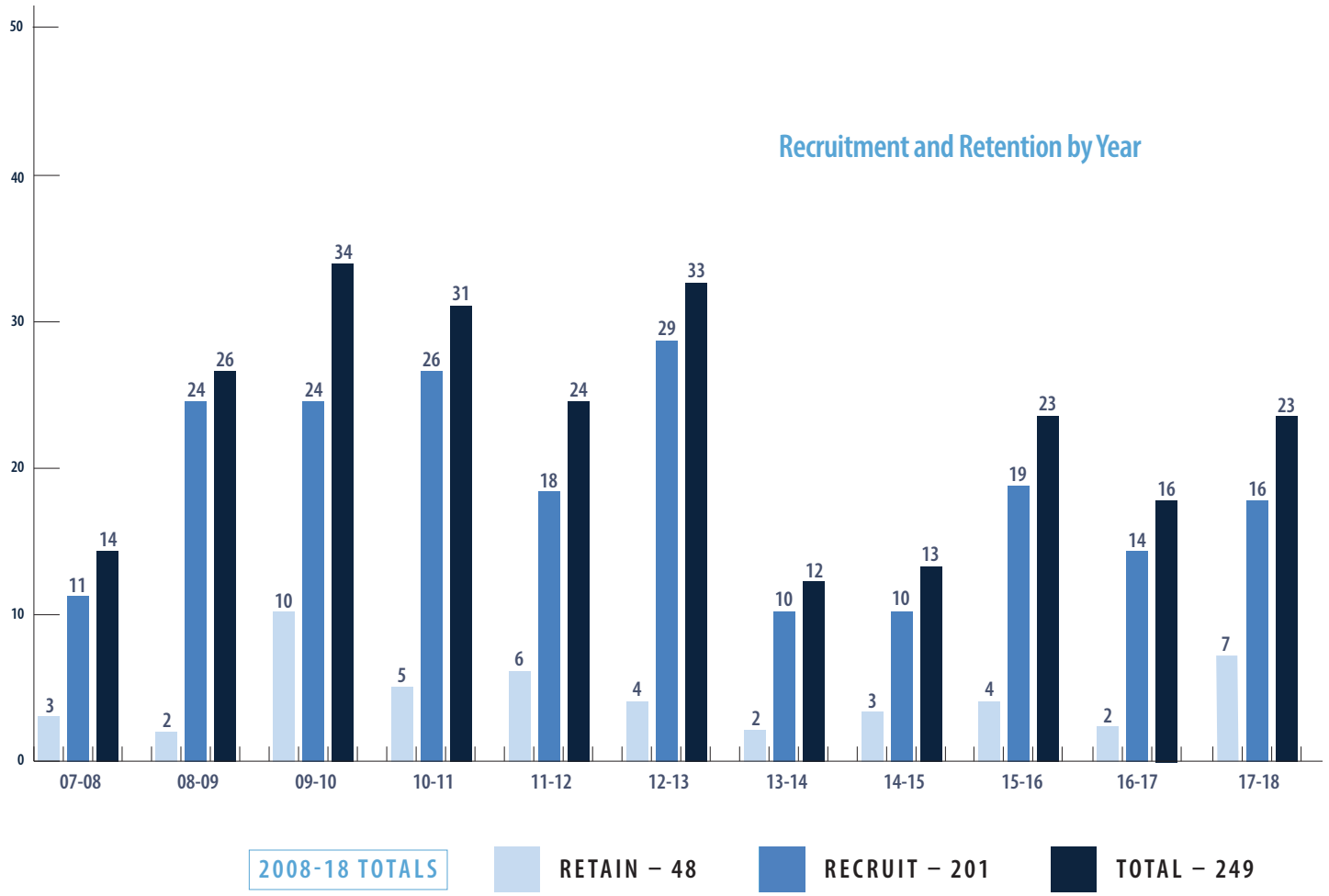
Rebecca Fry, PhD
Associate Chair, Department of Environmental Sciences and Engineering
Professor
UNC Gillings School of Global Public Health
Environment and Cancer

Til Stürmer, MD, MPH, PhD
Chair and Professor, Department of Epidemiology
UNC Gillings School of Global Public Health
Pharmacoepidemiology

William Wood, MD
Associate Professor
UNC School of Medicine
Division of Hematology/Oncology
Cancer outcomes/bone marrow transplant

DEVELOPING NEW TREATMENTS

Tim Elston, PhD
Professor
UNC School of Medicine
Department of Pharmacology
Computational medicine



SUPPORTING INFRASTRUCTURE AND SHARED RESOURCES

In addition to recruiting and retaining world-class researchers and clinicians, investments from the UCRF have supported vital core infrastructure and shared resources. Imaging, informatics and other research tools are critical in improving cancer research and care. The development of virtual tumor boards, telemedicine, community and provider partnerships, and other outreach initiatives have helped us reach patients and clinical practices in every North Carolina county.

UNC Cancer Network educates medical professionals, patients

An important part of UNC Lineberger's function as a teaching hospital is to provide continuing education to health care providers across the state. A continuing medical education (CME) credit is a continuing education credit owned by the American Medical Association. Physicians earn CME credit by attending events sponsored by an accredited provider and can use the credit toward re-licensure, re-certification, and renewal of hospital privileges.

The UNC Cancer Network is a primary source of continuing education for oncology professionals. The program's bi-monthly continuing education series reaches physicians, nurses and allied health professionals across North Carolina through live, interactive medical and nursing lectures delivered by UNC faculty. This lecture series allows practitioners to access timely, evidence-based oncology therapeutic updates from the convenience of their own practice – and earn continuing education credits. Medical professionals earned 1,159 CME credit hours this year.

UCRF resources also have significantly improved UNC Lineberger's ability to connect with oncologists and cancer patients across North Carolina. Using the infrastructure supported by UCRF funds, UNC faculty regularly hold virtual "tumor boards" – in-depth review of a particular patient's case with a team of doctors – with doctors in hospitals across the state, and do consultations in specialties that are lacking in rural communities. This year 297 virtual tumor boards helped connect community-based medical professionals with UNC oncology experts.

UNC Lineberger's tumor boards also are an important source for continuing education. This year, tumor boards provided nearly 2,800 credit hours in the following specialty areas:

Breast	983
Gastro-Intestinal	655
Head and Neck	545
Hematology-Oncology (Parker)	278
Pediatrics	335
Total	**2,796**

Through the telehealth network, UNC Lineberger connects with health care providers in real time to discuss best practices for patient care and cutting-edge research, and holds community education events to raise patient awareness of issues related to cancer. This year, UNC Lineberger hosted 24 telehealth lectures with almost 2,330 participants including nurses, doctors, physician assistants, nurse practitioners, pharmacists, social workers, nutritionists and clinic managers in more than 20 oncology practices across the state.

The UNC Cancer Network North Carolina Community College Lecture Series also offered four courses designed for students enrolled in nursing and allied health sciences programs at 14 community college sites. The series had 101 student participants. These lectures provide opportunities for students to become more familiar with strategies necessary for caring for cancer patients.

Innovative cancer data resource expands

Academics and policymakers are using comprehensive UCRF-supported data resources to knit together information from multiple public and private sources in order to examine a wide range of complex issues tied to improving cancer outcomes in North Carolina.

When UNC Lineberger leaders approved the use of the UCRF to launch the Integrated Cancer Information and Surveillance System (ICISS) in 2010, the vision was to develop a tool that facilitated "big data" population-based cancer research. Now known as the Cancer Information & Population Health Resource (CIPHR), this data resource has continued to grow. CIPHR now has access to information on more than 500,000 cancer patients in the state, 80 percent of whom are linked to insurance claims data.

"Population health research is extremely data intensive, and aggregating and analyzing data from different organizations and platforms can be a significant barrier for scientists," said UNC Lineberger's Chris Baggett, PhD, the program's faculty director. "The investments UNC Lineberger and the university made were instrumental in expanding our capabilities to ask and investigate some challenging questions. It provided the foundation on which to build a nationally unique research tool."

Academics and policymakers are now using the data resource to knit together data from multiple public and private sources, including the North Carolina Cancer Registry and public and private health insurance claims, to examine a wide range of complex issues tied to improving cancer outcomes in North Carolina, such as what treatments are most effective or what geographic or economic factors affect prognosis.

"The next big test for CIPHR will be to effectively and securely link our core data to electronic health records and genetic data," Baggett said. "Connecting these data sets will allow researchers to take an unprecedented look at an even wider variety of factors that might influence cancer incidence or impact the delivery, cost and quality of cancer care.

Pope Foundation establishes "Tomorrow's Best Hope" Endowed Fellowship Fund

When UNC announced a $10 million commitment from the John William Pope Foundation to support a combination of core areas where Carolina excels, UNC Lineberger and its commitment to training the next generation of cancer researchers was a key area of focus.

UNC Lineberger received $5 million to establish the John William Pope "Tomorrow's Best Hope" Endowed Fellowship Fund. The fund will generate nearly $250,000 each year for competitively awarded fellowships to recruit, educate and train future oncologists and cancer researchers to reduce cancer's burden in the state and beyond.

This latest gift builds on the Pope Foundation's support of the cancer center, which includes funds to create an award that recognizes emerging physician-researchers in-training and their efforts to improve cancer care through research, as well as the creation of the John William Pope Distinguished Professorship in Cancer Research, which honors the foundation's founder. The first recipient of the professorship is Thomas C. Shea, MD, who leads the UNC Bone Marrow Transplant Program and the UNC Cancer Network, which touches oncology professionals across the state. (See section above for more information about the UNC Cancer Network.)

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BUDGET AND EXPENDITURE INFORMATION

UNIVERSITY CANCER RESEARCH FUND
2018 LEGISLATIVE REPORT

BUDGET AND EXPENDITURES

The charts below reflect anticipated and actual revenue for this year, and the fund balance after considering carryover and expenditures.

ANTICIPATED AND ACTUAL REVENUE

FY 2018 Anticipated and Actual Fund Revenue	Amount*
Anticipated	
State Appropriation	$16,020,000
Projected OTP Tax Receipts	$30,480,000
Total	$46,500,000
Actual	
State Appropriation	$16,020,000
Actual OTP Tax Receipts	$31,769,093
Total	$47,789,093
Balance	$1,289,093

FUND BALANCE

FY 2018 Budget and Expenditures	Amount*
Anticipated Budget	
Revenue	$46,500,000
Carryover from FY 2017	$(236,373)
Total	$46,263,627
Actual Budget	
Revenue	$47,789,093
Carryover from FY 2017	$(236,373)
Total	$47,552,720
Expenditures	$47,622,107
Balance	$(69,387)

* Rounded to the nearest dollar

Restrictions on the Use of UCRF Monies

G.S. 11629.1 established the UCRF as a special revenue fund and created the Cancer Research Fund Committee to provide accountability and oversight. As the Cancer Research Fund Committee, led by its Chairman, then-UNC President Erskine Bowles, developed the UCRF Strategic Plan in 2009, each potential use of UCRF resources was evaluated according to the following questions:

- Will it address North Carolina's needs in terms of the goal of reducing the cancer burden in the state?
- Can we be world class at it? (Does it build on existing strengths, and is there an opportunity to lead?)
- Is there a strong economic model/justification for UCRF investment?

Based on these questions, the Committee developed a clear set of rules to guide how UCRF funds would be best spent. The Committee determined that UCRF funds should focus major resources on a limited set of opportunities to have the greatest impact; fund initiatives where UNC has the opportunity to establish a leadership position; be self-sustaining and provide leverage for additional extramural funding; build fundamental cancer-related research capabilities that benefit UNC research programs; and enhance North Carolina's economy by creating jobs, intellectual property, and startup companies.

To maximize the effectiveness of the state's investment and to ensure wise and responsible use of the funding, the Strategic Plan imposed additional restrictions on the use of these funds, instructing that UCRF funds *should not:*

- Invest broadly in an effort to make incremental improvements everywhere;
- Provide funding that would limit future flexibility;
- Undermine faculty innovation and competitiveness by eliminating the need for extramural grant funding;
- Substitute for existing university or health system funding or new philanthropy;
- Make expenditures based upon institutional or other needs outside cancer research; or
- Negatively impact other research on campus, for example by appropriating shared research infrastructure or resources.

Expenditures of State Funds Related to UCRF

The table below provides an accounting of expenditures of state funding related to the UCRF. Further details regarding these expenditures are included as appendices to this report.

Categories	YTD Actual
Strategic Plan Categories	
Tier 1: Research Priorities	
Optimizing NC Cancer Outcomes	$6,260,268
Understanding Genetics in Cancer - Basic approaches & Clinical Applications	$7,463,776
Developing New Cancer Treatments	$7,631,229
Tier 2: Opportunity Fund	$10,484,212
Tier 3: Critical Infrastructure	
Clinical Excellence – Research & Outreach	$6,277,665
Research & Tech Development and Training	$9,504,957
Total	**$47,622,107**

CONCLUSION

The University Cancer Research Fund is invested responsibly and effectively to support innovative research that will enhance the prevention, diagnosis and treatment of cancer and improve outcomes for patients. It has enabled us to form important partnerships and share research resources with other universities, the private sector, and with communities all across our state. The UCRF leverages remarkable amounts of external funding, and has sparked jobs and commercialization opportunities for North Carolina. Its total economic impact demonstrates a 9-to-1 return on investment.

The UCRF's economic benefits to our state continue to grow, and our advancements in cancer care and research will have a lasting impact both in and beyond North Carolina. We are sincerely grateful for the General Assembly's continued support of the University Cancer Research Fund – it is a vital tool in our ongoing efforts to defeat our state's deadliest disease.

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APPENDIX

UNIVERSITY CANCER RESEARCH FUND
2018 LEGISLATIVE REPORT

APPENDIX

CANCER RESEARCH FUND COMMITTEE

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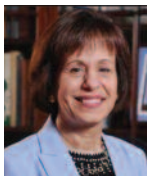
CANCER RESEARCH FUND COMMITTEE

The legislatively established Cancer Research Fund Committee, chaired by Carol Folt, Chancellor of the University of North Carolina at Chapel Hill, oversees the University Cancer Research Fund. The seven-member committee includes five ex-officio members designated by the legislation who elect two at-large members. The at-large members are to be leaders at nationally prominent cancer programs. Currently, the two are Drs. Edward Benz (President and CEO Emeritus, Dana-Farber Cancer Institute) and Gary Gilliland (President and Director, Fred Hutchinson Cancer Research Center).



Carol Folt, PhD, Chair
Chancellor
The University of North Carolina
at Chapel Hill

Edward J. Benz, MD
President and Chief
Executive Officer, Emeritus
Dana-Farber Cancer Institute

H. Shelton Earp, MD
Director
UNC Lineberger Comprehensive
Cancer Center
The University of North Carolina
at Chapel Hill

Gary Gilliland, MD, PhD
President and Director
Fred Hutchinson Cancer Research
Center

Barbara K. Rimer, DrPH
Dean
Gillings School of Global Public Health
The University of North Carolina
at Chapel Hill

William L. Roper, MD, MPH
Dean
UNC School of Medicine
Vice Chancellor for Medical Affairs
CEO, UNC Health Care
The University of North Carolina
at Chapel Hill

Dhiren Thakker, PhD
Interim Dean
UNC Eshelman School of Pharmacy
The University of North Carolina
at Chapel Hill

APPENDIX

ECONOMIC IMPACT ANALYSIS

UNC | LINEBERGER COMPREHENSIVE CANCER CENTER

The Economic Impact of University Cancer Research Fund

Current economic, employment, government revenue, and generated research funds that assist with the recruiting and retaining of local research talent due to the UCRF at University of North Carolina Lineberger Comprehensive Cancer Center

October 2018

Tripp Umbach

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Table of Contents

Executive Summary

In 2007, the state leaders of North Carolina developed a fund to invest in cancer research in the state through the University of North Carolina Lineberger Comprehensive Cancer Center. Cancer is one of the leading causes of death in North Carolina, and the fund was developed to demonstrate a commitment to the health of the state's residents. Although cancer mortality rates have been decreasing, incident rates of cancer have increased over the past decade.[1] Additionally, lung cancer continues to be the leading cancer-causing death in North Carolina.[2] The state is investing in this fund, ensuring that future generations of North Carolinians will develop cancer less often and live longer and better when they do.

The initial investment in 2007 to the University Cancer Research Fund (UCRF) of $25 million has grown to nearly $47.8 million for FY 2018. This year alone the FY 2018 $47.8 million investment produced an economic impact of more than $432.2 million, Tripp Umbach analysis shows. This investment has translated into innovative research to detect, treat, and prevent cancer and has given an opportunity for UNC to become home to one of the nation's leading public comprehensive cancer centers. University of North Carolina Lineberger Comprehensive Cancer Center (UNC LCCC) is one of only 49 National Cancer Institute-designated comprehensive cancer centers. The center brings together some of the most exceptional physicians and scientists in the country to investigate and improve the prevention, early detection, and treatment of cancer. With research that spans the spectrum from the laboratory to the bedside to the community, the faculty work to understand the causes of cancer at the genetic and environmental levels, to conduct groundbreaking laboratory research, and to translate findings into pioneering and innovative clinical trials. Investment in the UCRF allows the state an even greater ability to continue its tradition of care for all North Carolinians. It is an investment in making the best care in the world available in North Carolina, and it is difficult to think of a better investment than one for the future health of the state's residents.

People and place are the keys to the UCRF's success. UCRF is about investing in people – promising researchers with the best ideas for cancer research and master clinicians who know how to bring those findings to patients and others. UNC Chapel Hill and UNC Lineberger have a culture of collaboration – both across the university and with partners beyond the university's walls – that is essential to promote discovery and then turn those discoveries into new ways to treat, find, and prevent cancer. Outside of the obvious impacts that UNC Lineberger provides to North Carolina,

[1] Cancer in North Carolina 2013 Report. North Carolina State Center for Health Statistics.
[2] Cancer Profiles North Carolina April 2017 http://www.schs.state.nc.us/schs/CCR/cp2017/NorthCarolina.pdf

the UCRF offers additional impacts through the dollars that directly and indirectly impact the state economy and job numbers.

The aim of this report is to illustrate in detail the positive economic impact that UCRF dollars have on North Carolina's biomedical sector in the current year as well as the history of impacts the fund has shown over the last decade; it is important to note that these impacts have been annual since the fund's inception. Through expanding the state economy, creating jobs, generating tax revenue, encouraging scientific collaboration, and leveraging federal research funds, these dollars have provided a significant benefit to the state of North Carolina.

University Cancer Research Fund

Key Findings

- **Expanding the state's economy.** UCRF generated nearly more than $432.2 million in total economic impact in North Carolina in 2018. This includes direct spending of more than $231.1 million within the state, much of which is a result of the generation of funds from national grants due to research activities that are just a portion of the $183.3 million in research funding received in 2018 alone. The ripple effect of in-state spending accounts for nearly $201.1 million in additional funds, representing downstream spending by employees, vendors, and contractors. This is just the impact of the current year (2018). Tripp Umbach estimates that through the commercialization of the discoveries made from this research, the impact by 2028 will be dramatically larger.

- **Creating jobs.** UCRF directly supported employment in 2018 of more than 1,105 jobs in North Carolina and an additional 1,515 jobs through both the indirect and induced impacts of those direct jobs and the spending generated from the UCRF within North Carolina. This means the total impact of this fund is more than 2,620 jobs.

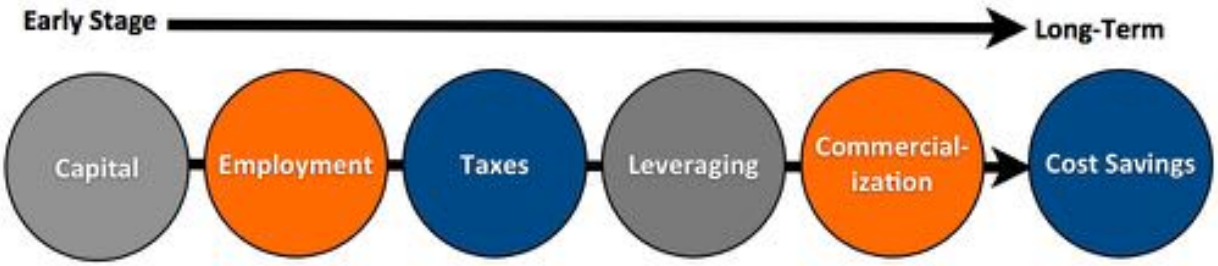
- **Generating tax revenue.** Tripp Umbach estimates that UCRF provided nearly $14.8 million in local and state tax revenue in 2018.

- **Encouraging scientific collaboration and leveraging federal research funds.** These funds have encouraged recipient institutions to collaborate as well as to apply for and win highly competitive federal grants. Recipients of these state research funds have leveraged federal research funds amounting to more than $156.9 million in federal research grants, bringing the total to more than $183.3 million in external funding in 2018 alone. This would not have been possible without the UCRF funding, which elevated UNC Lineberger to the top rankings.

Impacts of UCRF in 2018

Any discussion of the economic impact of these state funds must be predicated on an understanding that research investments, by their nature, have a multitude of impacts on a state's economy, both in the present and in the future. Short-term impacts include capital and non-capital investment and employment growth supported by the funds and new federal medical research funding leveraged by North Carolina's funds that expand the state's economy. Longer-term impacts include a strengthened ability to compete nationally for funding and to attract world-class scientists; the economic and employment advances that will be achieved when medical research and innovation are translated into commercial products and services; and healthcare cost savings to the state as a result of innovation (see Figure 1):

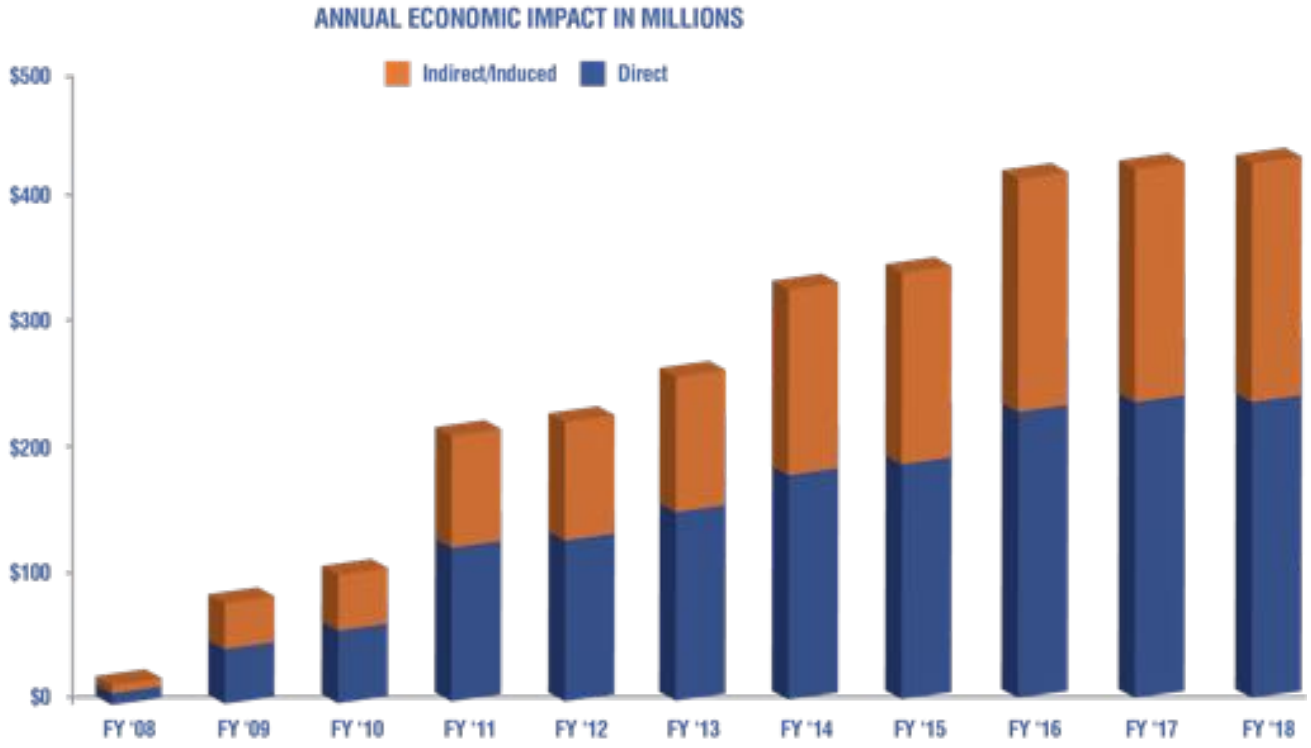
Figure 1: Research Return on Investment Timeline



Early Stage Economic Impact of Funding

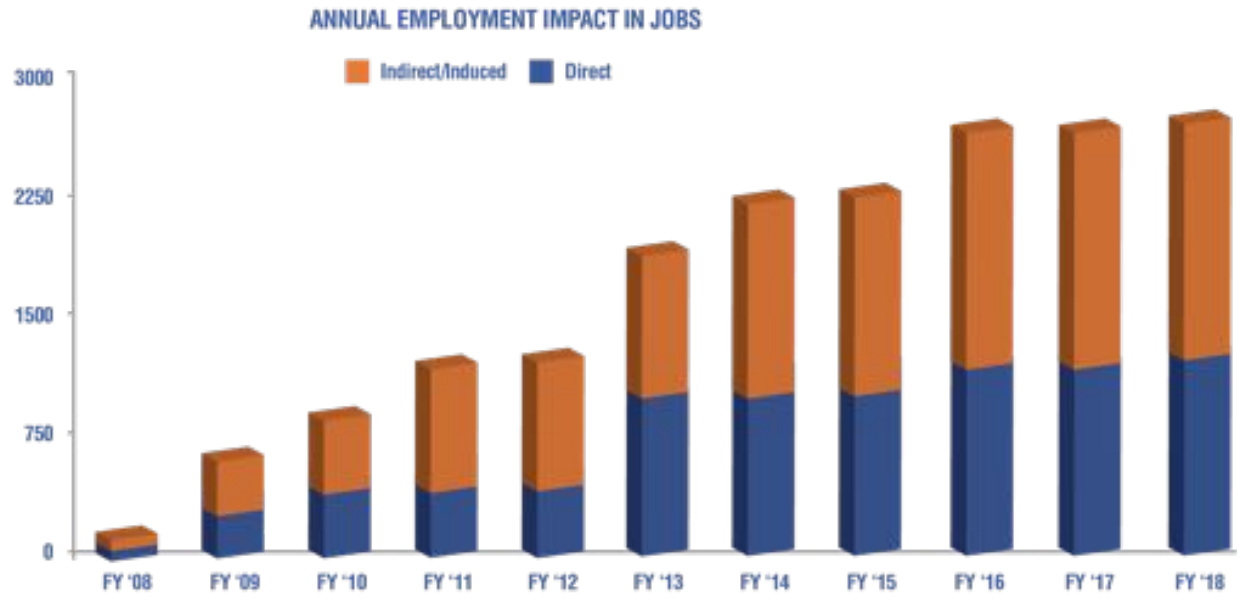
UCRF dollars invested in research in 2018 have resulted in an expansion of the state's economy by nearly $432.2 million. Tripp Umbach's economic impact analysis indicates that even in the early stage (2007-2011), program investments in capital and human resources have returned greater than three dollars to the state's economy for every one dollar invested. In 2018, this amount has risen to more than nine dollars for every dollar invested. Spending attributable to the fund can be divided into two parts: direct and indirect/induced impacts.

The direct impacts of program funding include institutional expenditures for capital improvements and goods and services but also spending by researchers, research staff, subcontractors, and visitors who come to these institutions for conferences and meetings. The indirect impacts of tobacco funds result from these direct, first-round expenditures, which are received as income by businesses and individuals in the state and recirculate through the economy in successive rounds of re-spending. The end result is a multiplied economic impact that is a linear result of the state's investment in research. The impacts over the last decade are outlined below in the chart below.


ANNUAL ECONOMIC IMPACT IN MILLIONS
Indirect/Induced
Direct
$500
$400
$300
$200
$100
$0
FY '08
FY '09
FY '10
FY '11
FY '12
FY '13
FY '14
FY '15
FY '16
FY '17
FY '18

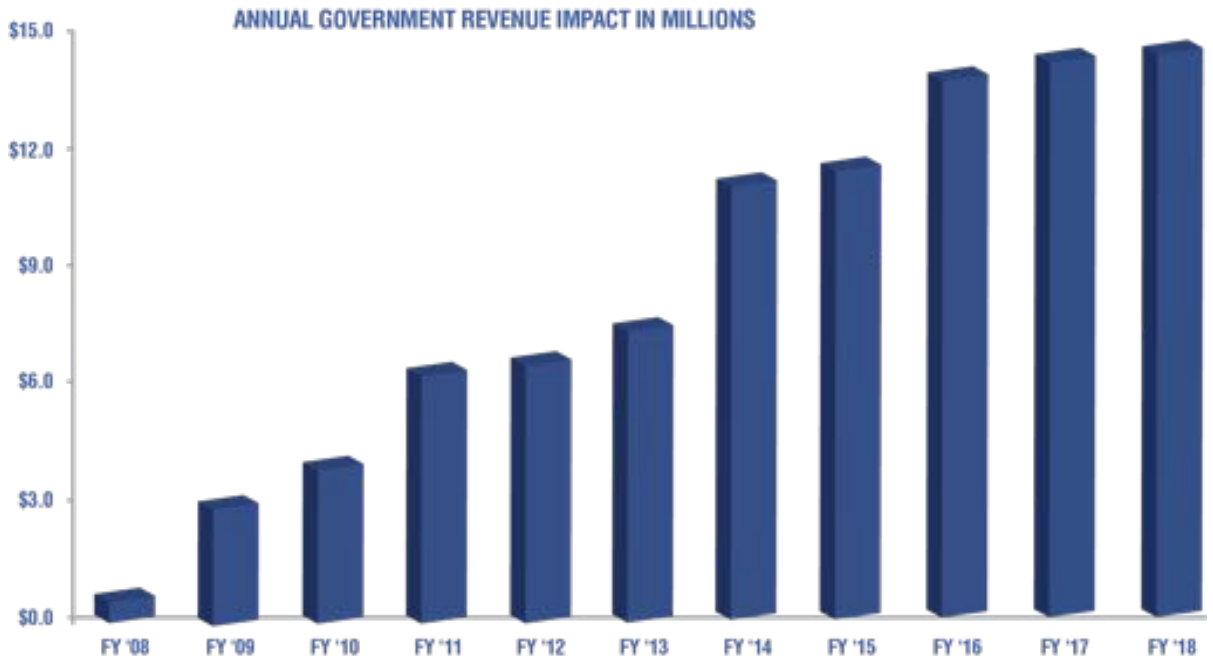
Early Stage Impact of UCRF Dollars on Employment

Tripp Umbach estimates that in 2018, UCRF dollars for healthcare research have created and sustained 2,620 high-paying research-related jobs throughout the state of North Carolina. This includes both the 1,105 high-paying research-related jobs directly attributed to UNC in addition to the 1,515 indirect and induced jobs supported throughout the state of North Carolina. The economic expansion created by the funds allocated to the UCRF have, in turn, brought about demand for additional employment in the state's economy. The employment impact has continued to grow and provide high-paying jobs to the state of North Carolina.



Early- and Later-Stage State Tax Impacts

Tripp Umbach estimates that funds provided in 2018 have resulted in nearly $14.8 million in tax revenues to the state of North Carolina. In-state spending by the recipient organizations and spending in the state by out-of-state parties have a significant impact on state tax revenue. Taxes created as a result of spending in the state's economy, and generation of fresh dollars from outside of the state, are expected to grow as early-stage research is commercialized. The tax impacts have increased over the last decade as well provided a return to the state for the investment.



Impacts Associated with Leveraged Federal Medical Research Funds

The North Carolina academic medical industry and growing life sciences industry have been measurably enhanced by these state funds. This federal medical research funding helps fuel clinical enterprises. According to the Association of American Medical Colleges, North Carolina's academic medical industry ranks 11th for total annual economic impact[3].

These funds from the state's UCRF have encouraged researchers at the recipient organization to collaborate to apply for and win highly competitive federal grants. These funds have enabled recipients of UCRF dollars to leverage federal research funds amounting to more than $156.9 million, bringing the total to more than $183.3 million in external funding in 2018 alone.

[3] In 2018, North Carolina ranked 11th in Academic Medical Impact of AAMC members and COTH hospitals.

Healthcare Cost Savings

While this study does not include detailed economic impact models that calculate the potential cost savings attributable to research activities, a growing body of literature provides potential insights. Breakthrough research by Silverstein et al (1995) documented $69 billion in annual economic savings resulted from NIH-supported research. The return on investment calculated by Silverstein was $7 in healthcare cost-savings for every dollar invested in NIH-sponsored research.[4]

Commercialization

Additional impacts that will be realized because of the UCRF are the levels of commercialization that occur when clusters of research professionals collaborate on a specialty area of research. Tripp Umbach estimates that after 10 years of funding and operations, the commercialization of the UCRF will produce discoveries and spinoff businesses generating additional economic activity in the state of North Carolina. Looking at projected commercialization impact in 2028, Tripp Umbach estimates this to be from $563.6 million at a conservative level of growth scenario to $1 billion using the aggressive level of growth in additional economic activity within North Carolina. These activities will also create an additional 3,131 (conservative) to 5,630 jobs (aggressive) high-paying jobs. These additional economic and employment impacts will translate into additional state and local government revenue of $16.9 million to $30.4 million.

It is important to note that these commercialization impacts are in addition to the annual operational impacts of the UCRF and that these impacts will continue to grow as the research fund continues to be successful. These impacts are realized after years of research once the breakthroughs or discoveries have been made and the discoveries begin to hit the marketplace. Examples of successful spinoff businesses supported by UNC Lineberger include Meryx, G1 Therapeutics, Genecentric, EpiCypher, Epizyme, Liquidia, and many others. Since 2009, UNC Lineberger startup companies have raised more than $300 million in non-dilutive financing from the NIH, angel investors, and venture capitalists.

Tripp Umbach's projections are based on 2018 funding and the national experience of peer academic medical centers that have implemented similar academic, clinical, research, and economic development plans during the past 20 years. Since 1995, Tripp Umbach has measured the economic impact of every U.S. academic medical center on behalf of the Association of

[4] Cost-Savings Resulting from NIH Research Support, NIH Publication No. 93. Silverstein, H.H. Garrison and S.J. Heinig, 1995.

American Medical Colleges and used historical trending data from this experience in making projections.

Appendix A: Definition of Terms

Study Year

Fiscal Year 2018

Total Impact

The total impact of an organization is a compilation of the direct impact, the indirect impact, and the induced impact generated in the economy as a result of the organization.

Direct Impact

Direct impact includes all direct effects the organization has on the regional area due to the organizational operations. These items include direct employees, organizational spending, employee spending, as well as spending by patients and visitors to the organization.

Indirect Impact

The indirect impact includes the impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to value added. The impacts are calculated by applying direct effects to the Type I Multipliers.

Induced Impact

The response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added. IMPLAN's default multiplier recognizes that labor income (employee compensation and proprietor income components of value added) is not leakage to the regional economy. This money is recirculated through the household spending patterns, causing further local economic activity.

Multiplier Effect

The multiplier effect is the additional economic impact created as a result of the organization's direct economic impact. Local companies that provide goods and services to an organization increase their purchasing by creating a multiplier.

Appendix B: Methodology

To fully quantify the impact of the funding of UCRF to the operations of UNC Lineberger Comprehensive Cancer Center within the various geographical areas throughout this study, Tripp Umbach established a study methodology. It was critically important that the methodology used would deliver a comprehensive, yet conservative, estimate of the operations' impact, based on information compiled using uniform and consistent techniques. In addition, the study team sought to develop a reproducible methodology, ensuring that subsequent studies could build upon the information and knowledge gained through this effort.

Tripp Umbach determined that the use of the IMPLAN Pro economic impact model software was most appropriate for this analysis. The IMPLAN econometric model operates by estimating the direct impact, indirect impacts, and induced impacts of specific economic activity. Direct economic impacts are those attributable to the initial economic activity. For example, an operation with 10 full-time employees creates 10 direct jobs. Indirect economic impacts are those economic activities undertaken by vendors and suppliers within the supply chain of the direct activity because of the initial economic activity. For example, suppliers of goods, materials, and services used in the direct activities produce indirect economic impacts. Induced economic impacts result from the spending of wages paid to employees in local industries involved in direct and indirect activities. Tripp Umbach selected the IMPLAN model because of its frequent use in economic impact, in addition to its development independent of local influences.

Tripp Umbach collected employment information concerning the economic activity of UCRF's funding on operations themselves and followed up in person to make certain the data was the most current available.

In this report, the impact was measured using IMPLAN datasets. The IMPLAN data files include information for 528 different industries (generally three- or four-digit SIC code breakdown) and 21 different economic variables. IMPLAN sources their employment data from ES202 employment security data supplemented by county business patterns and REIS data. Employment data used in the analysis includes full-time and part-time positions.

It should be noted that, at the time of performing the UCRF assessment, the most recent IMPLAN data files for the state of North Carolina were for 2015. While the data is not current, it is unlikely that the fundamental economic structure of North Carolina's economic fabric has changed to an extent that would invalidate the analysis. IMPLAN data and accounts closely follow the accounting

conventions used in the “Input/Output Study of the U.S. Economy” by the U.S. Bureau of Economic Analysis and the rectangular format recommended by the United Nations.

By deriving the direct and actual employment numbers from IMPLAN for each county, Tripp Umbach was able to conduct input/output modeling to analyze the current impact of the industry in each county. Tripp Umbach supplied additional information as required to supplement the data supplied by UNC Lineberger Comprehensive Cancer Center.

Appendix C: Tripp Umbach Qualifications

Tripp Umbach is the national leader in providing economic impact analysis to leading healthcare organizations and academic health centers. The firm has completed more than 250 economic impact studies over the years for clients such as the Mayo Clinic Rochester, The Cleveland Clinic, University of Florida Shands HealthCare, and the Ohio State University Medical Center. In addition to work on multiple occasions for the six allopathic medical schools and academic medical centers in Pennsylvania, Tripp Umbach has completed statewide studies for multiple institutions in Ohio, Virginia, South Carolina, Wisconsin, and Minnesota.

Tripp Umbach recently completed its fifth national study of all U.S. medical schools and teaching hospital affiliates for the Association of American Medical Colleges.

In addition to completing similar studies for UNC LCCC over the last 10 years, Tripp Umbach has also completed economic impact studies for cancer centers such as the CURE Funding for PA Cancer Alliance, The Wistar Institute, University of North Carolina's Cancer Hospital, Ohio State University's James Cancer Center and Solove Research Center, Ohio State University's Comprehensive Cancer Center, Milton S. Hershey Medical Center's Cancer Institute, Mayo Clinic/Allegheny General Hospital Cancer Services planning, UPMC Hillman Cancer Center feasibility and economic impact projections study, University of Pennsylvania projected economic impact of the Cancer Center as a component of the Civic Center project, and University of Florida Shands HealthCare economic impact projections.

For more information on Tripp Umbach, please go to www.trippumbach.com, and for more information on this research please contact:

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APPENDIX

ESTABLISHING LEGISLATION

UNC | LINEBERGER COMPREHENSIVE CANCER CENTER

ESTABLISHING LEGISLATION

§ 116-29.1. University Cancer Research Fund (as modified by SL 2013-360)

(a) Fund. – The University Cancer Research Fund is established as a special revenue fund in the Office of the President of The University of North Carolina. Allocations from the fund shall be made in the discretion of the Cancer Research Fund Committee and shall be used only for the purpose of cancer research under UNC Hospitals, the Lineberger Comprehensive Cancer Center, or both.

(b) Effective July 1 of each calendar year, the funds remitted to the University Cancer Research Fund by the Secretary of Revenue from the tax on tobacco products other than cigarettes pursuant to G.S. 105-113.40A is appropriated for this purpose are appropriated for this purpose.

(c) Cancer Research Fund Committee. – The Cancer Research Fund Committee shall consist of five ex officio members and two appointed members. The five ex officio members shall consist of the following: (i) one member shall be the Chancellor of the University of North Carolina at Chapel Hill, (ii) one member shall be the Director of the Lineberger Comprehensive Cancer Center, (iii) one member shall be the Dean of the School of Medicine at The University of North Carolina, (iv) one member shall be the Dean of the School of Pharmacy at The University of North Carolina, and (v) one member shall be the Dean of the School of Public Health at The University of North Carolina. The remaining two members shall be appointed by a majority vote of the standing members of the Committee and shall be selected from persons holding a leadership position in a nationally prominent cancer program.

If any of the specified positions cease to exist, then the successor position shall be deemed to be substituted in the place of the former one, and the person holding the successor position shall become an ex officio member of the Committee.

(d) Chair. – The chair shall be the Chancellor of the University of North Carolina at Chapel Hill.

(e) Quorum. – A majority of the members shall constitute a quorum for the transaction of business.

(f) Meetings. – The Committee shall meet at least once in each quarter and may hold special meetings at any time and place at the call of the chair or upon the written request of at least a majority of its members. (2007-323, s. 6.23(b); 2009-451, s. 27A.5(e); 2010-31, s. 9.12.)

(g) Report. – By November 1 of each year, the Cancer Research Fund Committee shall provide to the Joint Legislative Education Oversight Committee and to the Office of State Budget and Management an annual financial report which shall include the following components:

(1) Accounting of expenditures of State funds related to strategic initiatives, development of infrastructure, and ongoing administrative functions.

(2) Accounting of expenditures of extramural funds related to strategic initiatives, development of infrastructure, and ongoing administrative functions.

(3) Measures of impact to the State's economy in the creation of jobs, intellectual property, and start-up companies.

(4) Other performance measures directly related to the investment of State funds.

(5) Accounting of any fund balances retained by the Fund, along with information about any restrictions on the use of these funds.

APPENDIX

FY 2018 EXPENDITURES

UNC | LINEBERGER COMPREHENSIVE CANCER CENTER

FISCAL YEAR 2018 EXPENDITURES

Strategy	Annual Budget	Year to Date Actual*	Cash Balance
Tier 1: Research Priorities			
Optimizing NC Cancer Outcomes	$6,375,000	$6,260,268	$114,732
Understanding Genetics in Cancer - Basic approaches & Clinical Applications	$7,650,000	$7,463,776	$186,224
Developing New Cancer Treatments	$7,489,093	$7,631,229	-$142,136
Tier 2: Opportunity Fund	$10,450,000	$10,484,212	-$34,212
Tier 3: Critical Infrastructure			
Clinical Excellence and Outreach	$6,775,000	$6,277,665	$497,335
Infrastructure	$9,050,000	$9,504,957	-$454,957
Grand Total	$47,789,093	$47,622,107	$166,986

*Rounded to nearest dollar

FISCAL YEAR 2018 EXPENDITURES SUMMARY

Expense Category	Actual* Year To Date	Expense to Total Expenditure
Faculty Salaries	$14,561,837	30.6%
EPA Student Salaries	$2,558,698	5.4%
Staff Salaries	$6,507,547	13.7%
Other Staff	$236,962	0.5%
Bonus Incentive Wages	$2,378	0.0%
Benefits	$6,007,390	12.6%
Phy Benefits	$232,082	0.5%
Other Staff Benefits	$128,234	0.3%
Transit Tax	$70,623	0.1%
Consultants/Contracted Services	$971,331	2.0%
Employee Education	$16,762	0.0%
Repairs and Maint	$641,368	1.3%
Other Current Services	$2,606,195	5.5%
Supplies, Other	$3,220,135	6.8%
Travel	$438,695	0.9%
Maintenance Contracts	$1,250,205	2.6%
Advertising	$15,143	0.0%
Meetings & Amenities	$30,838	0.1%
Printing and Binding	$39,233	0.1%
Communication	$120,159	0.3%
Computer Services	$48,697	0.1%
Rental/Lease Facilities	$1,008,658	2.1%
Rental Equipment	$321,227	0.7%
Equipment	$5,119,680	10.8%
Study Subjects & Exp	$51,396	0.1%
Insurance	$3,038	0.0%
Student Support	$925,704	1.9%
HCS Residents	$422,812	0.9%
Utilities	$65,070	0.1%
Legal Fees	$10	0.0%
Grand Total	$47,622,107	100.0%

*Rounded to nearest dollar

Tier 1: Research Priorities

Optimizing NC Cancer Outcomes

Expense Category	Actual* Year to Date
Faculty Salaries	$2,728,289
EPA Student Salaries	$92,404
Staff Salaries	$1,203,346
Other staff	$25,952
Bonus Incentive Wages	$136
Benefits	$1,124,584
Phy Benefits	$7,826
Other Staff Benefits	$22,014
Transit Tax	$12,231
Consultants/Contracted Services	$29,407
Employee Education	$65
Repairs and Maint	$649
Other Current Services	$115,358
Supplies, Other	$101,738
Travel	$102,639
Maintenance Contracts	$127,707
Meetings & Amenities	$1,873
Printing and Binding	$19,141
Communication	$31,232
Contracted Serv	$0
Computer Services	$31,347
Rental/Lease Facilities	$310,936
Equipment	$11,595
Study Subjects & Exp	$48,314
Student Support	$111,485
	$6,260,268

*Rounded to nearest dollar

Tier 1: Research Priorities

Understanding Genetics in Cancer - Basic Approaches & Clinical Applications

Expense Category	Actual* Year to Date
Faculty Salaries	$2,245,562
EPA Student Salaries	$144,166
Staff Salaries	$1,335,428
Other staff	$67,552
Bonus Incentive Wages	$337
Benefits	$1,096,763
Phy Benefits	$6,837
Other Staff Benefits	$21,517
Transit Tax	$11,345
Consultants/Contracted Services	$67,228
Employee Education	$1,941
Repairs and Maint	$953
Other Current Services	$492,784
Supplies, Other	$1,042,339
Travel	$56,918
Maintenance Contracts	$239,527
Printing and Binding	$587
Communication	$7,549
Computer Services	$10,896
Rental/Lease Facilities	$233,665
Equipment	$298,861
Insurance	$51
Student Support	$15,900
Utilities	$65,070
	$7,463,776

*Rounded to nearest dollar

Tier 1: Research Priorities

Developing New Cancer Treatment

Expense Category	Actual* Year to Date
Faculty Salaries	$1,765,622
EPA Student Salaries	$352,766
Staff Salaries	$767,064
Other staff	$6,218
Benefits	$735,410
Phy Benefits	$564
Other Staff Benefits	$14,324
Transit Tax	$7,957
Consultants/Contracted Services	$5,548
Employee Education	$7,177
Repairs and Maint	$19,049
Other Current Services	$662,749
Supplies, Other	$741,749
Travel	$21,317
Maintenance Contracts	$268,465
Advertising	$1,195
Meetings & Amenities	$217
Communication	$20,530
Computer Services	$1,341
Rental/Lease Facilities	$438,311
Rental Equipment	$321,227
Equipment	$1,391,304
Insurance	$66
Student Support	$81,059
	$7,631,229

*Rounded to nearest dollar

Tier 2: Opportunity Fund

Expense Category	Actual* Year to Date
Faculty Salaries	$1,484,112
EPA Student Salaries	$1,068,238
Staff Salaries	$684,184
Other staff	$109,089
Bonus Incentive Wages	$1,713
Benefits	$758,217
Phy Benefits	$44,950
Other Staff Benefits	$18,208
Transit Tax	$10,106
Consultants/Contracted Services	$18,777
Employee Education	$2,454
Repairs and Maint	$606,157
Other Current Services	$995,508
Supplies, Other	$1,064,111
Travel	$201,804
Maintenance Contracts	$289,447
Meetings & Amenities	$10,394
Printing and Binding	$11,146
Communication	$33,645
Rental/Lease Facilities	$24,014
Equipment	$2,691,600
Study Subjects & Exp	$3,082
Insurance	$2,921
Student Support	$210,624
HCS Residents	$139,701
Legal Fees	$10
	$10,484,212

*Rounded to nearest dollar

Tier 3: Critical Infrastructure

Clinical Excellence and Outreach

Expense Category	Actual* Year to Date
Faculty Salaries	$4,276,167
Staff Salaries	$357,387
Other Staff	$19,834
Benefits	$934,587
Phy Benefits	$164,007
Other Staff Benefits	$24,813
Transit Tax	$13,785
Consultants/Contracted Services	$29,039
Employee Education	$4,668
Repairs and Maint	$1,110
Other Current Services	$45,428
Supplies, Other	$54,902
Travel	$8,162
Maintenance Contracts	$30,289
Printing and Binding	$7,945
Communication	$4,221
Computer Services	$5,038
Rental/Lease Facilities	$200
Student Support	$12,972
HCS Residents	$283,111
	$6,277,665

*Rounded to nearest dollar

Tier 3: Critical Infrastructure

Infrastructure

Expense Category	Actual* Year to Date
Faculty Salaries	$2,062,085
EPA Student Salaries	$901,124
Staff Salaries	$2,160,138
Other Staff	$8,317
Bonus Incentive Wages	$192
Benefits	$1,357,829
Phy Benefits	$7,898
Other Staff Benefits	$27,358
Transit Tax	$15,199
Consultants/Contracted Services	$821,332
Employee Education	$457
Repairs and Maint	$13,450
Other Current Services	$294,368
Supplies, Other	$215,296
Travel	$47,855
Maintenance Contracts	$294,770
Advertising	$13,948
Meetings & Amenities	$18,354
Printing and Binding	$414
Communication	$22,982
Computer Services	$75
Rental/Lease Facilities	$1,532
Equipment	$726,320
Student Support	$493,664
	$9,504,957
	$47,622,107

*Rounded to nearest dollar

APPENDIX

LIST OF ACTIVE EXTRAMURAL AWARDS

UNC | LINEBERGER COMPREHENSIVE CANCER CENTER

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Recruitment	Akulian	Jason	Premier Research Group		5/19/15	5/18/19	A Phase III Study Evaluating the Efficacy and Safety of Remimazolam (CNS 7056) Compared to Placebo and Midazolam in Patients Undergoing Bronchoscopy	$88,507
Recruitment	Akulian	Jason	Mercator MedSystems, Inc.		8/24/15	8/23/18	Broncho-Adventitial Delivery of Paclitaxel to Extend Airway Patency in Malignant Airway Obstruction Patients	$16,100
Recruitment	Akulian	Jason	Chiltern International, Inc		9/1/16	9/30/18	A Pivotal Multi-Center, Randomized, Controlled, Single-Blinded Study Comparing the Silver Nitrate-Coated Indwelling Pleural Catheter (SNCIPC) to the Uncoated PleurX® Pleural Catheter for the Management of Symptomatic, Recurrent, Malignant Pleural	$71,578
Recruitment	Alexander	Thomas	AbbVie, Inc.	M16-106 83476/PO#420	11/7/17	9/30/20	A Phase 1 Dose Escalation, Open-Label Study of Venetoclax in Combination with Navitoclax and Chemotherapy in Subjects with Relapsed Acute Lymphoblastic Leukemia	$15,510
Retention	Allbritton	Nancy	NIH National Cancer Institute	5-R01-CA177993-01-04	8/15/14	7/31/19	Single-Cell Measurement of Lipid Signaling in Colorectal Cancer	$584,480
Retention	Allbritton	Nancy	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-R01-DK109559-01-03	9/25/15	7/31/20	Development of Human Intestinal Simulacra	$1,370,054
Retention	Allbritton	Nancy	NIH National Cancer Institute	5-F31-CA206233-02	6/1/16	4/23/18	FELLOW:M DISALVO High-Throughput Generation of Pancreatic Organoids with Controlled Stromal Milieus using Microraft-Based Cell Sorting	$34,866
Retention	Allbritton	Nancy	NIH National Cancer Institute	1-F31-CA228223-01	4/1/18	3/31/20	A combined single cell gene expression and enzyme activity assay to study chemotherapy resistance in pancreatic ductal adenocarcinoma	$35,681
Retention	Allbritton	Nancy	NIH National Cancer Institute	1-R01-CA224763-01A1	4/1/18	3/31/23	Profiling signaling activity and gene expression in single, pancreatic adenocarcinoma cells using CE-RNA-Seq	$575,272
Recruitment	Amelio	Antonio	Scripps Research Institute	5-27078	8/1/17	7/31/19	Development and Validation of a Genetically Engineered Model of Neurofibromatosis Type 2 to Facilitate Discovery of Neurotherapeutics	$22,206
Recruitment	Amelio	Antonio	NIH National Institute of Dental and Craniofacial Research	1-F31-DE027282-01A1	3/1/18	2/28/20	FELLOW:A MUSICANT Role of CRTC1/MAML2-Mediated Interactions with CREB and MYC in Defining the Cellular Heterogeneity of Salivary Tumors	$34,124
Investment (Protocol)	Anders	Carey	Novartis Pharmaceuticals Corporation		8/1/11	12/31/17	LCCC 1025 A Phase II Study Evaluating The Efficacy And Tolerability Of Everolimus (RAD001) In Combination With Trastuzumab And Vinorelbine In The Treatment Of Progressive HER2-Positive Breast Cancer Brain Metastases	$18,317
Investment (Protocol)	Anders	Carey	Merrimack Pharmaceuticals		5/1/15	5/1/25	A Pilot Study in Patients Treated with MM-398 to Determine Tumor Drug Levels and to Evaluate the Feasibility of Ferumoxytol Magnetic Resonance Imaging to Measure Tumor Associated Macrophages and to Predict Patient Response to Treatment	$208,111
Investment (Protocol)	Anders	Carey	Merck Sharp and Dohme Corp.		12/21/15	6/19/18	A Phase II Clinical Trial of Pembrolizumab (MK-3475) as Monotherapy for Metastatic Triple-Negative Breast Cancer (mTNBC)	$188,047
Investment (Protocol)	Anders	Carey	TESARO, Inc.	PO04461	11/15/16	11/15/18	Niraparib efficacy and pharmacodynamics in intracranial TNBC murine models	$68,620
Investment (Protocol)	Anders	Carey	TESARO, Inc.		2/15/17	4/30/21	Phase 1/2 Trial of Niraparib in Combination with Pembrolizumab in Patients with Advanced or Metastatic Triple-Negative Breast Cancer and in Patients with Recurrent	$92,273
Investment	Anton	Eva	NIH National Institute of Mental	5-R01-MH060929-17-19	12/1/99	5/31/20	Radial Glial Development and Differentiation	$380,000
Recruitment	Armistead	Paul	NIH National Cancer Institute	5-R01-CA201225-01-03	2/1/16	1/31/21	Leukemia Specific Splice Isoforms as Neo-Antigens for T-Cell Immunotherapy	$441,729
Recruitment	Armistead	Paul	NIH National Cancer Institute	5-R01-CA201225-01-03	2/1/16	1/31/21	Leukemia Specific Splice Isoforms as Neo-Antigens for T-Cell Immunotherapy	$49,080
Innovation Award	Armistead	Paul	BioFluidica, Inc.		3/1/17	2/28/19	SBIR: Rapid Detection of Minimal Residual Disease in Acute Myeloid Leukemia from Peripheral Blood	$213,308
Innovation Award	Armistead	Paul	Cell Microsystems, Inc.		7/3/17	6/30/19	STTR: CellRaft Array for Screening and Isolation of Highly Effective Cytotoxic T Cells	$240,954
Recruitment	Arthur	Janelle	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-K01-DK103952-01-04	9/17/14	8/31/19	Intestinal inflammation and genotoxicity of the colonic-adherent microbiota	$151,681
Recruitment	Arthur	Janelle	Kenneth Rainin Foundation	2017-307	10/1/17	9/30/18	Bacterial siderophores and inflammatory bowel diseases (IBD)-associated fibrosis	$100,000
Recruitment	Aube	Jeffrey	Cornell University Medical Campus	180185	7/1/15	6/30/18	Tri-institutional TB Research Unit: Persistence and Latency 1U19AI111143 - Chemistry	$620,479
Recruitment	Aube	Jeff	University of Kansas Center for Research, Inc.	FY2016-020-M1	7/8/15	5/31/19	Molecular Cancer Therapy Targeting HuR-ARE Interaction	$80,817
Recruitment	Aube	Jeff	University of Kansas Center for Research, Inc.	FY2016-006	7/1/15	3/31/19	HTS to identify small molecules to disrupt abnormal huntingtin interactions in hd	$149,354
Recruitment	Aube	Jeff	Scripps Research Institute	5-27127	2/1/17	1/31/21	Novel Probes of the Kappa Opioid Receptor: Chemistry, Pharmacology, and Biology	$180,865
Recruitment	Aube	Jeff	Scripps Research Institute	5-27127	2/1/17	1/31/21	Novel Probes of the Kappa Opioid Receptor: Chemistry, Pharmacology, and Biology	$18,228
Recruitment	Aubé	Jeff	Fox Chase Cancer Center	FCCC15101-01	9/26/16	8/31/18	Identifying stabilizers of p53 using pocket complementarity	$15,200

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Retention	Bae-Jump	Victoria	American Cancer Society	RSG-15-138-01-CCE	1/1/16	12/31/19	Obesity, Cation-Selective Transporters and Metformin in Endometrial Cancer	$198,000
Retension	Bae-Jump	Victoria	North Carolina Biotechnology Center	2015-CFG-8004	8/14/15	8/1/18	Discovery of Novel, Efficacious and Safe Biguanides for the Treatment of Ovarian Cancer	$50,000
Retension	Bae-Jump	Victoria	V Foundation for Cancer Research	T2017-015	11/1/17	11/1/20	Metabolic and Molecular Biomarkers of Metformin Response in Obesity-driven Endometrial Cancer	$200,000
Retension	Bae-Jump	Victoria	NIH National Cancer Institute	1-R21-CA220269-01	9/25/17	8/31/19	Inter-relationship between microbiota diversity, obesity and race in Endometrial Cancer	$202,928
Retension	Bae-Jump	Victoria	NIH National Cancer Institute	1-R01-CA226969-01	3/14/18	2/28/23	Obesity-driven Metabolic and Molecular Biomarkers of Metformin Response in Endometrial Cancer	$355,706
Investment (CC)	Baric	Ralph	NIH National Institute of Allergy and Infectious Diseases	5-R01-AI110700-01-04	4/20/15	3/31/20	Mechanisms of MERS-CoV Entry, Cross-species Transmission and Pathogenesis	$727,370
Investment (CC)	Baric	Ralph	University of Alabama at Birmingham	000502793-005	3/1/15	2/28/19	Antiviral Drug Discovery and Development Center	$462,644
Investment (CC)	Baric	Ralph	Columbia University	5(GG008377-39)	3/1/16	2/28/19	Diagnostic and Prognostic Biomarkers for Viral Severe Lung Disease	$889,034
Investment (CC)	Baric	Ralph	NIH National Institute of Allergy and Infectious Diseases	5-U19-AI107810-05	6/21/13	5/31/19	Characterization of novel genes encoded ty RNA and DNA viruses	$2,021,134
Investment (CC)	Baric	Ralph	NIH National Institute of Allergy and Infectious Diseases	1-R01-AI132178-01	8/9/17	7/31/22	Broad-spectrum antiviral GS-5734 to treat MERS-CoV and related emerging CoV	$1,455,240
Investment (CC)	Baric	Ralph	Vanderbilt University Medical Center	VUMC 41666	3/1/18	2/28/19	Determinants of Coronavirus Fidelity in Replication and Pathogenesis	$293,121
Investment (CC)	Baric	Ralph	University of Texas at Austin	UTA18-000140	2/1/18	1/31/20	Molecular Analysis of Serum Antibody Constituents in Zika Virus Infection	$116,625
Investment (CC)	Baric	Ralph	NIH National Institute of Allergy and Infectious Diseases	HHSN27220180462P	3/5/18	3/4/19	Immunological Data for MERS-CoV vaccine and immunotherapeutic candidates	$146,246
Recruitment	Baron	John	University of Michigan	SUBK00008176	9/1/17	4/30/19	GLNE 010 Validation and Comparison of Biomarkers for the Early Detection of Colorectal Adenocarcinoma	$35,840
Recruitment	Basch	Ethan	Mayo Clinic	65507744 UNC 194321-03	8/1/14	7/31/18	Alliance NCORP Research Base	$70,283
Recruitment	Basch	Ethan	Patient-Centered Outcomes Research Institute	ME-1507-32079	8/1/16	12/31/20	Patient-Reported Outcomes-based Performance Measures (PRO-PMs)	$478,112
Recruitment	Basch	Ethan	Alliance for Clinical Trials in Oncology Foundation	IHS-1511-33392	11/1/16	1/31/22	Electronic Patient Reporting Of Symptoms During Outpatient Cancer Treatment: A U.S. National Randomized Controlled Trial	$444,226
Recruitment	Basch	Ethan	University of Michigan	3004700015	8/17/17	3/31/22	Advanced Development and Dissemination of EMERSE for Cancer Phenotyping from Medical Records	$91,106
Retention	Bateman	Ted	Wake Forest University School of Medicine	WFUHS 111777	6/25/17	3/31/19	Exercise Countermeasures for Knee and Hip Joint Degradation during Spaceflight	$37,511
Retention	Bateman	Ted	Novo Nordisk Inc.		3/4/14	2/28/19	Analysis of 220 mouse limbs	$16,000
Retention	Bateman	Ted	Wake Forest University Health Sciences	WFUHS 115740	9/30/17	9/29/20	Molecular crosstalk: bone metastatic prostate cancer and nociceptive neurons	$20,000
Retention	Bateman	Ted	Wake Forest University Health Sciences	WFUHS 551250	4/1/18	3/31/19	Targeting IRE-1? to protect against radiation therapy-induced bone loss	$19,033
Recruitment	Batrakova	Elena	Elsa U Pardee Foundation		10/1/17	9/30/18	Targeting the Triple Negative Breast Cancer with Paclitaxel-loaded Biomimetic Nanovesicles, Exosomes	$150,254
Recruitment	Batrakova	Elena	NIH National Institute of Neurological Disorders and Stroke	1-R01-NS102412-01A1	3/1/18	11/30/22	Cell-based Platform for Gene Delivery to the Brain	$350,719
Innovation Award	Bautch	Victoria	NIH National Heart, Lung, and Blood Institute	5-R01-HL117256-01-04	8/1/14	12/31/17	Mechanisms of neovascularization in response to ischemia	$375,662
Innovation Award	Bautch	Victoria	American Heart Association	16PRE29730003	7/1/16	6/30/18	SMAD6 Function in Endothelial Cells	$25,950
Innovation Award	Bautch	Victoria	NIH National Heart, Lung, and Blood Institute	1-R35-HL139950-01	1/1/18	12/31/24	Molecular and cellular control of angiogenesis	$922,296
Retension	Bear	James	NIH National Institute of General Medical Sciences	5-R01-GM110155-01-04	9/1/14	8/31/18	Mechanisms of mesenchymal chemotaxis	$353,046
Retension	Bear	James	North Carolina State University	2014-0702-01	9/15/14	5/31/18	Multiscale modeling of wound healing	$109,168

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Innovation Award	Bear	James	NIH National Institute of General Medical Sciences	5-R01-GM111557-01-04	9/1/14	8/31/18	The role of the Arp2/3 complex in cellular actin dynamics	$370,544
Recruitment	Bennett	Antonia	Leukemia and Lymphoma Society		4/1/15	9/30/17	Implementation of Patient-Reported Outcome Endpoints in the Acute Myeloid Leukemia Phase IB/II Master Protocol	$44,009
Recruitment	Bennett	Antonia	Alliance for Clinical Trials in Oncology Foundation	PCS-1505-30497	7/1/16	12/1/21	Comparison of Operative to Medical Endocrine Therapy (COMET) for Low-Risk DCIS	$177,806
Recruitment /Investment	Berg	Jonathan	NIH National Institute of Child Health and Human Development	5-U19-HD077632-04-05	9/5/13	8/31/18	NC NEXUS, North Carolina Newborn Exome Sequencing for Universal Screening	$1,183,338
Recruitment /Investment	Berg	Jonathan	NIH National Institute of Child Health and Human Development	3-U19-HD077632-05S1	9/5/13	8/31/18	NC NEXUS, North Carolina Newborn Exome Sequencing for Universal Screening	$33,869
Recruitment /Investment	Berg	Jonathan	NIH National Human Genome Research Institute	2-U01-HG006487-05	12/5/11	5/31/21	North Carolina Clinical Genomic Evaluation by Next-gen Exome Sequencing 2	$3,021,823
Recruitment /Investment	Berg	Jonathan	NIH National Human Genome Research Institute	1-U41-HG009650-01	9/12/17	7/31/21	The Clinical Genome Resource - Expert Curation and EHR Integration	$3,050,000
Recruitment	Bowers	Albert	NIH National Institute of General Medical Sciences	1-R35-GM125005-01	9/5/17	8/31/22	Chemoenzymatic Synthesis, Mode of Action and Evolution of Natural Product-based Macrocycles	$383,398
Recruitment	Bowers	Albert	Arnold and Mabel Beckman				Synthetic Biology Approach to Scaffolding Pathways for Small Molecule Biosynthesis	$187,500
Recruitment	Branca	Rosa	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-R01-DK108231-01-03	9/25/15	8/31/20	Sensitive and Specific Detection of BAT Tissue and Activity by Magnetic Resonance with Hyperpolarized Xe-129	$333,365
Investment	Brenner	Alison	University of Texas at Austin		10/1/16	6/30/19	Improving colorectal cancer screening adherence in vulnerable populations: a pilot quality improvement project in Travis County, TX	$11,924
Innovation	Brenner	Alison	Colon Cancer Coalition		7/1/17	6/30/19	Mailed reminders plus fecal immunochemical testing (FIT) to increase colorectal cancer screening among patients of Roanoke Chowan Community Health Center	$25,000
Innovation	Brewer	Noel	Centers for Disease Control and Prevention	1-U01-IP001073-01	8/1/17	8/31/20	Impact of AFIX and Physician-to-Physician Engagement on HPV Vaccination in Primary Care: An RCT	$499,752
Recruitment	Brookhart	M.	AstraZeneca UK Limited	16-1166	12/17/15	12/16/17	Cancer Incidence Among End-stage Renal Disease Patients Receiving Hemodialysis	$16,506
Recruitment	Brookhart	M.	Durham Veterans Affairs Medical Center	558-C75604	8/1/17	7/31/18	IPA FOR Ohnuma Fellowship	$22,107
Recruitment	Brown	Nicholas	NIH National Cancer Institute	1-K22-CA216327-01	9/1/17	8/31/20	Regulation of Mitotic Checkpoint Complex by Anaphase-Promoting Complex/Cyclosome	$192,747
Innovation Award	Burridge	Keith	NIH National Institute of General Medical Sciences	5-R01-GM029860-33-36	4/1/81	3/31/19	Cell Adhesion and the Regulationof Rho GTPases	$406,665
Innovation Award	Burridge	Keith	NIH National Institute of General Medical Sciences	5-R01-GM029860-33-36	4/1/81	3/31/19	Cell Adhesion and the Regulationof Rho GTPases	$45,185
Investment (GeriOnc)	Busby-Whitehead	Jan	NIH National Institute on Aging	5-T35-AG038047-08	5/1/10	5/31/20	UNC-CH Summer Research Training in Aging for Medical Students	$75,719
Investment (GeriOnc)	Busby-Whitehead	Jan	American Geriatrics Society		3/15/16	12/31/18	Geriatrics Workforce Enhancement Program (GWEP) Coordinating Center	$67,819
Recruitment	Calabrese	Mauro	NIH National Institute of General Medical Sciences	5-R01-GM121806-01-02	1/23/17	12/31/21	Mechanisms of gene silencing induced by long noncoding RNAs	$284,529
Recruitment	Calabrese	Mauro	NIH National Institute of General Medical Sciences	5-R01-GM121806-01-02	1/23/17	12/31/21	Mechanisms of gene silencing induced by long noncoding RNAs	$31,615
Innovation Award	Campbell	Sharon	NIH National Institute of General Medical Sciences	5-R01-GM114130-01-02	9/1/16	8/31/19	Structure and function of novel G protein conformations	$304,002
Innovation Award	Campbell	Sharon	NIH National Institute of General Medical Sciences	3-R01-GM114130-02S1	9/1/16	8/31/19	Structure and function of novel G protein conformations	$21,790
Investment	Carey	Lisa	Susan G. Komen Breast Cancer Foundation	SAC110006	10/20/10	5/31/18	Translating Biology Into Therapeutic Advances	$500,000
Investment	Carey	Lisa	Mayo Clinic		5/1/12	9/26/24	BO25126/BIG 4-11/TOC4939GB025126 A randomized multicenter, double-blind, placebo-controlled comparison of chemotherapy plus trastuzumab plus placebo versus chemotherapy plus trastuzumab plus pertuzumab as adjuvant therapy in patients with operable HER2-positive primary breast cancer	$10,596

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Investment	Carey	Lisa	Genentech, Inc.		7/3/13	6/30/19	Defining the HER2 positive (+) Breast Cancer Kinome Response to Trastuzumab, Pertuzumab, Combination Trastuzumab +Pertuzumab, or Combination Trastuzumab + Lapatinib	$82,692
Investment	Carey	Lisa	Johns Hopkins University		5/8/14	9/1/18	A Phase 2 Clinical Trial Assessing the Correlation of Early Changes in StandardizedUptake Value (SUV) on Positron Emission Tomography (PET) with Pathological CompleteResponse (pCR) to Pertuzumab and Trastuzumab in Patients with Primary OperableHER2-Positive Breast Cancer	$51,591
Investment (Protocol)	Carey	Lisa	NIH National Cancer Institute	5-U10-CA180838-05	5/7/14	2/28/19	NCTN Lead Academic Participating Sites Application	$623,046
Investment (Protocol)	Carey	Lisa	Alliance for Clinical Trials in Oncology Foundation		12/2/14	12/1/17	A Randomized, Placebo-Controlled, Double-Blind, Phase 3 Study Evaluating Safety and Efficacy of the Addition of Veliparib Plus Carboplatin Versus the Addition of Carboplatin to Standard Neoadjuvant Chemotherapy Versus Standard Neoadjuvant Chemotherapy in Subjects with Early Stage Triple Negative Breast Cancer (TNBC)	$8,065
Investment (Protocol)	Carey	Lisa	Clinipace Worldwide		8/9/16	12/31/19	A Phase 1/2 Open-Label Study to Evaluate the Safety, Tolerability, Pharmacokinetics, Pharmacodynamics and Efficacy of VT-464 in Patients with Advanced Breast Cancer	$92,235
Investment (Protocol)	Carey	Lisa	Dana Farber Cancer Institute	1231004	8/1/16	7/31/17	Dana-Farber/ Harvard SPORE in Breast Cancer	$7,255
Investment (Protocol)	Carey	Lisa	Breast Cancer Research Foundation	BCRF-17-023	10/1/17	9/30/18	The Assessment of Genomic Instability in Breast Cancer Patients	$250,000
Innovation Award	Caron	Kathleen	NIH National Institute of Child Health and Human Development	5-R01-HD060860-06-08	4/1/09	7/31/20	Adrenomedullin Signaling at the Maternal-Fetal Interface	$310,847
Innovation Award	Caron	Kathleen	Ferring Pharmaceuticals		12/1/15	11/30/17	Adrenomedullin in Implantation	$72,369
Innovation Award	Caron	Kathleen	American Heart Association	16IRG27260077	1/1/16	12/31/17	Role of Cardiac Lymphatics in Resolution of Myocardial Edema and Injury	$74,999
Innovation Award	Caron	Kathleen	NIH National Institute of Child Health and Human Development	5-F30-HD085652-02	7/1/16	6/30/20	FELLOW:B MATSON Compartmental Adrenomedullin Signaling in the Uterus during Implantation	$35,350
Recruitment	Chen	Ronald	NIH National Cancer Institute	5-R01-CA174453-01-04	9/21/12	7/31/18	PROMIS Validation in Prospective Population-based Prostate Cancer Research Study	$280,122
Recruitment	Chen	Ronald	Patient-Centered Outcomes Research Institute	CER-1310-06453	1/1/15	8/31/18	North Carolina Prostate Cancer Comparative Effectiveness & Survivorship Study (NCProCESS): A Stakeholder-Driven, Population-Based Prospective Cohort Study	$490,822
Recruitment	Chen	Ronald	Patient-Centered Outcomes Research Institute	CER-1310-06453	1/1/15	8/31/18	North Carolina Prostate Cancer Comparative Effectiveness & Survivorship Study (NCProCESS): A Stakeholder-Driven, Population-Based Prospective Cohort Study	$53,717
Recruitment	Chen	Ronald	Livestrong Foundation		3/1/15	12/31/19	True NTH USA Projects of Self-Management Portal Intervention and The Care Plan & Navigation Intervention	$184,159
Recruitment	Chen	Ronald	Alliance for Clinical Trials in Oncology	CER-1503-29220	2/1/16	6/30/19	Optimizing the Effectiveness of Routine Post-Treatment Surveillance in Prostate Cancer Survivors	$384,161
Recruitment	Chen	Ronald	NIH National Institute on Minority Health and Health Disparities	1-R21-MD012465-01	9/26/17	6/30/19	Disparities in care of prostate cancer survivors, a population-based cohort study	$235,541
Recruitment	Chen	Ronald	Capio Biosciences, Inc.		3/1/18	11/30/19	Investigation of Circulating Tumor Cells from Cancer Patients Undergoing Radiation	$233,708
Recruitment	Coombs	Catherine	Gilead Sciences, Inc.		5/7/14	5/6/28	A Phase 2, Open-Label Study Evaluating the Efficacy, Safety, Tolerability, and Pharmacodynamics of GS-9973 in Subjects with Relapsed or Refractory Hematologic Malignancies	$38,835
Recruitment	Coombs	Catherine	Incyte Corporation		1/31/17	11/30/18	INCB 57643-101 A Phase 1/2, Open-Label, Dose-Escalation/Dose-Expansion, Safety and Tolerability Study of INCB057643 in Subjects with Advanced Malignancies	$192,688
Investment (Training)	Cox	Adrienne	NIH National Cancer Institute	2-T32-CA071341-21	9/30/96	8/31/22	Cancer Cell Biology Training Program	$167,026
Investment (HTSF)	Crowley	James	NIH National Institute of Mental Health	5-R01-MH105500-01-04	1/20/15	11/30/19	Genetic & Environmental Predictors of Tourette Syndrome & OCD in Denmark	$543,780
Investment (HTSF)	Crowley	James	NIH National Institute of Mental Health	5-R01-MH105500-01-04	1/20/15	11/30/19	Genetic & Environmental Predictors of Tourette Syndrome & OCD in Denmark	$60,419
Investment (HTSF)	Crowley	James	NIH National Institute of Mental Health	5-R01-MH110427-01-02	8/1/16	4/30/21	OCD: Novel Comparative Genomic Approaches to Identify Disease and Treatment Mechanisms	$562,368
Retention	Damania	Blossom	NIH National Cancer Institute	5-R01-CA096500-15	7/1/02	7/31/18	Role of KSHV Viral Proteins in Signaling and Pathogenesis	$281,108

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Retention	Damania	Blossom	NIH National Cancer Institute	5-P01-CA019014-37-38	5/1/97	6/30/21	Herpesviral, Oncogenesis, Latency and Reactivation	$1,812,080
Retention	Damania	Blossom	NIH National Cancer Institute	3-P01-CA019014-38S1	5/1/97	6/30/21	Herpesviral, Oncogenesis, Latency and Reactivation	$63,936
Retention	Damania	Blossom	NIH National Institute of Dental and Craniofacial Research	5-R01-DE023946-04-05	9/17/13	7/31/19	Targeting the Epigenome of Gammaherpesviruses in Oral Disease	$378,255
Retention	Damania	Blossom	American Cancer Society	PF-18-046-01-MPC	7/1/18	6/30/21	FELLOW: S. HOPCRAFT Viral Co-Infection and Oncogenesis	$52,000
Investment (HTS)	Dangl	Jeffery	Gordon and Betty Moore Foundation	3030	9/1/11	1/1/18	Understanding Plant Immune System Function in Complex Microbial Environments	$166,667
Investment (HTS)	Dangl	Jeff	National Science Foundation	IOS-1257373	1/1/14	12/31/18	Mechanisms of NB-LRR disease resitance protein function	$275,000
Investment (HTS)	Dangl	Jeff	Two Blades Foundation	TB15 03	6/1/15	6/30/20	Multi-scale Genomic Interrogation of the Angiosperm Immune Receptor Repertoire	$134,674
Investment (HTS)	Dangl	Jeff	NIH National Institute of General Medical Sciences	2-R01-GM107444-05	9/1/13	8/31/21	The intersection of development and the innate immune system function in arabidopsis	$265,905
Innovation Award	Davis	Ian	Hyundai Hope on Wheels		10/1/15	9/30/18	Chromatin based strategies to target Ewing sarcoma	$83,333
Innovation Award	Davis	Ian	Vanderbilt University Medical Center	VUMC58792	9/30/15	8/31/18	Chromatin Maintenance in Cancer Progression	$298,669
Retention	Dayton	Paul	NIH National Cancer Institute	5-R01-CA189479-01-04	9/4/14	8/31/18	Academic-Industrial Partnership for Translation of Acoustic Angiography	$509,325
Retention	Dayton	Paul	NIH National Cancer Institute	5-F31-CA196216-03	8/1/15	7/31/18	FELLOW:ROJAS, J Novel Ultrasound Molecular Imaging for Assessment of Tumor Response to Therapy	$34,397
Retension	Dayton	Paul	North Carolina State University	570253	4/13/15	3/31/19	Ultrasound Molecular Imaging to Assess Therapeutic Response	$81,024
Retention	Dayton	Paul	NIH National Cancer Institute	5-U01-CA189281-01-03	7/17/15	6/30/18	Improving breast ultrasound specificity through SFRP2 targeted molecular imaging	$482,737
Retention	Dayton	Paul	Vanderbilt University	VUMC 60090	8/22/16	6/30/18	Fast volumetric treatment using multi-focus insonation and thermal amplification	$58,622
Retention	Dayton	Paul	NIH National Cancer Institute	5-F99-CA212227-02	9/21/16	12/31/17	FELLOW:E SHELTON Imaging Cancer Angiogenesis with Acoustic Angiography Ultrasound	$34,685
Retention	Dayton	Paul	North Carolina State University		9/30/16	7/31/18	Ultrasonic characterization of atherosclerotic plaque using multiple scattering	$3,462
Retention	Dayton	Paul	Anelleo, Inc.	18-1771 3-13400	6/1/17	5/31/18	3D Printed IVR Technology to Supplement Progesterone in Assisted Reproductive Technology (ART) for Infertility	$6,575
Retention	Dayton	Paul	SonoVol, Inc.	PA-16-302	3/3/17	2/28/19	SBIR: Development of a mobile and automated platform for multiplexed multi-modality imaging	$76,580
Retention	Dayton	Paul	NIH National Cancer Institute	1-F31-CA220970-01	9/1/17	8/31/19	FELLOW:SAMANTHA FIX Image-guided, sonoporation-enhanced immunotherapy for pancreatic cancer treatment	$35,005
Retention	Dayton	Paul	NIH National Cancer Institute	1-R01-CA220681-01	8/10/17	7/31/22	High Frame Rate 3-D Super Resolution Ultrasound Microvascular Imaging	$551,664
Retention	Dayton	Paul	NIH National Institute of Biomedical Imaging and Bioengineering	1-R01-EB025149-01	9/30/17	7/31/19	An academic industrial partnership for the development of high frame-rate transcranial super resolution ultrasound imaging	$409,196
Retention	Dees	Elizabeth	Novartis Pharmaceuticals Corporation		7/1/11	12/31/18	LCCC 1024 A four part, Phase I Dose-Escalation Study of the Cominations of Concurrent BKM120 and Capecitabine, or Concurrent BYL719 and Capecitabine, or Concurrent BKM120 and Capecitabine and Trastuzumab, or Concurrent BKM120 and Capecitabine and Lapatinib in Patients with Metastatic Breast Cancer	$14,688
Retention	Dees	Elizabeth	Merck Sharp and Dohme		7/24/13	7/31/22	A Phase Ib Multi-Cohort Study of MK-3475 in Subjects with Advanced Solid Tumors	$55,719
Retention	Dees	Elizabeth	Eli Lilly and Company		4/11/14	5/1/24	A Phase 1b Study of LY2835219 in Combination with Endocrine Therapies for Patients with Hormone Receptor Positive, HER2 Negative Metastatic Breast Cancer	$27,212
Retention	Dees	Elizabeth	Bayer HealthCare		7/3/14	7/2/17	A Phase 1b/2, multi-center, uncontrolled, open-label, dose escalation study of refametinib (BAY 86-9766) in combination with regorafenib (BAY 73-4506) in patients with advanced or metastatic cancer	$18,501
Retention	Dees	Elizabeth	Leidos Biomedical Research		10/28/14	10/27/17	NCI 9455/OSU 13117: A single arm, phase II study of single agent trametinib followed by trametinib in combination with GSK2141795 in patients with advanced triple negative breast cancer	$3,333
Retention	Dees	Elizabeth	Cerulean Pharma, Inc.		6/1/15	5/31/19	Phase 1/2a Dose-Escalation Study of CRLX301 in Patients with Advanced Solid Tumor Malignancies	$13,110
Retention	Dees	Claire	inVentiv Clinical LLC		7/25/16	7/24/18	Phase IB study to assess the safety, tolerability, and clinical activity of gedatolisib in combination with palbociclib and either letrozole or fulvestrant in women with metastatic or locally advanced/recurrent breast cancer (MBC)	$35,039

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Investment (Protocol)	Dees	Claire	Duke University	2035886	3/1/16	2/28/18	Duke-UNC-Wash U Partnership for Early Phase Clinical Trials in Cancer	$61,765
Investment (Proteomics)	Der	Channing	NIH National Cancer Institute	5-R01-CA175747-01-05	2/5/14	1/31/19	Mechanisms of PAK1 activation, signaling and tumor resistance	$218,870
Investment (Proteomics)	Der	Channing	Lustgarten Foundation		6/1/15	6/30/18	Identification and Validation of Raf Inhibitor-Based Combination KRAS-Targeted Therapies	$120,746
Investment (Proteomics)	Der	Channing	NIH National Cancer Institute	5-R01-CA042978-29-31	7/1/86	7/31/20	Biological Activity of Ras Oncogenes	$349,678
Investment (Proteomics)	Der	Channing	NIH National Cancer Institute	5-U01-CA199235-01-04	9/1/15	6/30/19	Identification of synthetic lethal interactors in pancreatic cancer	$316,801
Innovation Award	Der	Channing	NIH National Cancer Institute	5-P01-CA203657-01-03	6/1/16	5/31/21	Defining RAS isoform- and mutation-specific roles in oncogenesis	$1,539,964
Investment (Proteomics)	Der	Channing	NIH National Cancer Institute	5-T32-CA009156-42	7/1/80	7/31/21	Integrated Training in Cancer Model Systems	$789,141
Investment (Proteomics)	Der	Channing	Washington University in St. Louis School of Medicine	WU-18-76 2934358E	7/28/16	6/30/21	Combination Inhibition of ERK for Pancreatic Cancer Treatment	$184,974
Retention	Dittmer	Dirk	Brigham and Womens Hospital	110006	12/1/14	11/30/17	A5263/A5264 Biopsy Kit	$30,000
Retention	Dittmer	Dirk	NIH National Institute on Drug Abuse	5-R01-DA040394-01-03	7/1/15	6/30/20	HIV and substances of abuse influence exosomes and endothelial cell function	$370,472
Retention	Dittmer	Dirk	University of California at Los Angeles	1568 G TA857	9/1/15	8/31/18	AIDS Malignancy Laboratory Consortium (AMC)	$62,510
Retention	Dittmer	Dirk	University of California at Los Angeles	1568 G TA857 4-441340-RM-30508 LABY11	9/1/15	8/31/18	AIDS Malignancy Laboratory Consortium (AMC)	$213,543
Retention	Dittmer	Dirk	Baylor College of Medicine	7000000377	1/1/16	7/31/17	Bioassays by Vironomics Core	$26,876
Retention	Dittmer	Dirk	NIH National Institute of Dental and Craniofacial Research	5-R01-DE018304-09-10	5/15/07	8/31/19	ART Modulation of Viral Pathogenesis	$377,837
Retention	Dittmer	Dirk	NIH National Cancer Institute	5-R01-CA163217-06-07	9/1/11	7/31/21	Targeted Therapies for HIV-Associated Kaposi Sarcoma and Lymphoma	$342,759
Retention	Dittmer	Dirk	NIH National Cancer Institute	3-R01-CA163217-07S1	9/1/11	7/31/21	Targeted Therapies for HIV-Associated Kaposi Sarcoma and Lymphoma	$236,852
Retention	Dittmer	Dirk	Tulane University	TUL-HSC-555238-17/18	4/1/17	3/31/19	Exosome Origin in HIV Pathogenesis	$48,104
Retention	Dittmer	Dirk	Tulane University	TUL-HSC-555238-17/18	4/1/17	3/31/19	Exosome Origin in HIV Pathogenesis	$5,345
Retention	Dittmer	Dirk	Baylor College of Medicine	7000000573	8/1/17	7/31/19	(PQ5) Exploring the Biological Distinctions between HIV-Related and Endemic Pediatric Kaposi Sarcoma in a KSHV-Endemic Region of Africa	$24,418
Recruitment	Dittus	Christopher	Seattle Genetics, Inc		3/11/16	3/10/19	A randomized, open-label phase 2 study of denintuzumab mafodotin (SGN-CD19A) plus rituximab, ifosfamide, carboplatin, and etoposide (19A+RICE) chemotherapy vs. RICE in the treatment of patients with relapsed or refractory diffuse large B-cell lymphoma (DLBCL) who are candidates for autologous stem cell transplant	$10,105
Recruitment	Dittus	Christopher	University of California at Los Angeles	1568 G UA023	9/1/16	8/31/18	Clinical trials unit (CTU) for the AIDS Malignancy Clinical Trials Consortium (AMC)	$75,000
Recruitment	Dittus	Christopher	Millennium Pharmaceuticals, Inc.	218558	8/28/17	8/6/22	A Phase 1b Dose Escalation Study to Determine the Recommended Phase 2 Dose of TAK-659 in Combination With Bendamustine (± Rituximan), Gemcitabine, Lenalidomide, or Ibritinib for the Treatment of Patients With Advanced Non-Hodgkin's Lymphoma After At Least 1 Prior Line of Therapy	$21,719
Retention	Dittus	Christopher	Seattle Genetics, Inc		10/18/17	11/1/22	Brentuximab Vedotin with Cyclophosphamide, Doxorubicin, Etoposide, and Prednisone (BV-CHEP) for the treatment of Adult T-Cell Leukemia/Lymphoma: A Phase II Trial of the Rare Lymphoma Working Group	$27,320
Recruitment	Doerschuk	Claire	NIH National Heart, Lung, and Blood Institute	5-K12-HL119998-04-05	9/1/13	5/31/19	Application of Omics in Lung Disease	$349,342
Recruitment	Doerschuk	Claire	NIH National Heart, Lung, and Blood Institute	5-T32-HL007106-42	7/1/75	4/30/22	Multidisciplinary research training in pulmonary diseases	$444,817
Recruitment	Dotti	Gianpietro	Baylor College of Medicine	PO number 7000000472	3/1/15	9/30/18	Targeting CD138 in Myeloma	$244,159
Recruitment	Dotti	Gianpietro	NIH National Cancer Institute	5-R01-CA193140-01-03	2/1/16	1/31/21	Targeting the Ig-Light Chains with CAR-T Cells in Lymphoid Tumors	$511,190
Recruitment	Dotti	Gianpietro	Bluebird bio, Inc.		5/16/16	5/15/18	Sponsored Research Bluebird Bio - UNC	$165,301
Recruitment	Dotti	Gianpietro	Houston Methodist Research Institute	11030002-143	5/1/16	4/30/18	Bispecific Cytotoxic Lymphocytes in HIV-related Lymphoma	$7,006

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Recruitment	Dotti	Gianpietro	DOD DA Army Medical Research Acquisition Activity	W81XWH-16-1-0332	8/15/16	8/14/17	Exploiting Hypoxia for T-Cell Immunotherapy in Neuroblastoma	$114,000
Recruitment	Dotti	Gianpietro	DOD DA Army Medical Research Acquisition Activity	W81XWH-16-1-0501	9/1/16	8/31/19	Strategies to Counteract Resistance Mechanisms in CAR + T Cell-based Immunotherapy for Triple Negative Breast Cancer	$202,481
Recruitment	Dotti	Gianpietro	Triangle Community Foundation		6/1/17	6/1/18	CD30 CAR T cells as a Novel Immunotherapy for Testicular Germ Cell Tumors	$10,000
Recruitment	Dotti	Gianpietro	University of Texas MD Anderson Cancer Center	3000931318/ 00003608	10/1/16	9/30/17	Cord Blood Derived Natural Killer (NK) Cells as a Novel Therapeutic Strategy for Leukemia	$22,200
Recruitment	Dotti	Gianpietro	Baylor College of Medicine		4/1/17	3/31/20	BCM-UNC SIRA Project 5: Development of Alpha-Beta TCR survivin-NKTs	$712,317
Recruitment	Dotti	Gianpietro	Baylor College of Medicine		4/1/17	3/31/20	BCM-UNC SIRA Project 4: Development of CSPG4.CAR-NKTs Using the scFv 763.74 Specific for CSPG4	$627,394
Recruitment	Dotti	Gianpietro	Bellicum Pharmaceuticals, Inc.		6/2/17	6/2/20	Bellicum CAR.CD19 Manufacturing Support for LCCC 1541	$190,690
Recruitment	Dotti	Gianpietro	Alex's Lemonade Stand Foundation		2/1/18	1/31/20	Targeting Chondroitin Sulphate Proteoglycan 4 (CSPG4) in Glioblastoma	$125,000
Recruitment	Dotti	Gianpietro	Multiple Myeloma Research Foundation		3/1/18	2/28/19	New Generation CD138 Chimeric Antigen Receptor Targeting Multiple Myeloma	$75,000
Recruitment	Dotti	Gianpietro	Marsha Rivkin Center for Ovarian Cancer Research		4/1/18	3/31/19	Targeting B7-H3 in Ovarian Cancer	$75,000
Recruitment	Dotti	Gianpietro	Conquer Cancer Foundation		7/1/18	6/30/19	FELLOWSHIP: Preclinical Evaluation of B7H3-Specific Chimeric Antigen Receptor T-cells for the Treatment of Acute Myeloid Leukemia	$50,000
Recruitment	Dowen	Jill	Sidney Kimmel Foundation	SKF-16-095	7/1/16	11/30/18	Role of long-range chromosomal interactions in cancer	$100,000
Recruitment	Dowen	Jill	NIH National Institute of General Medical Sciences	1-R35-GM124764-01	9/1/17	7/31/22	Regulation of chromosome structure and gene expression by architectural proteins	$370,824
Investment (CBCS)	Earp	Shelton	Susan G. Komen Breast Cancer Foundation	OGUNC1202	5/1/12	4/30/21	Carolina Breast Cancer Study: PHASE III	$241,667
Investment	Earp	Shelton	Medical University of South Carolina	MUSC15-085	9/1/15	3/31/18	Administrative Supplement for Strengthening Research, Training, and Outreach Capacity of the Geographic Management of Cancer Health Disparities Program (GMaP)	$110,119
Investment	Earp	Shelton	NIH National Cancer Institute	5-P30-CA016086-40-42	6/1/97	11/30/20	Cancer Center Core Support Grant - Prime Award	$7,252,540
Investment (CBCS)	Earp	Shelton	NIH National Cancer Institute	5-U54-CA156733-06-08	9/28/10	8/31/20	NCCU-LCCC Partnership in Cancer Research (2 of 2)	$919,471
Retention	Elston	Timothy	NIH National Institute of General Medical Sciences	5-R01-GM079271-09-12	9/30/06	8/31/19	Spatiotemporal modeling of signal transduction in yeast	$375,290
Retention	Elston	Timothy	NIH National Institute of General Medical Sciences	5-R01-GM114136-01-04	5/1/15	4/30/19	Mechanisms of noise regulation in cell fate transitions	$523,852
Retention	Elston	Timothy	NIH National Institute of General Medical Sciences	5-T32-GM067553-13	7/1/03	6/30/20	Predoctoral Training Program in Bioinformatics and Computational Biology	$2,022
Innovation Award	Elston	Timothy	DOD DA Army Research Office	W911NF-15-1-0631	9/28/15	9/27/18	Spatio-temporal control of Rho family signaling networks in motility	$130,000
Recruitment	Emanuele	Michael	NIH National Institute of General Medical Sciences	5-R01-GM120309-01-02	9/1/16	8/31/21	SCF Ubiquitin Ligases in Cell Cycle Control and Chromosome Stability	$301,840
Recruitment	Engel	Lawrence	Henry M Jackson Foundation	306048-1.00-63850	3/1/12	11/30/17	Effects of the Deepwater Horizon Disaster:the Coast Guard Responder Cohort	$7,968
Investment (HTSF)	Farrell	Marty	NIH National Institute of Mental Health	5-K01-MH108894-01-02	8/8/16	7/31/20	MARTILIAS FARRELL The Genomics of Highly Treatment Resistant Schizophrenia	$141,831
Retention	Foster	Matthew	ICON Clinical Research		6/26/13	7/2/17	An Open-label, Randomized Phase 3 Study of Inotuzumab Ozogamicin Compared to a Defined Investigator's Choice in Adult Patients with Relapsed or Refractory CD22-Positive Acute Lymphoblastic Leukemia (ALL)	$1,609
Retention	Foster	Matthew	MacroGenics, Inc.		5/18/16	5/17/18	A Phase 1, First-in-Human, Dose Escalation Study of MGD006, a CD123 x CD3 Dual Affinity Re-Targeting (DART) Bi-Specific Antibody-Based Molecule, in Patients with Relapsed or Refractory Acute Myeloid Leukemia or Intermediate-2/High Risk Myelodysplastic Syndrome	$63,666
Recruitment	Foster	Matthew	Seattle Genetics, Inc		11/16/16	11/15/19	A phase 1/2 study of vadastuximab talirine (SGN-CD33A) in combination with azacitidine in patients with previously untreated international prognostic scoring system (IPSS) intermediate -2 or high-risk myelodysplastic syndrome (MDS)	$25,170

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Recruitment	Franco	Hector	NIH National Cancer Institute	5-R00-CA204628-02-03	2/17/17	1/31/20	Mechanisms of FoxA1 Latent Enhancer Formation in Response to Proinflammatory Signaling in Hormone Dependent Cancers	$248,997
Recruitment	Frerichs	Leah	Prevent Cancer Foundation	17-0444	1/16/17	1/15/19	A Randomized Trial of a Culturally-Adadpted Colorecial Cancer Screening Decision Aid Designed for American Indians	$50,000
Recruitment	Frerichs	Leah	NIH National Heart, Lung, and Blood Institute	1-K01-HL138159-01	8/1/17	7/31/22	Identifying and disentangling social and physical environmental effects on physical activity in diverse adolescent and young adult populations	$159,386
Retention	Fry	Rebecca	NIH National Institute of Environmental Health Sciences	3-P42-ES005948-22S4	4/1/97	3/31/18	Elucidating Risks: From Exposure & Mechanism to Outcome	$285,377
Retention	Fry	Rebecca	Duke University	203-6060	3/1/17	2/28/19	Protecting Neurodevelopment In Latino Migrant Children by Reduced Exposure to Organophosphate Pesticides	$28,707
Retention	Fry	Rebecca	Johns Hopkins University	2003583375	3/1/17	11/30/21	Arsenic and immune response to influenza vaccination in pregnant women and	$2,685
Retention	Fry	Rebecca	NIH National Institute of Environmental Health Sciences	2-T32-ES007018-41	7/1/77	6/30/19	Biostatistics for Research in Environmental Health	$1,406,501
Retention	Fry	Rebecca	NIH National Institute of Environmental Health Sciences	3-T32-ES007018-41S1	7/1/77	6/30/19	Biostatistics for Research in Environmental Health	$11,362
Recruitment	Frye	Stephen	NIH National Institute of General Medical Sciences	5-R01-GM100919-05-06	5/1/12	7/31/20	Discovery of Chemical Probes for Chromatin Readers	$416,687
Recruitment	Frye	Stephen	NIH National Cancer Institute	1-R21-CA216673-01A1	12/18/17	11/30/19	Modulating the DNA methylation program through UHRF1 antagonism	$223,654
Recruitment	Frye	Stephen	NIH National Cancer Institute	1-R01-CA218392-01A1	4/1/18	3/31/21	Discovery of in vivo chemical probes fro polycomb cbx domains	$456,482
Retention	Gallagher	Kristalyn	Johns Hopkins University	PO#2003058245	6/22/16	6/21/21	The Incidence of Adjacent Synchronous Ipsilateral Infiltrating Carcinoma and/or DCIS in Patients Diagnosed with Intraductal Papilloma without Atypia or Flat Epithelial Atypia by Core Needle Biopsy	$9,427
Retention	Gallagher	Kristalyn	University of Pittsburgh Medical Center		3/1/16	9/23/18	A Trial of Endocrine Response in Women with Invasive Lobular Breast Cancer	$8,616
Recruitment	Gershon	Timothy	NIH National Institute of Neurological Disorders and Stroke	5-R01-NS088219-01-03	2/15/15	1/31/20	Glycolytic regulation of cerebellar development and medulloblastoma tumorigenesis	$32,784
Recruitment	Gershon	Timothy	NIH National Institute of Neurological Disorders and Stroke	5-R01-NS088219-01-04	2/15/15	1/31/20	Glycolytic regulation of cerebellar development and medulloblastoma tumorigenesis	$295,053
Recruitment	Gershon	Timothy	NIH National Institute of Neurological Disorders and Stroke	5-R01-NS088219-01-04	2/15/15	1/31/20	Glycolytic regulation of cerebellar development and medulloblastoma tumorigenesis	$32,784
Recruitment	Gershon	Timothy	NIH National Institute of Neurological Disorders and Stroke	1-F31-NS100489-01A1	8/1/17	7/31/19	FELLOW:J OCASIO ADORNO Proliferation of cerebellar neural progenitors and Shh-driven medulloblastoma requires suppression of WNT by GSK-3	$34,644
Recruitment	Gershon	Timothy	NIH National Institute of Neurological Disorders and Stroke	1-F31-NS101883-01A1	12/1/17	9/30/19	FELLOW:K VELETA Cooperation of BCL-xL and SHH in regulating cell survival during cerebellar neurogenesis and in medulloblastoma	$34,774
Recruitment	Gilkey	Melissa	NIH National Cancer Institute	7-K22-CA186979-04	1/29/18	8/31/18	Improving Healthcare Providers' Communication about HPV Vaccine	$35,764
Recruitment	Gilkey	Melissa	Harvard Pilgrim Health Care	IHS-1602-34331	11/17/17	2/28/19	Comparing adults and children with asthma in high-deductible health plans with and without preventive drug lists	$79,660
Investment (HTS)	Giusti	Paola	NIH National Institute of Mental Health	5-K01-MH109772-01-03	4/1/16	3/31/20	Interpreting GWAS associations in schizophrenia using genome-wide chromatin mapping	$155,168
Innovation Award	Goldstein	Bob	National Institutes of Health	5-F32-GM119348-02	8/2/16	7/31/18	FELLOW:M SLABODNICK Investigating the mechanisms that regulate apical constriction during C. elegans gastrulation	$57,066
Innovation Award	Goldstein	Bob	NIH National Institute of General Medical Sciences	5-R01-GM083071-09-10	6/1/08	7/31/20	C. elegans Gastrulation: a Model for Understanding Apical Constriction Mechanisms	$334,215
Retention	Gopal	Satish	NIH National Cancer Institute	5-U54-CA190152-01-04	9/1/14	8/31/19	'Addressing Herpesvirus-Associated Cancers Through The UNC-Malawi Cancer Consortium	$749,897
Retention	Gopal	Satish	NIH National Cancer Institute	5-P20-CA210285-02	9/1/16	8/31/18	Planning for a National Non-Communicable Disease Center of Research Excellence in Malawi	$251,816
Investment (HTS)	Gordon-Larsen	Penny	NIH National Institute of Child Health and Human Development	5-R01-HD057194-06-09	1/1/08	6/30/19	Exome Variants Underlying Weight Gain from Adolescence to Adulthood	$575,293
Recruitment	Grilley-Olson	Juneko	Peregrine Pharmaceuticals, Inc.		2/18/11	4/30/18	LCCC 1030 A phase Ib study of bavituximab plus carboplatin and pemetrexed in Chemotherapy-Naive Stage IV non-squamous non-small cell lung cancer	$24,593

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Recruitment	Grilley-Olson	Juneko	Novartis Pharmaceuticals		9/1/13	10/31/18	BKM120H2201 - Phase II multicenter randomized, double blind, placebo controlled study assessing the efficacy of buparlisib (BKM120) plus paclitaxel vs. placebo plus paclitaxel in patients with platinum pre-treated recurrent or metastatic head and neck squamous cell carcinoma	$12,226
Recruitment	Grilley-Olson	Juneko	Novartis Pharmaceuticals		1/7/14	12/31/17	Modular phase II study to link targeted therapy to patients with pathway activated tumors: Module 1 - BKM120 for patients with PI3K-activated tumors	$4,580
Recruitment	Grilley-Olson	Juneko	Pharmaceutical Product Development, Inc.		5/13/14	5/12/19	NC-6004-0043A: A Phase 1b/2 Dose Escalation and Expansion Trial of NC-6004 (Nanoparticle Cisplatin) plus Gemcitabine in Patients with Advanced Solid Tumors or Non-Small Cell Lung Cancer	$143,221
Recruitment	Grilley-Olson	Juneko	Novartis		10/28/13	12/31/17	Modular phase II study to link targeted therapy to patients with pathway activated tumors: Module 3 - MEK162 for patients with RAS/RAF/MEK activated tumors	$17,562
Recruitment	Grilley-Olson	Juneko	Novartis Pharmaceuticals		9/4/14	12/31/17	Modular phase II study to link targeted therapy to patients with pathway activated tumors: Module 8 - LEE011 for patients with CDK4/6 pathway activated tumors	$18,960
Recruitment	Grilley-Olson	Juneko	Genentech, Inc.		2/23/15	3/31/20	My Pathway: An Open-Label Phase IIA Study Evaluating Trastuzumab/Pertuzumab, Erlotinib, Vemurafenib, and Vismodegib in Patients who have Advanced Solid Tumors with Mutations or Gene Expression Abnormalities Predictive of Response to one of these	$18,127
Recruitment	Grilley-Olson	Juneko	Seattle Genetics, Inc		4/9/15	4/8/21	SGNS40-001 - A phase 1, open-label, dose-escalation study of SEA-CD40 in adult patients with advanced malignancies	$176,492
Recruitment	Grilley-Olson	Juneko	MedImmune, Inc.		9/29/15	9/28/18	A Phase I, First-Time-in-Human Study of MEDI9197, a TLR 7/8 Agonist, Administered Intratumorally in Subjects with a Solid Tumor Cancer	$55,779
Recruitment	Grilley-Olson	Juneko	inVentiv Clinical LLC		6/28/16	6/27/25	A phase I, open-label, dose escalation and expansion study of PF-06801591 in patients with locally advanced or metastatic melanoma, squamous cell head and neck cancer, ovarian cancer, sarcoma, or relapsed or refractory classic Hodgkin lymphoma.	$205,959
Recruitment	Grilley-Olson	Juneko	Medpace, Inc.		11/16/16	10/31/18	A Phase II Basket Study of the Oral TRK Inhibitor LOXO-101 in Subjects with NTRK Fusion-Positive Tumors	$3,935
Recruitment	Grilley-Olson	Juneko	NanoCarrier Co., Ltd.		1/3/17	1/17/20	Phase I/II Clinical Trial of NC-6004 in Combination with 5-FU and Cetuximab as First-line Treatment in Patients with Recurrent or Metastatic Squamous Cell Carcinoma of The Head and Neck	$20,886
Recruitment	Grilley-Olson	Juneko	Washington University in Saint Louis		12/9/16	12/6/18	201404139 Phase I/II Trial of the Addition of PD 0332991 to Cetuximab in Patients with Incurable SCCHN	$3,600
Recruitment	Grover	Natalie	Acerta Pharma BV		11/7/17	12/14/22	A Phase 3, Randomized, Double-blind, Placebo-controlled, Multicenter Study of Bendamustine and Rituximab (BR) Alone Versus in Combination with Acalabrutinib (ACP-196) in Subjects with Previously Untreated Mantle Cell Lymphoma	$26,719
Recruitment	Gupta	Gaorav	NIH National Cancer Institute	5-F32-CA206345-03	6/1/16	5/31/19	FELLOW: K FAGAN-SOLIS Identifying Drivers of Genomic Instability in Triple-Negative Breast Cancer	$65,158
Recruitment	Gupta	Gaorav	Susan G Komen for the Cure	CCR16377075	7/1/16	6/30/19	Identifying Drivers of Genomic Instability in Triple Negative Breast Cancer	$150,000
Recruitment	Gupta	Gaorav	Johns Hopkins University		3/30/17	6/1/22	TBCRC 040: Plasma Tumor DNA and Pathologic Complete Response in Early-Stage, High-Risk Breast Cancer	$9,060
Recruitment	Gupta	Gaorav	Washington State University	130544-G003764	7/1/17	5/31/19	Mechanisms of Genome Instability Induced by APOBEC Cytidine Deaminases and its Impacts During Cancer Development	$34,420
Recruitment	Gupta	Gaorav	DOD DA Army Medical Research Acquisition Activity	W81XWH-18-1-0047	3/15/18	3/14/21	Elucidating Polymerase Theta Functions and Genetic Determinants of Synthetic Lethality in Breast Cancer	$249,806
Recruitment	Gupton	Stephanie	NIH National Institute of General Medical Sciences	5-R01-GM108970-01-04	1/1/14	12/31/18	TRIM9 coordinates membrane trafficking and cytoskeletal dynamics	$31,607
Recruitment	Gupton	Stephanie	NIH National Institute of General Medical Sciences	3-R01-GM108970-04S1	1/1/14	12/31/18	TRIM9 coordinates membrane trafficking and cytoskeletal dynamics	$23,782
Recruitment	Gupton	Stephanie	NIH National Institute of General Medical Sciences	5-R01-GM108970-01-05	1/1/14	12/31/18	TRIM9 coordinates membrane trafficking and cytoskeletal dynamics	$258,526
Recruitment	Gupton	Stephanie	NIH National Institute of General Medical Sciences	5-R01-GM108970-01-05	1/1/14	12/31/18	TRIM9 coordinates membrane trafficking and cytoskeletal dynamics	$28,726
Recruitment	Gupton	Stephanie	NIH National Institute of Mental Health	5-R21-MH109653-01-02	5/15/16	4/30/19	Identification of ubiquitnated neural substrates of TRIM9 and TRIM67	$19,000
Recruitment	Gupton	Stephanie	NIH National Institute of Neurological Disorders and Stroke	5-F31-NS096823-03	3/15/16	3/14/19	FELLOW:N BOYER TRIM67 regulates growth cone filopodia during netrin-dependent axon guidance	$34,883

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Recruitment	Gupton	Stephanie	NIH National Institute of Neurological Disorders and Stroke	1-F31-NS103586-01	6/15/17	6/14/20	FELLOW:F URBINA TRIM67 as a novel regulator of exocytosis in developing neurons	$34,685
Retention	Hahn	Klaus	NIH National Cancer Institute	5-F31-CA192739-03	7/1/15	6/30/18	FELLOW:STONE, O Cancer metastasis studied via optically controlled cofilin and LIM kinase analogs.	$34,403
Retention	Hahn	Klaus	University of Wisconsin at Madison	647K662	12/8/15	11/30/18	Mechanisms of cell migration on aligned matrices	$93,188
Retention	Hahn	Klaus	American Cancer Society	129486-PF-16-118-01-CSM	7/1/16	7/1/18	Microtubule-Mediated RhoG Dynamics in Migration of Cancer Cells	$57,500
Retention	Hahn	Klaus	NIH National Institute of General Medical Sciences	5-F32-GM120958-02	8/1/16	7/31/19	FELLOW:N PINKIN Improving Environment Sensitive Dyes for Live Cell Single Molecule Imaging	$57,066
Retention	Hahn	Klaus	NIH National Institute of General Medical Sciences	5-P01-GM103723-04-05	9/30/13	7/31/18	Spatio-temporal dynamics of GEF-GTPase networks	$1,101,950
Retention	Hahn	Klaus	NIH National Institute of General Medical Sciences	5-R35-GM122596-01-02	4/1/17	3/31/22	Dissecting signaling in vivo via precise control and visualization of protein activity	$559,333
Retention	Hahn	Klaus	NIH National Institute of General Medical Sciences	5-R35-GM122596-01-02	4/1/17	3/31/22	Dissecting signaling in vivo via precise control and visualization of protein activity	$62,149
Retention	Hahn	Klaus	National Science Foundation	CMMI-1762468	5/15/18	4/30/21	Collaborative Research: Mechanobiology of Fiber Geometry-RhoGTPase Crosstalk at the Leading Edge of Cells Crawling on Fibers	$57,348
Investment	Hammond	Scott	NIH National Cancer Institute	5-R21-CA196379-01-03	9/1/15	8/31/19	An optimized design for single copy short hairpin RNAi	$198,360
Recruitment	Han	Zongchao	NIH National Eye Institute	5-R01-EY026564-01-03	4/1/16	3/31/21	Targeting Retinitis Pigmentosa Using Nanoparticle-Mediated Delivery of Genomic DNA	$336,736
Recruitment	Han	Zongchao	NIH National Eye Institute	5-R01-EY026564-01-03	4/1/16	3/31/21	Targeting Retinitis Pigmentosa Using Nanoparticle-Mediated Delivery of Genomic DNA	$37,416
Innovation Award	Hanson	Laura	Duke University	2035898	7/1/17	6/30/18	Refinement and Expansion of the Palliative Care Research Cooperative Group (PCRC)	$96,242
Recruitment	Hathaway	Nate	NIH National Institute of General Medical Sciences	1-R01-GM118653-01A1	7/1/17	6/30/22	Mechanism of HP1-mediated heterochromatin assembly and durability in live cells	$300,310
Recruitment	He	Shenghui	NIH National Institute on Aging	5-R01-AG024379-11-13	8/15/04	3/31/20	The Role of p16INK4a in Mammalian Aging	$301,644
Recruitment	He	Shenghui	NIH National Institute on Aging	5-R01-AG024379-11-13	8/15/04	3/31/20	The Role of p16INK4a in Mammalian Aging	$33,516
Investment (CC)	Heise	Mark	University of Alabama at Birmingham	000502793-008	3/1/14	2/28/19	Antiviral Drug Discovery and Development Center	$228,000
Investment (CC)	Heise	Mark	NIH National Institute of Allergy and Infectious Diseases	5-T32-AI007419-25	9/1/93	8/31/18	Molecular Biology of Viral Diseases Predoctoral Training Grant	$149,973
Investment (CC)	Heise	Mark	NIH National Institute of Allergy and Infectious Diseases	2-U19-AI100625-06	8/5/12	8/31/22	Systems Immunogenetics of Biodefense and Emerging Pathogens in the Collaborative Cross	$2,437,629
Investment (CC)	Heise	Mark	NIH National Institute of Allergy and Infectious Diseases	1-R21-AI137887-01	2/5/18	1/31/20	Molecular Characterization of Functional RNA Structures in the ZIKV genome	$231,668
Investment (HTS)	Henderson	Gail	NIH National Human Genome Research Institute	5-P50-HG004488-09-10	9/27/07	5/31/19	Center for Genomics and Society	$1,189,389
Innovation Award	Henderson	Louise	University of California at Davis	201600303-08	9/1/16	8/31/18	Comparative Effectiveness of Breast Cancer Screening and Diagnostic Evaluation by Extent of Breast Density	$244,976
Investment (HTS)	Henderson	Gail	NIH National Institute of Allergy and Infectious Diseases	5-R01-AI127024-01-03	6/15/16	5/31/20	Integrating Decision Making Studies into HIV Cure Trials: A real-time longitudinal assessment	$533,093
Investment	Henderson	Louise	NIH National Cancer Institute	5-R21-CA209442-01-02	8/16/16	7/31/19	Evaluating the effect of breast density legislation on supplemental screening	$142,120
Investment	Henderson	Louise	University of California at San Francisco	10010sc	1/1/17	11/30/17	Comorbidity and screening outcomes among older women undergoing mammography	$32,706
Investment	Henderson	Louise	Harvard Pilgrim Health Care	AH000632	3/15/17	2/28/21	Advanced Breast Imaging: Trends and Outcomes Associated with Recent Breast Density Reporting Legislation	$86,208
Investment	Henderson	Louise	University of California at Davis	201603696-08	7/1/17	5/31/22	Risk-based Breast Cancer Screening and Surveillance in Community Practice	$298,686
Investment	Henderson	Louise	NIH National Cancer Institute	1-R01-CA212014-01A1	9/20/17	8/31/22	Evaluating Lung Cancer Screening Patterns and Outcomes through a North Carolina Registry	$628,514
Investment	Henderson	Louise	Georgetown University	411518_GR412884-UNC	1/1/18	12/31/18	Comorbidity and screening outcomes among older women undergoing mammography	$31,238
Recruitment	Hingtgen	Shawn	NIH National Institute of Neurological Disorders and Stroke	5-R01-NS097507-01-03	6/1/16	5/31/21	Nanofiber matrices to improve neural stem cell-mediated cancer therapy	$325,684
Recruitment	Hingtgen	Shawn	North Carolina State University	2017-1369	2/1/17	1/31/20	3D Printing of Fibrous Tissue Engineered Medical Products: A New Paradigm for Tissue Biofabrication and Therapeutics	$55,000

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Recruitment	Hingtgen	Shawn	University of Birmingham United Kingdom	170295	6/19/17	12/18/17	The Development of Irinotecan-loaded PLGA Millirods for the Treatment of Glioblastoma	$12,648
Recruitment	Hingtgen	Shawn	Falcon Therapeutics, Inc.		6/15/17	6/14/18	STTR: Personalized Neural Stem Cell Therapy for Cancer	$106,417
Recruitment	Hingtgen	Shawn	NIH National Institute of Neurological Disorders and Stroke	1-R01-NS099368-01A1	9/26/17	6/30/22	Engineering stem cell therapies to understand and overcome glioblastoma adaption	$332,192
Recruitment	Hoadley	Katherine	Susan G Komen for the Cure	CCR16376756	7/7/16	7/6/19	Therapeutic Relevance of Genetic Subtypes Within Basal-Like Breast Cancer	$150,000
Investment (HTS)	Hoadley	Katherine	NIH National Cancer Institute	5-U24-CA210988-01-02	9/1/16	8/31/21	RNA sequencing analysis of Cancer	$416,184
Investment (Nanotech)	Huang	Leaf	NIH National Cancer Institute	5-U54-CA198999-01-03	8/1/15	7/31/20	Nano Approaches to Modulate Host Cell Response for Cancer Therapy	$2,090,241
Investment (Nanotech)	Huang	Leaf	NIH National Cancer Institute	5-U54-CA198999-01-03	8/1/15	7/31/20	Nano Approaches to Modulate Host Cell Response for Cancer Therapy	$221,398
Investment (Nanotech)	Huang	Leaf	NIH National Cancer Institute	5-U54-CA198999-03	8/1/15	7/31/20	Nano Approaches to Modulate Host Cell Response for Cancer Therapy	$324,985
Investment (Nanotech)	Huang	Leaf	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	4-R01-DK100664-04	9/10/13	6/30/18	Hepatic Non-viral Gene Therapy	$330,600
Investment (Nanotech)	Huang	Leaf	ZY Therapeutics, Inc.		3/1/17	8/31/18	The Development of Novel Taxane Drug Formulation	$60,000
Investment (Nanotech)	Huang	Leaf	ZY Therapeutics, Inc.		3/1/17	8/31/18	The Development of Novel Taxane Drug Formulation	$10,000
Recruitment	Hursting	Stephen	University of Texas	UTA14-001433	6/1/14	5/31/18	Overcoming pancreatic tumor resistance to gemcitabine	$17,492
Recruitment	Hursting	Stephen	NIH National Cancer Institute	5-R35-CA197627-01-03	8/1/15	7/31/22	Breaking the Obesity-Cancer Link: New Targets and Strategies	$762,608
Recruitment	Hursting	Stephen	Breast Cancer Research Foundation	BCRF-17-072	10/1/17	9/30/18	Bariatric Surgery versus Dietary Interventions for Preventing Obesity-Related Breast Cancer: Roles of Epigenetic and Metabolic Reprogramming	$250,000
Retention	Ibrahim	Joseph	Amgen, Inc.	PO#7300001228	7/31/08	12/31/18	Supported Research Agreement	$276,000
Retention	Ibrahim	Joseph	Merck and Co., Inc.		7/1/09	3/31/20	Methods for Interim Analysis with Incomplete Adjudication of Events	$260,000
Investment (Bios/HTS)	Ibrahim	Joseph	NIH National Institute of General Medical Sciences	5-R01-GM070335-17-18	3/1/96	6/30/20	Bayesian Approaches to Model Selection for Survival Data	$383,181
Retention	Ibrahim	Joseph	University of Texas MD Anderson Cancer Center	3001008468	5/1/16	6/30/19	Statistical Analysis of Biomedical Imaging Data in Curved Space	$210,312
Investment (Bios/HTS)	Ibrahim	Joseph	NIH National Cancer Institute	5-T32-CA106209-12	5/1/04	7/31/21	Biostatistics for Research in Genomics and Cancer	$134,012
Recruitment	Innocenti	Federico	Alliance for Clinical Trials in Oncology Foundation		6/1/15	5/31/22	ACTO_Appendix IIB to CALGB/SWOG C80405	$214,136
Recruitment	Jamieson	Katarzyna	Astellas Pharma Global Development, Inc.		9/30/13	9/29/22	A Randomized, Double-Blind, Placebo-Controlled, Phase III Trial to Evaluate the Protective Efficacy and Safety of a Therapeutic Vaccine, ASP0113, in Cytomegalovirus (CMV)-Seropositive Recipients Undergoing Allogenic, Hematopoietic Cell Transplant	$16,692
Recruitment	Jamieson	Katarzyna	Daiichi Sankyo, Inc		10/9/14	12/31/19	A Phase 3 Open-Label Randomized Study of Quizartinib (AC220) Monotherapy Versus Salvage Chemotherapy in Subjects with FLT3-ITD Positive Acute Myeloid Leukemia (AML) Refractory To or Relapsed After First-line Treatment With or Without Hematopoietic Stem Cell Transplant (HSCT) Consolidation	$35,292
Investment (Proteomics)	Johnson	Gary	Childrens Hospital of Philadelphia	961188-RSUB	7/1/14	5/31/18	Targeting Oncogenic ALK Signaling in Neuroblastoma	$25,372
Investment (Proteomics)	Johnson	Gary	University Health Network	410003856	12/1/15	11/30/17	Selective Lethality by Targeting Gene Essentiality in Resistant Ovarian Cancer through Dynamic Monitoring of the Active Kinome	$35,416
Investment (Proteomics)	Johnson	Gary	NIH National Institute of General Medical Sciences	5-F31-GM116534-03	8/1/15	7/31/18	FELLOW:MILLER, S Suppression of Kinome Adaptation to Trametinib by BET Bromodomain Inhibitors	$34,912
Investment (Proteomics)	Johnson	Gary	Susan G Komen for the Cure	PDF15331014	10/8/15	10/7/18	Hippo pathway activation in chemo-sensitive and -insensitive breast cancer	$60,000
Investment (Proteomics)	Johnson	Gary	Indiana University at Indianapolis	IN4689857UNC/ 2058940	9/1/15	8/31/18	Developmental and Hyperactive Ras Tumor SPORE (Omics Core)	$279,000

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Investment (Proteomics)	Johnson	Gary	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	1-U24-DK116204-01	9/1/17	8/31/23	Illuminating Function of the Understudied Druggable Kinome	$2,308,193
Investment (HTS)	Jones	Corbin	Leidos Biomedical Research, Inc.	16X250	11/17/16	9/16/18	RNA- Seq Services to the Genome Characterization Center	$2,500,000
Recruitment	Kabanov	Alexander	NIH National Cancer Institute	5-R01-CA184088-01-04	1/1/15	12/31/19	PEGylated Liposomal Doxorubicin and Pluronic Combination for and Cancer Therapy	$310,094
Recruitment	Kabanov	Alexander	NIH National Cancer Institute	5-R01-CA184088-01-04	1/1/15	12/31/19	PEGylated Liposomal Doxorubicin and Pluronic Combination for and Cancer Therapy	$34,455
Recruitment	Kabanov	Alexander	NIH National Cancer Institute	5-U01-CA198910-01-03	8/14/15	7/31/20	Targeted Core Shell Nanogels for Triple Negative Breast Cancer	$562,542
Recruitment	Kabanov	Alexander	NIH National Cancer Institute	5-T32-CA196589-03	7/1/15	6/30/20	CAROLINA CANCER NANOTECHNOLOGY TRAINING PROGRAM (C-CNTP)	$388,701
Recruitment	Kabanov	Alexander	NIH National Cancer Institute	1-R21-CA220148-01	8/1/17	7/31/20	Targeted Magneto-Mechanic Nanotherapeutics for Cancer	$117,589
Investment	Kelada	Samir	NIH National Institute of Environmental Health Sciences	5-R01-ES024965-01-04	10/5/14	10/31/19	Gene-Environment Interactions with Ozone in Experimental Asthma	$451,634
Investment	Kelada	Samir	NIH National Heart, Lung, and Blood Institute	5-R01-HL122711-01-04	8/15/15	5/31/19	Systems-level transcriptomic analyses to Identify mouse models of asthma	$383,526
Retention	Key	Nigel	Duke University Medical Center	302-0442	5/1/12	4/23/18	Duke/UNC Clinical Hematology Research Career Development Program, K12	$125,337
Retention	Key	Nigel	American Thrombosis and Hemostasis Network		9/30/11	9/29/19	A Cross-Sectional Analysis of Cardiovascular Disease in the Hemophilia Population	$5,760
Retention	Key	Nigel	University of Washington	UWSC8675 (BPO9467)	8/15/15	5/31/18	Trial Using Epsilon Aminocaproic Acid in Therapy in Thrombocytopenia (TREAT)	$294,397
Retention	Key	Nigel	Doris Duke Charitable Foundation	2015191	11/1/15	2/28/18	Microfluidic modeling of sickle cell disease	$11,798
Retention	Key	Nigel	Hoffmann La Roche, Inc.		2/8/17	2/29/20	A Multicenter, Open-Label, Phase III Study To Evaluate The Efficacy, Safety, Harmacokinetics And Pharmacodynamics Of Emicizumab Given Every 4 Weeks (Q4w) In Patients With Hemophilia A	$59,131
Retention	Key	Nigel	Hemophilia of Georgia	6H30MC24046-06-02	6/1/12	5/31/18	Regional Hemophilia Network	$91,700
Retention	Key	Nigel	NIH National Heart, Lung, and Blood Institute	2-T32-HL007149-41	7/1/75	6/30/22	Research Training in Hematology at UNC Chapel Hill	$373,096
Retention	Key	Nigel	Shire US Inc.		10/27/17	10/26/20	An Observational Study of the Natural History of Outcomes in Hemophilics Undergoing Major Orthopedic Surgery	$83,785
Retention	Key	Nigel	Pfizer, Inc.	W1227678	9/22/17	11/1/19	A Re-evaluation of Fibrinolysis in Hemophilia	$99,557
Retention	Key	Nigel	Grifols Shared Services North America, Inc.		1/23/18	1/22/20	Attenuation of prothrombotic state and vascular pathology in SCD by anti-thrombin III	$140,933
Retention	Key	Nigel	BioMarin Pharmaceutical, Inc.		11/8/17	6/30/24	270-301 A Phase 3 Open-Label, Single-Arm Study To Evaluate The Efficacy and Safety of BMN 270, an Adeno-Associated Virus Vector-Mediated Gene Transfer of Human Factor VIII in Hemophilia A Patients with Residual FVIII Levels ? 1 IU/dL Receiving Prophylactic FVIII Infusions	$14,680
Retention	Key	Nigel	Hemophilia of Georgia	5 H30MC24046-07-00	6/1/18	5/31/19	Regional Hemophilia Network	$43,374
Recruitment	Khagi	Simon	Orbus Therapeutics, Inc.		6/6/17	6/9/21	A Phase 3, Randomized, Open-Label Study To Evaluate the Efficacy and Safety of Eflornithine with Lomustine Compared to Lomustine Alone in Patients with Anaplastic Astrocytoma That Progress/Recur After Irradiation and Adjuvant Temozolomide Chemotherapy	$18,500
Recruitment	Kibbe	Melina	Northwestern University	60043052	7/1/16	5/31/18	Novel Vehicles for Targeted Cardiovascular Repair	$62,666
Recruitment	Kibbe	Melina	University of Cincinnati	010635-002	10/24/16	10/23/19	Development of a Targeted Intravascular Therapy to Stop Non-Compressible Torso Hemorrhage	$278,503
Recruitment	Kibbe	Melina	Department of Veterans Affairs	558-D72052	7/1/17	6/30/19	IPA NICK TSIHLIS Bioengineering Catalytically Active Grafts for Vascular Surgery	$81,221
Recruitment	Kibbe	Melina	Department of Veterans Affairs	558-D72053	7/1/17	6/30/19	IPA FOR LU YU Bioengineering Catalytically Active Grafts for Vascular Surgery	$98,082
Recruitment	Kibbe	Melina	Department of Veterans Affairs	558-D72054	7/1/17	6/30/19	IPA FOR ROBIN SILETZKY Bioengineering Catalytically Active Grafts for Vascular Surgery	$26,882
Recruitment	Kibbe	Melina	Department of Veterans Affairs	558-D82031	1/1/18	9/30/19	IPA DAVID GILLIS Bioengineering Catalytically Active Grafts for Vascular Surgery	$45,849
Recruitment	Kibbe	Melina	American Heart Association	18POST33960499	7/1/18	6/30/20	Targeted, Niche-Responsive Peptide Amphiphile Nanofibers as Injectable Drug Delivery Vehicles to Treat Atherosclerosis	$51,844
Retention	Kim	William	NIH National Cancer Institute	5-R01-CA185353-01-04	6/1/14	5/31/19	(PQD5) Predicting Anti-Cancer Efficacy through Tumor Profiling	$405,890
Retention	Kim	William	Merck Sharp and Dohme Corp.		9/19/16	9/19/19	Prediction or Response and Rapid Development of Pembrolizumab-based Combination in Genetically Engineered Mouse Models of Melanoma and Breast	$166,195
Retention	Kim	William	NIH National Cancer Institute	5-1R01CA202053-01-02	8/1/16	7/31/21	Kinase Inhibition in Kidney Cancer	$432,423

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Retention	Kim	William	NIH National Cancer Institute	5-F31-CA213985-02	9/30/16	6/29/19	FELLOW:ALEISHA M SMITH Investigating HIF-MYC interactions within a Clear Cell Renal Cell Carcinoma Murine Model	$30,077
Recruitment	Kistler	Christine	Beth Israel Deaconess Medical Center	01027406	6/12/14	5/31/18	Randomized Trial of a Mammography Decision Aid for Women Aged 75 and Older	$44,306
Recruitment	Kistler	Christine	Gordon and Betty Moore Foundation	6419	6/15/17	8/15/19	Improving Primary Care Clinicians' Communication Skills in Dementia Palliative Care	$262,793
Investment (HTS)	Knowles	Michael	The COPD Foundation, Inc		10/15/08	10/14/23	Bronchiectasis Research Registry	$64,319
Investment (HTS)	Knowles	Michael	NIH National Heart, Lung, and Blood Institute	5-U54-HL096458-11-14	8/6/04	7/31/19	Genetic Disorders of Mucociliary Clearance	$1,244,846
Investment (Bios)	Kosorok	Michael	National Science Foundation	DMS-1407732	7/1/14	6/30/18	Support Vector Machines for Censored Data	$139,000
Investment (Bios)	Kosorok	Michael	NIH National Cancer Institute	5-P01-CA142538-06-09	4/1/10	3/31/20	Statistical Methods for Cancer Clinical Trials	$1,909,361
Investment (Bios)	Kosorok	Michael	NIH National Cancer Institute	5-P01-CA142538-06-09	4/1/10	3/31/20	Statistical Methods for Cancer Clinical Trials	$212,153
Investment (Bios)	Kosorok	Michael	NIH National Library of Medicine	5-T32-LM012420-04	5/1/15	4/30/20	Big Data Visualization Methods and Software for Population Health Research	$219,587
Recruitment	Laederach	Alain	NIH National Human Genome Research Institute	5-R01-HG008133-01-03	9/1/15	6/30/19	Predicting the causative SNPs in LD blocks by allele-specific structural analysis of the transcriptome	$785,970
Recruitment	Laederach	Alain	American Cancer Society	127532-PF-15-133-01-RMC	7/1/15	6/30/18	RNA Structure Mutations in Ovarian and Breast Cancers	$57,500
Recruitment	Laederach	Alain	University of Michigan Ann Arbor	3004537869	5/1/17	2/28/19	Spliceosome mechanism dissected at the single molecule level	$50,433
Recruitment	Laederach	Alain	NIH National Institute of General Medical Sciences	2-R01-GM101237-05	5/1/12	8/31/21	Structural and functional consequences of disease SNP's on the transcriptome	$322,350
Recruitment	Laederach	Alain	Georgia Institute of Technology - The Georgia Tech Research Corporation	RJ-193-G1	8/1/17	7/31/22	Collaborative Research: Multimodal RNA structural motifs in alphavirus genomes: discovery and validations	$112,850
Recruitment	Lafata	Jennifer	NIH National Cancer Institute	5-R01-CA197205-03	8/1/16	7/31/20	e-Assist: A Post-Visit Patient Portal Tool to Promote Colorectal Cancer Screening	$560,393
Recruitment	Lafata	Jennifer	Virginia Commonwealth University	FP00003673_SA001	8/1/16	2/28/18	Sub to VCU: An Interactive Preventive Health Record to Increase Colorectal Cancer Screening	$38,856
Retention	Lafata	Jennifer	Virginia Commonwealth University	FP00005212_SA001	7/1/17	6/30/21	Unveiling the role of physician implicit bias and communication behaviors in dissatisfaction, mistrust, and non-adherence in Black patients with Type 2 diabetes	$36,497
Recruitment	Lai	Sam	NIH National Institute of Dental and Craniofacial Research	5-F32-DE026683-02	9/1/16	8/31/18	FELLOW:TJACOBS Engineering Temperate Bacteriophages for Induced Secretion of Proteins and Peptides by Oral Streptococcus Mitis	$57,866
Recruitment	Lai	Sam	Pharmaceutical Research and Manufacturers of America Foundation		1/1/17	12/31/18	Engineering Mutant Antibodies with Enhanced Pathogen Trapping Potency in Mucus Secretions	$40,000
Recruitment	Lai	Sam	AI Tracking Solutions, Inc.		5/1/17	4/30/19	STTR: Artificial neural network for fully automated particle tracking under low signal-to-noise regimes	$79,486
Recruitment	Lai	Sam	Burroughs Wellcome Fund	1017727	6/1/18	5/31/21	Young Innovators Program: an immersive research experiential program at the Eshelman School of Pharmacy	$60,000
Recruitment	Lai	Sam	NIH National Institute of Child Health and Human Development	1-R56-HD095629-01	9/13/17	1/31/19	Development of novel sperm-binding antibodies	$306,590
Recruitment	Lai	Sam	North Carolina Biotechnology Center	2018-GTF-6905	11/1/17	10/31/19	Enhancing AAV gene therapy via bispecific fusion proteins that block anti-AAV antibodies while conferring active targeting	$95,000
Recruitment	Lai	Sam	NIH National Heart, Lung, and Blood Institute	1-R01-HL141934-01	5/10/18	4/30/22	Overcoming anti-PEG immunity to restore prolonged circulation and efficacy of PEGylated therapeutics	$633,547
Innovation Award	Lawrence	David	NIH National Cancer Institute	5-R01-CA203032-01-03	2/2/16	1/31/21	Single Cell Sampling of Signaling Activity in Triple Negative Breast Cancer	$451,931
Innovation Award	Lawrence	David	NIH National Cancer Institute	5-R01-CA203032-01-03	2/2/16	1/31/21	Single Cell Sampling of Signaling Activity in Triple Negative Breast Cancer	$50,216
Recruitment	Lazear	Helen	NIH National Institute of Allergy and Infectious Diseases	5-R21-AI129431-01-02	11/10/16	10/31/18	Viral and host determinants of Zika virus tissue tropism	$190,000
Recruitment	Lee	Carrie	GlaxoSmithKline , Inc.		1/7/13	2/28/19	BRA116598/LCCC 1128 Open Label phase II trial of the BRAF inhibitor (Dabrafenib) and the MEK inhibitor (Trametinib) in Unresectable Stage III and Stage IV BRAF Mutant Melanoma; Correlation of Resistance with the Kinome and Functional Mutations	$22,322

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Recruitment	Lee	Carrie	Quintiles, Inc		12/9/13	12/8/17	A Phase Ib Study of the Safety and Pharmacology of MPDL3280A Administered with Cobimetinib in Patients with Locally Advanced or Metastatic Solid Tumors	$26,597
Recruitment	Lee	Carrie	EMD Serono, Inc.		3/7/14	3/6/18	A Phase I, open-label, multiple-ascending dose trial to investigate the safety, tolerability, pharmacokinetics, biological and clinical activity of MSB0010718C in subjects with metastatic or locally advanced solid tumors and expansion to selected indications.	$213
Recruitment	Lee	Carrie	Novartis Pharmaceuticals Corporation		2/3/15	12/31/18	Modular Phase II Study to Link Targeted Therapy to Patients with Pathway Activated Tumors: Module 6 - BGJ398 for Patients with Tumors with FGFR Genetic Alterations	$748
Recruitment	Lee	Michael	Quintiles, Inc		8/10/16	8/9/18	A Phase I, open-label, multiple-ascending dose trial to investigate the safety, tolerability, pharmacokinetics, biological and clinical activity of MSB0011359C in subjects with metastatic or locally advanced solid tumors and expansion to selected indications	$12,542
Recruitment	Lee	Michael	Genentech, Inc.		10/26/16	11/15/18	An open-label, multicenter phase !b study of the safety and tolerability of atezolizumab (anti PD-L1 antibody) administered in combination with bevacizumab and/or other treatments in patients with solid tumors	$112,439
Recruitment	Lee	Yueh	RSNA Research and Educational Foundation	RMS1727	7/1/17	3/31/18	Coronary Artery Calcium Scoring by Cardiac Gated-Stationary Digital Tomosynthesis	$3,000
Recruitment	Lemon	Stanley	NIH National Institute of Allergy and Infectious Diseases	5-R01-AI095690-06-08	4/15/11	3/31/21	Micro-RNA 122 and Chronic Hepatitis C	$380,000
Recruitment	Lemon	Stanley	Gilead Sciences, Inc.	16-4945	9/1/16	8/31/18	MOA of Direct-Acting Antivirals Targeting HCV NS5A Protein	$164,005
Recruitment	Lemon	Stanley	NIH National Institute of Allergy and Infectious Diseases	5-R01-AI131685-01-02	3/6/17	2/28/22	Murine Model of Human Hepatitis A	$388,750
Recruitment	Lemon	Stanley	NIH National Institute of Allergy and Infectious Diseases	2-R01-AI103083-06	9/24/12	8/31/22	Membrane Hijacking: Biogenesis and Fate of Quasi-Enveloped Hepatovirus	$388,750
Recruitment	Li	Zibo	NIH National Institute of Biomedical Imaging and Bioengineering	5-R01-EB014354-02-04	9/23/13	6/30/18	The Tetrazine Ligation for Efficient 18F Labeling and Pretargeted Imaging/Radiotherapy of Cancer	$148,260
Recruitment	Li	Zibo	NIH Office of the Director	1-S10-OD023611-01	3/17/17	3/16/18	Small Animal PET/CT for Preclinical Imaging Research	$834,500
Recruitment	Li	Zibo	University of Georgia	RR168-708/S001393	3/15/17	1/31/19	Nanoscintillator-based X-ray sensitizers to enable efficient non-small cell lung cancer treatment with X-ray irradiation	$168,764
Recruitment	Li	Zibo	University of Georgia	RR168-708/S001393	3/15/17	1/31/19	Nanoscintillator-based X-ray sensitizers to enable efficient non-small cell lung cancer treatment with X-ray irradiation	$18,753
Investment	Lin	Weili	NIH National Institute of Mental Health	5-U01-MH110274-01-02	9/1/16	5/31/20	UNC/UMN Baby Connectome Project	$1,010,879
Investment	Lin	Weili	NIH National Institute of Neurological Disorders and Stroke	5-R21-NS095027-01-02	8/15/16	7/31/19	Characterizing morphological and hemodynamic characteristics of human brain perivascular spaces with aging using 7T MRI	$190,000
Investment	Lin	Weili	Siemens Medical Solutions USA, Inc.	UNC2016MR2601	8/15/16	8/14/19	Neonatal Imaging	$61,586
Investment	Lin	Weili	Nestec Ltd	RDNN201704/ 4520562240	2/27/17	9/30/20	Interrelationships of Nutrition, Gut Microbiota, as well as Brain & Cognitive Development in Early Life	$571,358
Investment	Lin	Weili	Siemens Medical Solutions USA, Inc.	UNC-2017-MR-28-01-LIN_C00225590	9/1/17	8/31/18	Neonatal Imaging Project 2	$87,576
Retention	Linnan	Laura	Research Triangle Institute	1-312-0214531-52014L	10/22/14	9/15/18	National Workplace Health Programs and Practices (WHPPS)	$83,592
Recruitment	Liu	Pengda	NIH National Cancer Institute	5-R00-CA181342-03-05	7/1/14	2/28/19	Elucidating a Novel Akt Activation Mechanism for Targeted Prostate Cancer Therapy	$217,518
Recruitment	Lund	Jennifer	London School of Hygiene and Tropical Medicine	10165532	1/1/17	12/31/18	Cardiovascular disease burden in older breast cancer survivors in the United States	$15,159
Investment (CC)	Magnuson	Terry	NIH Office of the Director	5-U42-OD010924-16-18	9/30/99	2/28/20	A Carolina Center to Characterize and Maintain Mutant Mice	$69,940
Investment (CC)	Magnuson	Terry	NIH Office of the Director	5-U42-OD010924-19	9/30/99	2/28/20	A Carolina Center to Characterize and Maintain Mutant Mice	$1,259,785
Investment (CC)	Magnuson	Terry	NIH Office of the Director	5-U42-OD010924-19	9/30/99	2/28/20	A Carolina Center to Characterize and Maintain Mutant Mice	$139,976
Investment (CC)	Magnuson	Terry	NIH National Institute of General Medical Sciences	5-R01-GM101974-29-30	12/1/89	3/31/20	Albino Deletion Complex and Early Mouse Development	$40,963
Investment (CC)	Magnuson	Terry	DOD DA Army Medical Research Acquisition Activity	W81XWH-16-1-0233	7/15/16	1/14/19	Co-occurent mutations in chromatin regulators define genetically distinct forms of cancer	$303,328
Investment (CC)	Magnuson	Terry	Jackson Laboratory	210265	4/1/18	3/31/19	Mutant Mouse Resource and Research Center Annual Meeting	$8,676

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Recruitment	Major	Ben	Gabrielle's Angel Foundation for Cancer Research	85	6/1/15	5/31/19	MOLECULAR RATIONALE FOR WNT INHIBITOR THERAPY IN B-CELL LYMPHOMA	$225,000
Recruitment	Major	Ben	NIH National Cancer Institute	5-R01-CA187799-01-03	7/1/15	6/30/20	Role of FOXP1 and WNT signaling in B-cell Lymphoma	$307,500
Recruitment	Major	Ben	University of Toledo	F-2016-26	5/1/16	4/30/18	RhoG Signaling in Invadopodia	$11,271
Recruitment	Major	Ben	University of Toledo	F-2016-27	4/12/16	3/31/19	Regulation of Invadopodia formation by RhoG specific GEFs and GAPs	$22,744
Recruitment	Major	Ben	University of Toledo	F-2017-106	7/19/16	6/30/18	A Novel RhoG Protein Interaction Network in Invadopodia	$11,271
Recruitment	Major	Ben	University of Arizona	344930	7/15/16	6/30/20	Arsenic, Nrf2 and autophagy dysfunction in type II diabetes	$15,280
Recruitment	Major	Ben	NIH National Cancer Institute	1-F32-CA225040-01	2/1/18	1/31/20	FELLOW:BRITTANY BOWMAN Proteomic and Genomic Characterizations of FOXP1 in Pancreatic Cancer	$57,066
Recruitment	Major	Ben	NIH National Cancer Institute	1-F32-CA225040-01	2/1/18	1/31/20	FELLOW:BRITTANY BOWMAN Proteomic and Genomic Characterizations of FOXP1 in Pancreatic Cancer	$1,972
Recruitment	Major	Ben	American Head and Neck Society	575894	7/1/18	6/30/20	NRF2 Mediated Radiation Resistance in HNSCC	$80,000
Recruitment	Major	Ben	Howard Hughes Medical Institute	GT10820	1/1/19	12/31/22	FELLOW: M. AGAJANIAN Defining the mechanism of WNT driven AAK1 phosphorylation	$150,000
Investment (Bios/HTS)	Marron	James	National Science Foundation	IIS-1633074	9/1/16	8/31/19	BIGDATA: F: Statistical Approaches to Big Data Analytics	$171,832
Investment (Bios/HTS)	Marron	James	Kitware, Inc.	K002137-00-S01	11/7/16	8/31/18	Statistical Analysis in Imaging	$47,919
Innovation Award	Matera	Greg	NIH National Institute of General Medical Sciences	5-R01-GM118636-01-03	4/1/16	3/31/20	In vivo models of small RNP biogenesis and Spinal Muscular Atrophy	$266,966
Innovation Award	Matera	Greg	NIH National Institute of General Medical Sciences	5-R01-GM118636-01-03	4/1/16	3/31/20	In vivo models of small RNP biogenesis and Spinal Muscular Atrophy	$29,663
Retention	Mayer	Deborah	American Cancer Society	GSCNP-17-134-01-SCN	7/1/17	6/30/19	Fellow: Rabenberg - Graduate Scholarship in Cancer Nursing Practice	$20,000
Retention	Mayer	Deborah	NIH National Cancer Institute		1/15/18	9/30/18	IPA Assignment Agreement	$37,440
Recruitment	McGinty	Robert	Searle Scholars Program	SSP-2017-2016	7/1/17	6/30/20	Deciphering the nucleosome interactome	$100,000
Recruitment	McGinty	Robert	Pew Charitable Trusts	00030551	8/1/17	7/31/22	Deciphering the nucleosome interactome	$75,000
Retention	McRee	Autumn	GlaxoSmithKline, Inc.		4/30/13	7/3/22	An Open-Label, Three-Part, Phase I/II Study to Investigate the Safety, Pharmacokinetics, Pharmacodynamics, and Clinical Activity of the MEK Inhibitor GSK1120212, BRAF Inhibitor GSK2118436 and the anti-EGFR Antibody Panitumumab in Combination in Subjects with BRAF-mutation V600E or V600K Positive Colorectal Cancer	$8,118
Retention	McRee	Autumn	Inovio Pharmaceuticals, Inc.		3/16/16	3/15/20	A Multi-center Study of hTERT Immunotherapy Alone or in Combination with IL-12 DNA Followed by Electroporation in Adults with Solid Tumors at High Risk of Relapse Post Definitive Surgery and Standard Therapy	$112,386
Retention	McRee	Autumn	Hoosier Cancer Research Network		4/21/17	4/20/21	A pilot study of pembrolizumab in combination with Y90 radioembolization in patients with high risk hepatocellular carcinoma with preserved liver function	$3,025
Retention	McRee	Autumn	Hoosier Cancer Research Network		11/7/17	11/30/23	An Open Label Randomized Phase I/II Trial of MLN0128 Compared to Sorafenib in Patients with Advanced or Metastatic Hepatocellular Carcinoma: Big Ten Cancer Research Consortium BTCRC-GI13-002	$20,706
Retention	McRee	Autumn	BioMed Valley Discoveries, Inc.		1/22/18	12/31/23	A Phase I Trial of Ulixertinib (BVD-523) in Combination with Palbociclib in Patients with Advanced Solid Tumors with Expansion Cohort in Previously Treated Metastatic Pancreatic Cancer	$83,932
Recruitment	Miao	Edward	NIH National Institute of Allergy and Infectious Diseases	5-R01-AI119073-01-04	5/1/15	4/30/20	Role of caspase-11 in innate immunity	$341,839
Recruitment	Miao	Edward	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-F31-DK105784-03	9/17/15	9/16/18	FELLOW:A TUBBS Impact of Dietary Salt on Inflammation and Infection: Insights into Colitis	$31,796
Recruitment	Miao	Edward	NIH National Institute of Allergy and Infectious Diseases	1-R56-AI133236-01	8/1/17	2/28/18	Natural killer cell cytotoxicity against intracellular bacteria	$291,365
Recruitment	Miao	Edward	NIH National Institute of Allergy and Infectious Diseases	1-R01-AI133236-01A1	3/1/18	2/28/23	Natural killer cell cytotoxicity against intracellular bacteria	$301,323
Recruitment	Miao	Edward	NIH National Institute of Allergy and Infectious Diseases	1-R01-AI139304-01	5/11/18	4/30/23	Intestinal epithelial cell exfoliation by caspases	$427,625
Infrastructur e/Investmen	Miley	Michael	North Carolina Biotechnology Center	2017-IDG-1014	3/28/17	3/27/18	Acquisition of a JANSi High-Throughput Automated Protein Crystallization Imaging System	$124,000

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Infrastructure/Investmen	Miller	Ryan	NIH National Cancer Institute	5-R01-CA204136-01-02	12/13/16	11/30/19	Credentialing murine models for glioblastoma preclinical drug development	$544,879
Infrastructure/Investmen	Miller	Ryan	NIH National Cancer Institute	5-R01-CA204136-01-02	12/13/16	11/30/19	Credentialing murine models for glioblastoma preclinical drug development	$60,543
Infrastructure/Investmen	Miller	Ryan	American Brain Tumor Association	MSSF1700007	6/1/17	8/31/17	Mapping Glioblastoma Kinome response to single agent kinase inhibitors	$3,000
Recruiment	Milowsky	Matthew	Duke University		6/26/15	6/1/21	A Phase II open-label, parallel group study of Abiraterone Acetate plus Prednisone in African American and Caucasian men with metastatic castrate-resistant prostate cancer	$16,315
Recruiment	Milowsky	Matthew	Hoosier Cancer Research Network		12/2/15	12/1/18	UC-GENOME: Urothelial Cancer-GENOnomic analysis to iMprove patient outcomes and rEsearch	$56,373
Recruiment	Milowsky	Matthew	Merck Sharp and Dohme Corp.		12/2/15	12/1/18	Phase II Single Arm Study of Gemcitabine and Cisplatin plus Pembrolizumab as Neoadjuvant Therapy Prior to Radical Cystectomy in Patients with Muscle-Invasive	$135,043
Recruiment	Milowsky	Matthew	BioClin Therapeutics, Inc.		8/26/16	8/25/19	A Phase 2, Randomized, Double-Blind,Placebo-Controlled, Multicenter, Parallel-Group Study of B-701 Plus Docetaxel Versus Placebo Plus Docetaxel in the Treatment of Locally Advanced or Metastatic Urothelial Cell Carcinoma in Subjects who haveRelapsed After, or are Refractory to Standard Therapy	$20,948
Recruiment	Milowsky	Matthew	Genentech, Inc.		7/12/16	7/11/19	A Phase Iii, Multicenter, Randomized, Placebo-Controlled, Double-Blind Study Of Atezolizumab (Anti?Pd-L1 Antibody) In Combination With Gemcitabine/Carboplatin Versus Gemcitabine/Carboplatin Alone In Patients With Untreated Locally Advanced Or Metastatic Urothelial Carcinoma Who Are Ineligible For Cisplatin-Based Therapy	$21,189
Recruiment	Milowsky	Matthew	Bristol-Myers Squibb Company		12/22/16	1/17/20	A Phase 3 Randomized, Double-blind, Multi-center Study of Adjuvant Nivolumab versus Placebo in Subjects with High Risk Invasive Urothelial Carcinoma	$227,265
Recruiment	Milowsky	Matthew	MedImmune, Inc.		12/8/16	2/29/20	A Phase 1 Study of MEDI4736 (Anti-PD-L1 Antibody) in Combination with Tremelimumab (Anti-CTLA-4 Antibody) in Subjects with Advanced Solid Tumors	$18,920
Recruiment	Milowsky	Matthew	Incyte Corporation		1/31/17	11/30/19	INCB 54828-201 Phase 2, Open-Label, Single-Agent, Multicenter Study to Evaluate the Efficacy and Safety of INCB054828 in Subjects With Metastatic or Surgically Unresectable Urothelial Carcinoma Harboring FGF/FGFR Alterations	$159,127
Recruiment	Milowsky	Matthew	Hoosier Cancer Research Network		10/25/16	2/29/20	Randomized, Double-Blinded, Phase II Study of Maintenance Pembrolizumab versus Placebo after First-line Chemotherapy in Patients with Metastatic Urothelial Cancer	$26,270
Investment (HTS)	Mohlke	Karen	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-U01-DK105561-01-03	5/1/15	4/30/20	Functional genetic variants for type 2 diabetes	$42,627
Investment (HTS)	Mohlke	Karen	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	3-U01-DK105561-03S1	5/1/15	4/30/20	Functional genetic variants for type 2 diabetes	$70,054
Investment (HTS)	Mohlke	Karen	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-U01-DK105561-04	5/1/15	4/30/20	Functional genetic variants for type 2 diabetes	$495,995
Investment (HTS)	Mohlke	Karen	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-R01-DK072193-10-13	9/1/05	5/31/19	Targeted Genetic Analysis of T2D and Quantitative Traits	$595,294
Investment (HTS)	Mohlke	Karen	University of Colorado Denver	FY18.878.005	8/1/17	4/30/20	Sequence analysis of hematological traits in African Americans	$146,304
Investment (HTS)	Mohlke	Karen	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	2-R01-DK093757-06	9/5/11	7/31/22	Genetic epidemiology of rare and regulatory variants for metabolic traits	$686,397
Investment (HTS)	Mohlke	Karen	American Heart Association	17POST33650016	7/1/17	6/30/19	Understanding the Genetic Architecture of Blood Pressure, Circulating Lipids, and Type 2 Diabetes in Trans-ancestry Populations	$52,216
Recruitment	Montgomery	Stephanie	American College of Laboratory Animal Medicine Foundation		7/1/17	6/30/18	Effect of C. bovis infection on tumor xenograft growth and innate immune system activation in immune-deficient mouse models	$26,550
Recruitment	Moody	Cary	NIH National Cancer Institute	5-R01-CA181581-01-04	9/11/14	8/31/19	Regulation of Human Papillomavirus Replication by the DNA Damage Response	$315,400
Recruitment	Moody	Cary	NIH National Institute of Allergy and Infectious Diseases	1-R21-AI135542-01A1	5/14/18	4/30/20	The Role of ATR Signaling in the Life Cycle of HPV	$233,250
Recruitment	Moorman	Nathaniel	NIH National Institute of Allergy and Infectious Diseases	2-R56-AI103311-06	12/1/12	3/31/19	The role of host and viral translation factors during HCMV infection	$383,676
Recruiment	Moschos	Stergios	Merck Sharp and Dohme		2/15/13	2/14/19	MK-3475-002-29 Randomized, Phase II Study of MK-3475 versus Chemotherapy in Patients with Advanced Melanoma	$80,554

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Recruiment	Moschos	Stergios	GlaxoSmithKline, Inc.		4/28/14	4/27/22	A Phase II, Open-Label, Multicentre Study of Dabrafenib plus Trametinib in Subjects with BRAF Mutation-Positive Melanoma that has Metastasized to the Brain	$4,211
Recruiment	Moschos	Stergios	Bristol-Myers Squibb Company		4/17/15	4/16/18	Multi-Center Phase 2 Open-Label Study to Evaluate Safety and Efficacy in Subjects with Melanoma Metastatic to the Brain treated with Nivolumab in Combination with Ipilimumab followed by Nivolumab Monotherapy	$31,518
Recruiment	Moschos	Stergios	Amgen Pharmaceuticals		4/21/15	4/20/28	A Phase 1b/2 Study Evaluation of the Safety, Tolerability, Pharmacokinetics, Pharmacodynamics and Efficacy of AMG 232 Combined with Trametinib and Dabrafenib or Trametinib in Adult Subjects with Metastatic Cutaneous Melanoma	$94,048
Recruiment	Moschos	Stergios	Merck Sharp and Dohme Corp.		6/3/16	6/2/20	Pembrolizumab in Systemic Treatment-Naïve Distant Metastatic Melanoma and Exploration of use of 11Cmethyl-L-tryptophan (AMT) PET at Baseline as a Predictive Imaging Biomarker of Response	$103,299
Recruiment	Moschos	Stergios	Leidos Biomedical Research, Inc.	17X011	5/24/17	5/23/22	A Phase 2 Study of Ibrutinib (PCI-32765) in Refractory Distant Metastatic Cutaneous Melanoma: Correlation of Biomarkers with Response and Resistance*** Sponsor: Leidos is providing multicenter correlative/support funding is related to the NCI9922 Clinical Trial which is being conducted under a existing grant funding.	$876,553
Recruiment	Moschos	Stergios	Syndax Pharmaceuticals, Inc.		5/11/17	5/31/21	A Phase 1b/2, Open-label, Dose Escalation Study of Entinostat in Combination with Pembrolizumab in Patients with Non-small Cell Lung Cancer, with Expansion Cohorts in Patients with Non-small Cell Lung Cancer and Melanoma	$20,886
Recruiment	Moschos	Stergios	Northwestern University	60046298 UNC	3/1/17	2/28/22	Systemic RNA interference to reactivate p53 tumor suppression	$13,157
Recruitment	Muss	Hy	NIH National Cancer Institute	5-R01-CA203023-01-02	1/12/16	12/31/20	Biomarkers of Molecular Age to Predict the Toxicity of Cancer Chemotherapy	$54,257
Recruitment	Muss	Hy	NIH National Cancer Institute	5-R01-CA203023-01-03	1/12/16	12/31/20	Biomarkers of Molecular Age to Predict the Toxicity of Cancer Chemotherapy	$478,352
Recruitment	Muss	Hy	City of Hope National Medical Center	23030.1000102.669202	5/1/16	4/30/18	Clinical and Biological Predictors of Chemotherapy Toxicity in Older Adults with Cancer	$56,058
Recruitment	Muss	Hy	Mayo Clinic in Rochester	UCH-194321/ PO65578650	8/1/17	7/31/18	Feasibility of an electronic geriatric assessment (EGA) for older adults with cancer	$2,000
Recruitment	Muss	Hy	Breast Cancer Research Foundation	BCRF-17-112	10/1/17	9/30/18	p16INK4a Gene Expression, Chemotherapy Toxicity, and Age in Women with Breast	$250,000
Recruitment	Nichols	Hazel	NIH National Cancer Institute	1-R01-CA204258-01A1	7/1/17	6/30/22	Clinical Pregnancy Outcomes in Adolescent and Young Adult Female Cancer Survivors	$675,579
Recruitment	Nichols	Hazel	Michigan State University	RC106691D	6/1/17	5/31/21	Assisted Reproductive Technology and Child Health: Risk of Birth Defects, Mortality, and Effect on Grade School Performance	$11,706
Recruitment	Nichols	Hazel	St Baldricks Foundation	523803	7/1/17	6/30/20	Reproductive Health after Adolescent and Young Adult Cancer	$50,000
Recruitment	Nicholson	Wanda	Duke University	203-8983	9/30/14	9/29/17	Comparing Options for Management: Patient-Centered Results in Uterine Fibroids (COMPARE-UF)	$207,574
Recruitment	Nicholson	Wanda	Johns Hopkins University	2605	3/1/16	8/31/17	Defining a patient-centered research and health agenda for women with diabetes using the DSNet	$50,119
Recruitment	Nicholson	Wanda	Duke University	203-7625	9/30/17	9/29/18	Comparing Options for Management: Patient-Centered Results in Uterine Fibroids (COMPARE-UF)	$351,537
Investment	Niethammer	Marc	National Science Foundation	ECCS-1610762	9/1/16	8/31/19	Dynamic Network Analysis: Analyzing the Chronnectome	$124,333
Investment	Niethammer	Marc	National Science Foundation	ECCS-1711776	7/15/17	6/30/20	Fast Predictive Medical Image Analysis	$113,660
Investment	Niethammer	Marc	NIH National Institute of Arthritis and Musculoskeletal and Skin Diseases	1-R01-AR072013-01	8/15/17	7/31/22	Large-scale automatic analysis of the OAI magnetic resonance image dataset	$422,272
Investment (Bios/HTS)	Nobel	Andrew	University of North Carolina at Charlotte	20160298-01-UNC	6/1/16	5/31/19	Random dynamical systems and limit theorems for optimal tracking	$19,033
Investment (Bios/HTS)	Nobel	Andrew	National Science Foundation	DMS-1613072	8/1/16	7/31/19	Iterative testing procedures and high-dimensional scaling limits of extremal random structures	$125,049
Investment (Bios/HTS)	Nobel	Andrew	NIH National Human Genome Research Institute	5-R01-HG009125-01-02	9/7/16	6/30/19	Multi-tissue and network models for next-generation EQTL studies	$395,344
Retention	North	Kari	NIH National Institute on Alcohol Abuse and Alcoholism	5-F31-AA024971-02	5/2/16	5/1/19	FELLOW:S LOVE Ethanol-metabolizing genes and the relationship between ethanol intake and cognitive decline	$35,563
Retention	North	Kari	NIH National Human Genome Research Institute	3-U01-HG007416-04S1	9/1/13	5/31/19	Genetic Epidemiology of Causal Variants Across the Life Course Phase II	$777,537
Retention	North	Kari	NIH National Heart, Lung, and Blood Institute	5-T32-HL129982-03	5/1/16	4/30/21	The Genetic Epidemiology of Heart, Lung, and Blood Training Grant (GenHLB)	$359,908
Retention	North	Kari	American Heart Association	16PRE29200008	7/1/16	6/30/18	Infant growth trajectories and dyslipdemia in adolescence	$25,950

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Retention	North	Kari	Rutgers the State University of New Jersey	0355	12/1/16	11/30/18	NHGRI Genome Sequencing Program Coordinating Center	$88,946
Retention	North	Kari	Washington University in Saint Louis	WU-18-3	1/1/17	12/31/18	Gene-Lifestyle Interactions	$23,325
Retention	North	Kari	Research Triangle Institute	4-312-0214641-65005l/ 888-11-16-04	7/17/17	11/30/17	NUTRITIONAL GENOMICS OF PULMONARY FUNCTION	$4,969
Retention	North	Kari	NIH National Heart, Lung, and Blood Institute	1-R01-HL142302-01	5/1/18	2/28/22	Hispanic Latino Lipid Consortium	$856,812
Innovation Award	Oldenburg	Amy	NIH National Heart, Lung, and Blood Institute	5-R01-HL123557-01-03	9/1/15	8/31/19	Anatomic optical coherence tomography for quantitative bronchoscopy	$637,818
Innovation Award	Oldenburg	Amy	NIH National Heart, Lung, and Blood Institute	5-R21-HL130901-01-02	8/1/16	7/31/19	Imaging nanophysical properties of actively transporting bronchial mucus	$182,866
Investment (CBCS)	Olshan	Andrew	University of Utah	10034028-01	7/1/14	7/31/18	Exome sequencing for head and neck cancer susceptibility genes	$17,118
Investment (CBCS)	Olshan	Andrew	International Agency for Research on Cancer	CRA NO GEP /16/07	9/1/16	8/31/18	Biomarkers of human papillomavirus (HPV) infection and risk of two increasing cancers	$10,941
Investment (CBCS)	Olshan	Andrew	Vanderbilt University Medical Center	VUMC 58928	1/1/16	6/30/18	Breast Cancer Genetic Study in African-Ancestry Populations	$14,518
Investment (CBCS)	Olshan	Andrew	International Agency for Research on Cancer	GEP/17/04	1/10/17	12/31/18	The role of germline and somatic DNA mutations in oral and oropharyngeal cancers	$28,203
Investment (CBCS)	Olshan	Andrew	Rutgers the State University of New Jersey	PO 808186	8/21/17	6/1/18	Translation of research materials from English to Japanese, and verse versa.	$4,000
Investment (CC)	Pardo Manuel de '	Fernando	NIH National Institute of Mental Health	5-F30-MH103925-04	9/8/14	9/7/18	FELLOW:MORGAN, ANDREW Effects of advanced paternal age on germline genome stability	$42,449
Investment (CC)	Pardo Manuel de '	Fernando	Neogen Corporation		3/24/17	3/23/20	Research Service Agreement for Genotyping Assays	$91,451
Investment (CC)	Pardo Manuel de '	Fernando	University of Massachusetts Medical School	OSP2018037	8/5/17	7/31/22	Systems Genetics of Tuberculosis	$286,363
Recruitment	Park	Leeza	Foundations of Hope		10/23/15	10/22/18	Longitudinal Assessment of Mental Health Needs of Advanced Cancer Patients with Dependent Children	$38,898
Recruitment	Park	Leeza	NIH National Cancer Institute	1-K07-CA218167-01	8/1/17	7/31/22	A Psychosocial Intervention to Improve Outcomes for Parents with Advanced Cancer	$176,839
Recruitment	Pearce	Kenneth	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-R01-DK101645-01-03	7/1/15	4/30/18	High Throughput Screening Assay for IP7K inositol pyrophosphate kinases	$34,200
Recruitment	Pecot	Chad	Lung Cancer Research Foundation		11/1/16	10/31/18	Targeting Lung Squamous Metastasis with CCR2 Inhibitors	$75,000
Recruitment	Pecot	Chad	V Foundation for Cancer Research	D2016-035	11/1/16	11/1/17	Targeting the Immune Microenvironment to Treat Squamous Cancers	$200,000
Recruitment	Pecot	Chad	Free to Breathe		2/14/17	12/31/19	Targeting Lung Squamous Metastasis with CCR2 Inhibitors	$125,000
Recruitment	Pecot	Chad	Lung Cancer Initiative of North Carolina		7/3/17	7/2/18	Nanoparticle delivery of anti-metastatic miR-671 for adjuvant therapy in lung squamous carcinoma	$25,000
Recruitment	Pecot	Chad	Susan G Komen for the Cure	CCR17479814	8/7/17	8/6/20	HDAC11 Promotes Breast Cancer Metastasis via the Lymphatic Route	$150,000
Recruitment	Pecot	Chad	NIH National Cancer Institute	1-R01-CA215075-01A1	9/21/17	8/31/22	Immune Regulation of Lung Squamous Metastasis	$400,580
Investment (HTS)	Peifer	Mark	NIH National Institute of General Medical Sciences	5-R35-GM118096-01-03	7/1/16	6/30/21	Regulating cell fate and shaping the body plan during morphogenesis and oncogenesis	$583,645
Investment (HTS)	Perou	Charles	NIH National Cancer Institute	5-U10-CA181009-05	4/22/14	2/28/19	Network Group Integrated Translational Science Centers Application	$610,519
Investment (HTS, CBCS, MP1U)	Perou	Charles	NIH National Cancer Institute	5-R01-CA195740-01-03	6/1/15	5/31/19	Credentialing Mouse Models for Immune System Therapy Research	$581,304
Investment (HTS, CBCS, MP1U)	Perou	Charles	NIH National Cancer Institute	5-R01-CA195754-01-03	8/1/15	7/31/18	Mouse Models of Metastatic Triple-Negative Breast Cancer for Therapeutic Testing	$569,391
Investment (HTS)	Perou	Charles	NIH National Cancer Institute	5-F30-CA200345-03	8/1/15	1/31/19	FELLOW:M SIEGEL Establishing Genetic Drivers of Breast Cancer Metastases	$42,019

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Investment (HTS, CBCS, MP1U)	Perou	Charles	NIH National Cancer Institute	5-R01-CA148761-06-08	3/17/10	8/31/20	Therapeutic Targeting of Breast Cancer Tumor Initiating Cells	$393,933
Investment (HTS)	Perou	Charles	Susan G Komen for the Cure	SAC160074	7/15/16	7/14/19	Identification of the Genetic Drivers of HER2-Enriched Subtype Breast Cancers	$200,000
Investment (HTS, CBCS, MP1U)	Perou	Charles	NIH National Cancer Institute	5-F32-CA210427-02	8/1/16	7/31/19	FELLOW:D HOLLERN Identifying Effective Immune Checkpoint Therapy Strategies in Triple Negative Breast Cancer	$56,694
Investment (HTS, CBCS, MP1U)	Perou	Charles	Susan G Komen for the Cure	PDF16378265	8/6/16	4/30/18	Subtype-specific Causes of Resistance to HER2 Therapy in Patients and Xenografts	$60,000
Investment (HTS)	Perou	Charles	Johns Hopkins University	2003125644	8/23/16	8/22/18	TBCRC: aurora genome characterization center related project 5106566	$94,320
Investment (HTS, CBCS, MP1U)	Perou	Charles	Breast Cancer Research Foundation	2003125644	8/23/16	8/22/18	TBCRC: aurora genome characterization center related to 4100452	$93,162
Investment (HTS)	Perou	Charles	Baylor College of Medicine	7000000410	6/7/17	5/31/22	microscaled proteogenomics for cancer clinical trials	$33,696
Investment (HTS, CBCS, MP1U)	Perou	Charles	Breast Cancer Research Foundation	BCRF-17-124	10/1/17	9/30/18	Molecular Therapeutics for Luminal Tumor Subtypes	$250,000
Investment (HTS, CBCS, MP1U)	Perou	Charles	Susan G Komen for the Cure	PDF17479425	10/4/17	10/3/20	Identification of Genetic Drivers in HER2-Enriched/HER2 negative Breast Cancer	$180,000
Recruitment	Phanstiel	Douglas	NIH National Human Genome Research Institute	5-R00-HG008662-03-04	9/2/16	11/30/19	The development and application of tools to characterize the 4D nucleome	$248,999
Recruitment	Pinton	Gianmarco	NIH National Institute of Neurological Disorders and Stroke	5-R01-NS091195-01-04	4/1/15	3/31/20	Shear shock wave propagation in the brain: high frame-rate ultrasound imaging, characterization, and simulations	$295,477
Recruitment	Pinton	Gianmarco	NIH National Institute of Neurological Disorders and Stroke	5-R01-NS091195-01-04	4/1/15	3/31/20	Shear shock wave propagation in the brain: high frame-rate ultrasound imaging, characterization, and simulations	$32,831
Recruitment	Pinton	Gianmarco	Duke University	203-5442	3/1/16	12/31/18	Improved ultrasound imaging using elevated acoustic output	$18,240
Investment (HTS)	Prins	Jan	NIH National Human Genome Research Institute	5-F31-HG008912-02	6/1/16	5/31/18	FELLOW:J WELCH Computational Modeling of Heterogeneous Gene Expression in Single Cells	$33,727
Recruitment	Purvis	Jeremy	WM Keck Foundation		7/1/15	6/30/19	Systematic Assembly of the Sequence of Molecular Events in the Human Cell Cycle	$296,338
Recruitment	Purvis	Jeremy	NIH National Heart, Lung, and Blood Institute	5-F31-HL134336-02	9/1/16	8/31/19	FELLOW:R HAGGERTY Single-cell dynamics of the OCT4-GATA6 axis in human lung progenitors	$32,111
Recruitment	Purvis	Jeremy	NIH National Institute of Child Health and Human Development	1-DP2-HD091800-01	9/30/16	6/30/21	Controlling Stem Cell Fate through Computational Modeling	$456,000
Recruitment	Purvis	Jeremy	NIH National Institute of Child Health and Human Development	3-DP2-HD091800-01S1	9/30/16	6/30/21	Controlling Stem Cell Fate through Computational Modeling	$54,769
Recruitment	Purvis	Jeremy	NIH National Cancer Institute	5-F30-CA213876-02	6/1/17	7/31/21	FELLOW:CHAO, HUI Defining the quantitative relationship between DNA damage and cell cycle dynamics in CUL9-deficient cells	$35,485
Recruitment	Pylayeva-Gupta	Yuliya	American Association for Cancer Research	13-70-25-PYLA	1/1/15	6/30/18	Immunomodulatory mechanisms in Kras-driven pancreatic cancer and metastasis	$125,358
Recruitment	Pylayeva-Gupta	Yuliya	American Association for Cancer Research	13-70-25-PYLA	1/1/15	6/30/18	Immunomodulatory mechanisms in Kras-driven pancreatic cancer and metastasis	$11,926
Recruitment	Pylayeva-Gupta	Yuliya	V Foundation for Cancer Research	V2016-016	11/1/16	11/1/18	Mechanisms of pancreatic cancer-driven re-programming of tumor promoting B lymphocytes	$200,000
Recruitment	Pylayeva-Gupta	Yuliya	Washington University in Saint Louis	WU-18-82	7/1/17	6/30/18	Role of Immunosuppressive B cells in Pancreatic Cancer	$25,000
Rentension	Ramsey	J	NIH National Human Genome Research Institute	3-R01-HG007407-04S1	8/1/16	5/31/19	Nanofluidic Platforms for High Resolution Mapping of Genomic DNA	$384,604
Recruitment	Rashid	Naim	Fred Hutchinson Cancer Research Center	0000905066	5/1/16	8/30/18	Statistical Methods for RNA-seq Data Analysis	$68,110

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Recruitment	Rashid	Naim	Fred Hutchinson Cancer Research Center	0000905066	5/1/16	8/30/18	Statistical Methods for RNA-seq Data Analysis	$2,160
Recruitment	Rashid	Naim	Fred Hutchinson Cancer Research Center	0000905066	5/1/16	8/30/18	Statistical Methods for RNA-seq Data Analysis	$14,853
Innovation Award	Redinbo	Matthew	NIH National Cancer Institute	5-R01-CA098468-11-14	9/23/14	8/31/19	Improving CPT-11 Efficacy Using Structural and Chemical Biology	$263,899
Innovation Award	Redinbo	Matthew	NIH National Cancer Institute	5-R01-CA207416-01-02	8/1/16	7/31/19	Microbiome-Targeted Probes to Eliminate Chemotherapy-Induced GI Toxicity	$596,764
Recruitment	Reeder-Hayes	Katie	Alliance for Clinical Trials in Oncology Foundation		1/1/17	12/31/18	Effects of Gene Expression Profiling on Racial Disparities in Breast Cancer Outcomes	$44,000
Recruitment	Reeder-Hayes	Katie	Lung Cancer Initiative of North Carolina		7/2/18	6/28/19	Patterns and Predictors of Unplanned Emergency Department Visits and Readmissions in Patients with Newly Diagnosed Lung Cancer	$25,000
Recruitment	Reeves	Brandi	Janssen Research Development, LLC		8/10/16	6/30/22	Phase 2, Randomized, Open-Label Study Comparing Daratumumab, Lenalidomide, Bortezomib, and Dexamethasone (D-RVd) Versus Lenalidomide, Bortezomib, and Dexamethasone (RVd) in Subjects With Newly Diagnosed Multiple Myeloma Eligible for High-Dose Chemotherapy and Autologous Stem Cell Transplantation	$309,670
Retention	Ribisl	Kurt	NIH National Cancer Institute	5-P50-CA180907-04-05	9/19/13	8/31/19	Effective Communication on Tobacco Product Risk and FDA Authority	$3,877,182
Retention	Ribisl	Kurt	NIH National Cancer Institute	2-T32-CA057726-26	7/1/17	6/30/22	Cancer Control Education Program	$334,634
Retention	Ribisl	Kurt	NIH National Cancer Institute	2-T32-CA057726-26	7/1/17	6/30/22	Cancer Control Education Program	$2,527
Retention	Ribisl	Kurt	University of Connecticut Health Center	UCHC91522216	9/1/17	8/31/18	UCONN Health Personal Service Agreement - UCHC91522216	$77,138
Recruitment	Riches	Marcie	Novartis		4/25/16	9/30/18	A randomized, open label, controlled, multiple dose study to evaluate the clinical efficacy, safety, tolerability, pharmacokinetics and pharmacodynamics of LFG316 in patients with transplant associated microangiopathy after hematopoietic precursor cell	$4,327
Recruitment	Riches	Marcie	Atara Biotherapeutics, Inc.		2/3/17	12/18/20	Multicenter Expanded Access Protocol of Allogeneic Epstein-Barr Virus Cytotoxic T Lymphocytes (EBV-CTLs) for Patients with EBV-Associated Lymphomas and Lymphoproliferative Disorders in Immunocompromised Patients for Whom There are No Other Comparable Options	$7,500
Recruitment	Riches	Marcie	Atara Biotherapeutics, Inc.		5/19/17	2/19/20	EBV-CTL 301 Multicenter, Open-Label, Phase 3 Trial of Allogeneic Epstein-Barr Virus Cytotoxic T Lymphocytes (EBV-CTLs) for Allogeneic Hematopoietic Cell Transplant (alloHCT) Patients with EBV-Associated Post-Transplant Lymphoproliferative Disease (EBV-PTLD) after Failure of Rituximab	$13,795
Recruitment	Robinson	Whitney	NIH National Cancer Institute	5-R03-CA212720-01-02	1/12/17	12/31/18	Resolving the obesity paradox in kidney cancer	$75,807
Recruitment	Robinson	Whitney	NIH National Cancer Institute	5-R03-CA212720-01-02	1/12/17	12/31/18	Resolving the obesity paradox in kidney cancer	$8,424
Recruitment	Robinson	Whitney	Robert Wood Johnson Foundation	74819	9/1/17	8/31/22	2017 Health Policy Research Scholars	$30,000
Recruitment	Robinson	Whitney	NIH National Institute on Minority Health and Health Disparities	1-R01-MD011680-01	9/26/17	6/30/22	Racial Differences in Treatment with Hysterectomy: a Multilevel Investigation	$602,883
Recruitment	Rose	Tracy	X4 Pharmaceuticals Inc.		2/27/17	3/15/19	A Phase 1b/2a Trial Adding X4P-001 in Patients Receiving Nivolumab for Treatment of Advanced Clear Cell Renal Cell Carcinoma	$40,840
Recruitment	Rose	Tracy	Bladder Cancer Advocacy Network		7/15/17	7/14/18	Defining the Immune Response to Chemotherapy and Chemo-Immunotherapy in Muscle-Invasive Bladder Cancer	$50,000
Recruitment	Rose	Tracy	Genentech, Inc.		6/9/17	6/30/22	A phase III, multi center, randomized, placebo-controlled, double-blind study of atezolizumab (anti PD1-LI antibody) as adjuvant therapy in patients with renal cell carcinoma at high risk of developing metastasis following nephrectomy	$26,719
Innovation Award	Rosenman	Julian	NIH National Cancer Institute	5-R01-CA158925-06	4/1/13	3/31/19	Integration of Endoscopic and CT data for Radiation Therapy Treatment Planning	$245,857
Recruitment	Rosenstein	Donald	Rising Tide Foundation for Clinical Cancer Research	CCR-17-300/513305	7/1/17	6/30/20	Thiamine for the Prevention of Delirium in Hematopoietic Stem Cell Transplantation	$32,318
Investment (HTS)	Sancar	Aziz	NIH National Institute of General Medical Sciences	5-R35-GM118102-01-03	4/1/16	3/31/21	Molecular Mechanism of Mammalian DNA Excision Repair, DNA Damage Checkpoints, and the Circadian Clock	$98,015
Investment (HTS)	Sancar	Aziz	NIH National Institute of Environmental Health Sciences	5-R01-ES027255-01-02	8/1/16	7/31/21	Single Nucleotide Resolution Map of Formation and Repair of Bulky Adducts in the Human Genome	$468,393

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Recruitment	Sanoff	Hanna	H Lee Moffitt Cancer and Research Institute		4/28/15	4/27/18	Multi institutional phase II trial of single agent regorafenib in refractory advanced biliary cancers.	$26,784
Recruitment	Sanoff	Hanna	Merck Sharp and Dohme		6/1/15	5/31/18	A Phase II Clinical Trial of Pembrolizumab as Monotherapy and in Combination with Cisplatin+5-Fluorouracil in Subjects with Recurrent or Metastatic Gastric or Gastroesophageal Junction Adenocarcinoma	$748
Recruitment	Savoldo	Barbara	NIH National Heart, Lung, and Blood Institute	5-R01-HL114564-03-05	9/1/13	6/30/19	Enhancement of stem cell transplants using CAR.CD30-redirected T lymphocytes	$447,090
Recruitment	Savoldo	Barbara	Hyundai Hope on Wheels		9/26/16	12/31/18	New generation Chimeric Antigen Receptor (CAR)-based cell therapy for Neuroblastoma	$125,000
Recruitment	Savoldo	Barbara	Leukemia and Lymphoma Society	6536-18	10/1/17	9/30/20	Exploiting the inducible Caspase9 to pharmacologically modulate CD19.CAR-T cell function in vivo	$200,000
Recruitment	Savoldo	Barbara	V Foundation for Cancer Research	T2017-006	11/1/17	11/1/20	Exploiting the inducible Caspase9 safety switch to pharmacologically modulate CD19.CAR-T cell function in vivo	$200,000
Retention	Schoenfisch	Mark	NIH National Institute of Dental and Craniofacial Research	5-R01-DE025207-01-03	7/2/15	4/30/20	Nitric oxide-releasing dendrimers for the treatment of periodontal disease	$30,991
Retention	Schoenfisch	Mark	NIH National Institute of Dental and Craniofacial Research	5-R01-DE025207-01-04	7/2/15	4/30/20	Nitric oxide-releasing dendrimers for the treatment of periodontal disease	$309,913
Retention	Schoenfisch	Mark	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-R01-DK108318-01-03	12/1/15	11/30/19	Role of diabetes and nitric oxide release duration on analytical performance of in vivo glucose biosensors	$54,441
Retention	Schoenfisch	Mark	KNOW Bio, LLC		1/1/18	12/31/22	Synthesis and Characterization of Next Generation Nitric Oxide-Releasing Biopolymers	$200,000
Innovation Award	Sekelsky	Jeff	NIH National Institute of General Medical Sciences	5-R35-GM118127-01-03	6/1/16	5/31/21	Mechanisms of meiotic and mitotic recombination	$520,113
Retention	Serody	Jonathan	Merck Sharp and Dohme Corp.	54830	12/15/16	12/14/19	Immune Biomarker Analysis of Pembrolizumab in Triple Negative Breast Cancer	$301,104
Retention	Serody	Jonathan	Merck Sharp and Dohme Corp.	54829	12/15/16	12/14/19	Correlative study of the activity of pembrolizumab in combination with gemcitabine and cisplatin as neoadjuvant therapy prior to radical cystectomy in patients with muscle-invasive urothelial carcinoma of the bladder	$264,352
Retention	Serody	Jonathan	Merck Sharp and Dohme Corp.	54823	12/15/16	12/14/19	Immune Biomarker Analysis of Pembrolizumab in AML	$281,310
Retention	Serody	Jonathan	Merck Sharp and Dohme Corp.	53851	12/1/16	11/30/19	Master Biomarker Plan for Pembrolizumab Clinical Trial Subjects	$66,561
Retention	Serody	Jonathan	NIH National Cancer Institute	1-T32-CA211056-01A1	8/1/17	7/31/22	Duke UNC-Chapel Hill Immunotherapy Training Grant	$470,297
Retention	Serody	Jonathan	NIH National Heart, Lung, and Blood Institute	1-R01-HL139730-01A1	7/15/17	5/31/21	Mechanistic Evaluations of ILC2 Cells for the Treatment/Prevention of GVHD	$543,763
Retention	Serody	Jonathan	GlaxoSmithKline Biologicals S.A.		12/18/17	6/1/20	GSK NTHI-MCAT-002	$15,200
Retention	Serody	Jonathan	University of Minnesota	N006335101	10/1/17	9/30/20	Innate Lymphoid Cell Type 2 Infusion for Graft-versus-Host Disease (GVHD) Prevention and Treatment	$100,000
Retention	Serody	Jonathan	NIH National Cancer Institute	1-F30-CA225136-01	2/13/18	2/12/23	FELLOW:CHRISTOF SMITH Design and Delivery of Neoantigen-based Tumor Vaccines	$35,693
Retention	Shaheen	Nicholas	CSA Medical, Inc.		3/21/13	3/31/19	CSA 003 truFreeze Spray Cryotherapy Patient Registry	$5,120
Retention	Shaheen	Nicholas	University of Texas MD Anderson Cancer Center	PO#3000602118/000033	6/15/15	6/14/19	Effect of Asprin on Biomarkers of Barrett's Esophagus After Successful Eradication of Barrrtt'sEsophagus with Radiofrequency Ablation	$5,334
Retention	Shaheen	Nicholas	C2 Therapeutics		1/27/16	1/26/20	Coldplay 3:: Multi-Center Clinical Study to Evaluate the Coldplay CryoBalloon Focal Ablation System for the Treatment of Patients with with Previously-Untreated Dysplastic Barrett's Epithelium	$57,248
Retention	Shaheen	Nicholas	National Institute of Diabetes, Digestive and Kidney Diseases	5-T35-DK007386-38	5/1/80	2/28/21	Short Term Research Training	$128,139
Retention	Shaheen	Nicholas	CDx Diagnostics		8/8/16	8/7/26	CDX 707 WATS Registry Services Agreement	$53,200
Retention	Shaheen	Nicholas	NIH National Institute of Diabetes, Digestive, and Kidney Diseases	5-K24-DK100548-04-05	9/17/13	8/31/18	Non-Endoscopic Surveillance for Barrett's Esophagus Following Ablative Therapy	$176,961
Retention	Shaheen	Nicholas	C2 Therapeutics	C2T1	8/25/16	6/30/19	C2 Services Agreement	$29,732
Retention	Shaheen	Nicholas	EndoStim, Inc.		8/19/16	8/18/22	Mltcntr, Random, Dbl-Blind, Sham-Control Clinical Investigation of the EndoStim® Lower Esophageal Sphincter (LES) Stimulation System for the Treatment of Gastroesophageal Reflux Disease (GERD), Protocol # CS-100	$227,464
Retention	Shaheen	Nicholas	Boston Scientific Corporation		8/24/16	8/23/19	An International, Multicenter, Prospective, Post Market Registry Using a New Device for Endoscopic Resection of Early Neoplasia in Barrett's Esophagus - The Captivator™ EMR Registry	$10,181

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Retention	Shaheen	Nicholas	Duke University	203-6050	12/13/16	11/30/18	Imaging and Biomarkers for Early Cancer Detection (R01)	$172,552
Retention	Shaheen	Nicholas	Case Western Reserve University	RES512160	5/17/17	4/30/18	Genetic Determinants of Barrett's Esophagus and Esophageal Adenocarcinoma	$42,560
Retention	Shaheen	Nicholas	CSA Medical, Inc.		11/2/17	10/31/22	A Prospective Single Arm Multicenter Study Evaluating the Effects of Spray Cryotherapy in Patients with Persistent Local Esophageal Cancer	$26,240
Investment (Protocol)	Shea	Thomas	Novartis Pharmaceuticals Corporation		9/17/07	10/1/18	CAMN107A2303 A phase III multi-center, open-label, randomized study of imatin	$7,027
Investment (Protocol)	Shea	Thomas	GlaxoSmithKline , Inc.		1/28/13	6/30/18	115523 (ZOSTER-2) A phase III, randomized, observer-blind, placebo-controlled, multicenter, clinical trial to assess the prophylactic efficacy, safety, and immunogenicity of GSK Biologicals? herpes zoster gE/AS01B candidate vaccine when administered intramuscularly on a two-dose schedule to adult autologous haematopoietic stem cell transplant (HCT) recipients	$12,921
Investment (Protocol)	Shea	Thomas	Novartis Pharmaceuticals Corporation		8/31/14	12/31/18	A Phase II, randomized, comparative trial of standard of care, with or without midostaurin to prevent relapse following allogeneic hematopoletic stem cell transplantation in patients wiht FLT3-ITD mutated acute myeloid Leukemia	$250
Investment (Protocol)	Shea	Thomas	Ohio State University		10/5/16	10/13/21	BMT CTN 1301: A Randomized, Multi-Center, Phase III Trial of Calcineurin Inhibitor-FreeInterventions for Prevention of Graft-versus-Host Disease	$18,000
Investment (Protocol)	Shea	Thomas	Pharmacyclics LLC		3/27/17	2/28/21	PCYC-1140-IM A Randomized, Double-Blind Phase 3 Study of Ibrutinib in Combination With Corticosteroids versus Placebo in Combination With Corticosteroids in Subjects with New Onset Chronic Graft Versus Host Disease (cGVHD)	$17,601
Investment (Protocol)	Shea	Thomas	Washington University in Saint Louis		4/4/17	1/14/19	HRPO #: 201312100 GNOS A Blinded, Prospective Non-Interventional Observational Study for the Evaluation of a GVHD Negative Outcome Score (GNOS) in Matched Unrelated or Haploidentical Hematopoietic Stem Cell Transplant	$8,900
Investment (Protocol)	Shea	Thomas	Teva Pharmaceutical Industries Ltd.		4/28/17	5/31/19	A Single-Arm Study of the Effect of a 5-day Regimen of Tbo-Filgrastim 10 ?g/kg of BodyWeight Administered Subcutaneously on Peripheral Stem Cell Mobilization in HealthyDonors	$8,571
Investment (Protocol)	Shea	Thomas	Baxalta Incorporated		1/27/17	1/31/18	PROTOCOL IDENTIFIER: CT2/3-GVHD-IV-Multi-Center-KAM/BAX; 471501 A Two-Part, Multi-Center, Prospective, Phase 2/3 Clinical Study to Evaluate the Safety and Efficacy of GLASSIA as an Add-On Biopharmacotherapy to Conventional Steroid Treatment in Subjects with Acute Graft-Versus-HostDisease with Lower Gastrointestinal Involvement	$167
Investment Outreach	Shea	Thomas	Duke Endowment	6650-SP	5/2/17	5/1/20	Improving Cancer Outcomes in North Carolina with Lay Patient Navigation	$200,000
Retention	Shen	Dinggang	NIH National Institute on Aging	5-R01-AG041721-04-07	4/1/12	3/31/20	Quantifying Brain Abnormality by Multimodality Neuroimage Analysis	$350,863
Retention	Shen	Dinggang	University of Texas at Arlington	2616022661	9/1/15	4/30/20	Imaging Genomics based Brain Disease Prediction	$215,170
Retention	Shen	Dinggang	NIH National Cancer Institute	5-R01-CA206100-01-02	9/1/16	7/31/21	Automatic Pelvic Organ Delineation in Prostate Cancer Treatment	$347,700
Retention	Shen	Dinggang	NIH National Institute on Aging	1-RF1-AG053867-01A1	9/30/16	6/30/21	Analyzing Large-Scale Neuroimaging Data in Alzheimer's Disease	$2,485,857
Retention	Shen	Dinggang	NIH National Institute of Biomedical Imaging and Bioengineering	2-R01-EB006733-08	9/17/08	5/31/21	Development of Robust Brain Measurement Tools Informed by Ultrahigh Field 7T MRI	$481,714
Recruitment	Smith	Jennifer	NIH National Cancer Institute	5-R01-CA183891-01-04	4/9/15	3/31/20	Effect of HPV Self-Collection on Cervical Cancer Screening in High Risk Women	$536,620
Recruitment	Smith	Jennifer	NIH National Cancer Institute	5-R01-CA183891-01-04	4/9/15	3/31/20	Effect of HPV Self-Collection on Cervical Cancer Screening in High Risk Women	$59,624
Recruitment	Smith	Angie	Agency for Healthcare Research and Quality	5-K08-HS024134-03	4/1/16	3/31/19	Developing an Interactive, Patient-Centered mHealth Tool to Enhance Post-Cystectomy Care	$154,464
Recruitment	Smith	Angie	UroGen Pharma		11/1/16	9/14/19	A phase 3 Multi-center Trial Evaluating the Efficacy and Safety of Mitogel on Ablation of Upper Urinary Tract Urothelial Carcinoma	$20,780
Recruitment	Smith	Angie	Bladder Cancer Advocacy Network		7/1/17	6/30/19	Patient Empowerment through Research Training and Engagement in Bladder Cancer PCOR	$35,281
Innovation Award	Sondek	John	NIH National Institute of General Medical Sciences	5-R01-GM120291-01-02	9/15/16	7/31/20	Inhibition of GTPases and G proteins to treat human disease	$358,307
Recruitment	Song	Paula	Patient-Centered Outcomes Research Institute	IHS-1310-07863	9/1/14	7/31/18	Improving Care Coordination for Children with Disabilities Through an Accountable Care Organization	$47,243
Recruitment	Song	Lixin (Lee)	NIH National Cancer Institute	5-R21-CA212516-01-02	12/1/16	11/30/18	Enhancing Survivorship Care Planning for Patients with Localized Prostate Cancer Using A Couple-focused Web-based Tailored Symptom Self-management Program	$148,770
Recruitment	Song	Lixin (Lee)	NIH National Institute of Nursing Research	1-R01-NR016990-01A1	9/25/17	6/30/22	Testing the Efficacy of a Couple-focused, Tailored mHealth Intervention for Symptom Self-Management among Men with Prostate Cancer and Their Partners	$544,248

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Innovation Award	Strahl	Brian	NIH National Institute of General Medical Sciences	5-R01-GM110058-01-04	6/1/14	2/28/19	Factors that regulate chromatin organization and gene transcription	$257,583
Innovation Award	Strahl	Brian	NIH National Institute of General Medical Sciences	5-R01-GM110058-01-04	6/1/14	2/28/19	Factors that regulate chromatin organization and gene transcription	$28,621
Innovation Award	Strahl	Brian	NIH National Institute of General Medical Sciences	5-F31-GM122321-02	12/1/16	11/30/18	FELLOW: A. LERNER Elucidating dynamics and function of histone H3 lysine 36 methylation and demethylation using optogenetic tools	$34,347
Innovation Award	Strahl	Brian	NIH National Institute of General Medical Sciences	2-R01-GM068088-12A1	5/1/03	4/30/18	Role of Set2 and H3 methylation in chromatin function	$334,207
Innovation Award	Strahl	Brian	NIH National Institute of General Medical Sciences	3-R01-GM068088-12A1S1	5/1/03	4/30/18	Role of Set2 and H3 methylation in chromatin function	$55,000
Innovation Award	Strahl	Brian	NIH National Institute of General Medical Sciences	1-R35-GM126900-01	5/1/18	4/30/23	Mechanisms of chromatin and transcriptional regulation	$638,875
Innovation Award	Stürmer	Til	NIH National Institute on Aging	1-R01-AG056479-01	9/15/17	4/30/21	Propensity Scores and Preventive Drug Use in the Elderly	$504,274
Innovation Award	Stürmer	Til	NIH National Institute on Aging	5-R01-AG056479-01-02	9/15/17	4/30/21	Propensity Scores and Preventive Drug Use in the Elderly	$484,066
Innovation Award	Stürmer	Til	Bioventus, LLC		12/8/17	12/7/18	Quantifying the effectiveness of the EXOGEN ultrasound fracture healing device in mitigating the risk of progression to fracture non-union in patients at risk	$96,000
Investment (HTS)	Sullivan	Patrick	Virginia Commonwealth University	PD303148-SC104511	9/1/13	6/30/18	A longitudinal methylome study to detect biomarkers predicting MDD trajectories	$94,829
Investment (HTS)	Sullivan	Patrick	Duke University	2034233	9/19/14	5/31/19	Decoding schizophrenia-From GWAS to functional regulatory variants	$90,279
Investment (HTS)	Sullivan	Patrick	Karolinska Institute	ZZC8ANALMQ	11/1/15	12/31/24	An International Effort to Advance Knowledge of Schizophrenia	$229,139
Investment (HTS)	Sullivan	Patrick	NIH National Institute of Mental Health	5-R01-MH077139-07-10	4/1/06	4/30/19	1/2 A Large-Scale Schizophrenia Association Study in Sweden	$985,429
Investment (HTS)	Sullivan	Patrick	NIH National Institute of Mental Health	3-U01-MH109528-02S1	4/1/16	3/31/21	1/7 Psychiatric Genomics Consortium: Finding actionable variation	$99,000
Investment (HTS)	Sullivan	Patrick	NIH National Institute of Mental Health	5-U01-MH109528-01-02	4/1/16	3/31/21	1/7 Psychiatric Genomics Consortium: Finding actionable variation	$43,091
Investment (HTS)	Sullivan	Patrick	NIH National Institute of Mental Health	5-U01-MH109528-03	4/1/16	3/31/21	1/7 Psychiatric Genomics Consortium: Finding actionable variation	$430,909
Investment (HTS)	Sullivan	Patrick	Lundbeck Research USA, Inc.		8/10/17	1/1/19	The Genomics of Treatment-Resistant Psychosis	$710,000
Investment (HTS)	Swanstrom	Ronald	University of Massachusetts	WA00615827/ OSP2017046	9/1/14	7/31/19	Interdependency of Drug Resistance Evolution and Drug Design: HIV-1 Protease a Case Study	$243,054
Investment (HTS)	Swanstrom	Ronald	University of Cape Town		2/1/15	1/31/19	Timing of the Establishment of Latent Infection in Subtype C Infected Women	$149,436
Investment (HTS)	Swanstrom	Ronald	University of California at San Francisco	9091SC	9/30/15	7/31/20	Compartmentalized CSF Viral Escape and the CNS HIV Reservoir	$294,171
Investment (HTS)	Swanstrom	Ronald	NIH National Institute of Allergy and Infectious Diseases	5-P30-AI050410-19-20	8/20/01	7/31/21	The University of North Carolina Center for AIDS Research	$2,729,963
Investment (HTS)	Swanstrom	Ronald	NIH National Institute of Allergy and Infectious Diseases	1-R21-AI134438-01	7/17/17	6/30/19	Identifying a New Class of HIV Maturation Inhibitors	$194,375
Investment (CC)	Tarantino	Lisa	Jackson Laboratory		8/15/16	4/30/21	Center for Excellence	$124,890
Investment (CC)	Tarantino	Lisa	Jackson Laboratory		8/15/16	4/30/21	Center for Excellence	$51,666
Investment (CC)	Tarantino	Lisa	Jackson Laboratory	210247-0418-07	8/15/16	4/30/21	Center for Excellence	$177,228
Investment (CHAI Core)	Tate	Deborah	University of Pittsburgh	0041597 (130470-1)	12/1/16	11/23/18	Identifying Strategies for Effective Weight Management in Diverse Interventions	$123,526
Investment (CHAI Core)	Tate	Deborah	Miriam Hospital	710-9144	9/1/15	5/31/19	Study of Novel Approaches to Weight Gain Prevention - Extension (SNAP-E)	$249,845

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Investment (CHAI Core)	Tate	Deborah	Miriam Hospital	710-9144	9/1/15	5/31/19	Study of Novel Approaches to Weight Gain Prevention - Extension (SNAP-E)	$26,878
Investment (CHAI Core)	Tate	Deborah	Weight Watchers International, Inc		1/17/17	10/30/18	Evaluation of an Online Commercial Program on Weight Loss and Health Outcomes	$269,678
Investment (CHAI Core)	Tate	Deborah	The Obesity Society		12/14/17	12/13/18	Mobile Methods for Reducing Obesity Risk in Parents and Preschool Children	$50,000
Investment (CHAI Core)	Tate	Deborah	University of Michigan Board of Regents	3004941494	12/1/17	7/31/18	Adaptation of a digital weight loss intervention promoting self-regulation for use in type 2 diabetes	$49,869
Retention	Thomas	Nancy	University of New Mexico at Albuquerque	3RCQ4	6/1/17	5/31/22	Primary Melanoma DNA Methylation Profiling for Evaluating Subtypes and Survival (UNC)Integration of Clinical and Molecular Biomarkers for Melanoma Survival (UNM)	$448,102
Recruitment	Thompson	Patrick	H Lee Moffitt Cancer and Research Institute		3/14/18	2/28/22	Phase II Study of nab-Paclitaxel in Combination with Gemcitabine for Treatment of Recurrent/Refractory Sarcoma in Teenagers and Young Adults	$3,877
Retention	Ting	Jenny	Duke University Medical Center	2036404	8/1/10	7/31/18	Inflammation and Radiation-Induced Lung Injury	$300,634
Retention	Ting	Jenny	NIH National Institute of Allergy and Infectious Diseases	5-U19-AI109965-05	3/1/14	2/28/19	Discovery of New Innate Immune Pathways in Viral Recognition	$2,863,677
Retention	Ting	Jenny	NIH National Institute of Allergy and Infectious Diseases	5-U19-AI109784-01-04	7/1/14	6/30/19	Novel Nanoparticle Platform for the Delivery of Vaccines and Adjuvants	$4,136,700
Retention	Ting	Jenny	NIH National Institute of Allergy and Infectious Diseases	5-U19-AI109784-01-04	7/1/14	6/30/19	Novel Nanoparticle Platform for the Delivery of Vaccines and Adjuvants	$529,300
Retention	Ting	Jenny	NIH National Cancer Institute	2-R01-CA156330-06A1	5/1/11	7/31/22	Colitis, Colon Cancer and the NLR Family	$383,978
Retention	Ting	Jenny	NIH National Cancer Institute	1-F99-CA223019-01	9/18/17	8/31/19	FELLOW:N CHENG Particulate Delivery of STING Agonist as Anti-cancer Immuotherapeutics and Cancer Microbiome	$38,879
Retention	Ting	Jenny	North Carolina Biotechnology Center	2018-BIG-6504	1/1/18	12/31/18	Advancement of Immunotherapeutic Formulation for Breast Cancer	$68,000
Recruitment	Troester	Melissa	NIH National Cancer Institute	5-U01-CA179715-01-05	6/1/14	5/31/19	Biology of Race and Progression Associated Breast Tumor Gene Expression	$313,159
Recruitment	Troester	Melissa	National Institute of Environmental Health Sciences	3-P30-ES010126-16S1	2/1/00	3/31/21	UNC Center for Environmental Health and Susceptibility	$46,650
Recruitment	Troester	Melissa	National Institute of Environmental Health Sciences	5-P30-ES010126-17	2/1/00	3/31/21	UNC Center for Environmental Health and Susceptibility	$1,506,662
Recruitment	Troester	Melissa	Susan G Komen for the Cure	GTDR16381071	8/5/16	8/4/19	Breast Cancer Mortality Disparities: Integrating Biology and Access	$135,000
Recruitment	Troester	Melissa	Leidos Biomedical Research, Inc.	X17346M	8/17/17	9/29/18	Blanket Purchase Agreement for Testing Services and Nucleic Acid Extraction	$1,000,000
Recruitment	Troester	Melissa	American Cancer Society	48195	8/23/17	12/31/18	Gene Expression Profiling of Breast Tumors from Cancer Prevention Study 3	$247,975
Recruitment	Troester	Melissa	Michigan State University	RC108247UNC	11/1/17	6/30/18	Translating Rodent Mammary Structure to Human Breast Density: Comparative Digital Analysis of Histology	$38,197
Recruitment	Trogdon	Justin	Centers for Disease Control and Prevention	15IPA1504755	7/1/15	8/31/18	Justin Trogdon IPA to CDC 070115 through 063016	$37,844
Recruitment	Trogdon	Justin	NIH National Institute on Aging	5-R01-AG050733-01-02	9/1/16	5/31/19	Cancer, Care Coordination, and Medication Use for Multiple Chronic Conditions	$186,960
Recruitment	Trogdon	Justin	Robert Wood Johnson Foundation	73923	9/1/16	8/31/21	RWJF Health Policy Research Scholar	$30,000
Recruitment	Tuchman	Sascha	Prothena Therapeutics Limited		3/16/16	3/15/19	A Phase 3, Randomized, Multicenter, Double-Blind, Placebo-Controlled, 2-Arm, Efficacy and Safety Study of NEOD001 Plus Standard of Care vs. Placebo Plus Standard of Care in Subjects with Light Chain (AL) Amyloidosis	$34,895
Recruitment	Tuchman	Sascha	Merck Sharp and Dohme Corp.		2/15/17	2/28/19	A Phase III Study of Lenalidomide and Low-Dose Dexamethasone With or Without Pembrolizumab (MK3475) in Newly Diagnosed and Treatment Naïve Multiple Myeloma (KEYNOTE 185).	$19,920
Recruitment	Tuchman	Sascha	Roche		6/8/17	6/30/22	Open-label, multicenter, dose-escalation/expansion phase Ib study to evaluate safety, pharmacokinetics, and activity of BET inhibitor R06870010, given as mono- and combination therapy to patients with advanced multiple myeloma	$22,920
Recruitment	Tuchman	Sascha	Karyopharm Therapeutics Inc		10/12/17	9/23/22	A Phase 2b, Open-Label, Single-Arm Study of Selinexor (KPT-330) Plus Low-Dose Dexamethasone (Sd) in Patients with Multiple Myeloma Previously Treated with Lenalidomide, Pomalidomide, Bortezomib, Carfilzomib, and Daratumumab, and Refractory to Prior Treatment with Glucocorticoids, an Immunomodulatory Agent, a Proteasome Inhibitor, and the anti-CD38 mAb Daratumumab	$69,853
Recruitment	Valdar	William	Pharmaceutical Research and Manufacturers of America Foundation		1/1/16	12/31/17	DANIEL OREPER Methods to identify parent-of-origin effects on behavior via reciprocal mouse crosses	$40,000

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Recruitment	Valdar	William	NIH National Institute of Mental	5-F30-MH108265-02	8/1/16	7/31/19	FELLOW:CORTY, R Statistical modeling of genetic effects on behavior and its variability	$39,548
Recruitment	Valdar	William	University of Colorado Denver	FY17.878.001/ PO1000836258	2/17/17	11/30/18	The interplay between genes and environment on cardiovascular disease phenotypes	$43,858
Recruitment	Valdar	William	University of Colorado Denver	FY17.878.001/	2/17/17	11/30/18	The interplay between genes and environment on cardiovascular disease phenotypes	$26,000
Recruitment	Valdar	William	Wake Forest University School of Medicine	WFUHS113519	8/1/17	6/30/18	Systems genetics of adiposity traits in outbred rats	$55,366
Recruitment	Valdar	William	NIH National Institute of General Medical Sciences	1-R35-GM127000-01	4/1/18	5/31/23	Statistical Modeling of Multiparental and Genetic Reference Populations	$336,445
Recruitment	Valle	Carmina	NIH National Cancer Institute	5-R01-CA204965-01-02	2/7/17	1/31/21	Promoting Physical Activity in Young Adult Cancer Survivors Using mHealth and Adaptive Tailored Feedback Strategies	$555,618
Recruitment	Valle	Carmina	NIH National Cancer Institute	5-R01-CA204965-01-02	2/7/17	1/31/21	Promoting Physical Activity in Young Adult Cancer Survivors Using mHealth and Adaptive Tailored Feedback Strategies	$61,735
Recruitment	Valle	Carmina	Wake Forest University Health Sciences		1/1/17	12/31/18	mHealth Physical Activity Intervention for Survivors of Adolescent and Young Adult Cancers	$42,420
Recruitment	Van Duin	David	Duke University	203-8436	12/1/15	11/30/18	ARLG-CRaCKIeII	$86,158
Recruitment	Van Duin	David	Duke University	203-7732	12/1/15	11/30/18	ARLG-CRaCKIeII	$52,529
Recruitment	Van Duin	David	Duke University	207574/215728	6/6/16	7/6/17	Prospective Observational Study of the Risk Factors for Hospital-Acquired and Ventilator-Associated Bacterial Pneumonia (HABP/VABP)	$16,580
Recruitment	Van Duin	David	Rutgers the State University of New Jersey	8316	12/16/16	11/30/21	The molecular basis of the carbapenem resistance epidemic	$18,555
Recruitment	Van Duin	David	Rutgers the State University of New Jersey	8316	12/16/16	11/30/21	The molecular basis of the carbapenem resistance epidemic	$18,555
Recruitment	Van Duin	David	Duke University	235058	1/3/18	11/30/19	A Phase 2 Randomised, Double-blind, Placebo-controlled, Single-dose, Dose-ranging Study of the Efficacy and Safety of MEDI4893, a Human Monoclonal Antibody Against Staphylococcus aureus Alpha Toxin in Mechanically Ventilated Adult Subjects (SAATELLITE)	$19,000
Recruitment	Vaziri	Cyrus	NIH National Cancer Institute	1-R01-CA215347-01A1	2/1/18	1/31/23	Defining Mechanisms of Pathological Trans-Lesion Synthesis during Carcinogenesis	$518,457
Recruitment	Vincent	Benjamin	Pharmacyclics, Inc.		6/1/16	5/31/19	Prediction of Response and Rapid Development of Ibrutinib-based Combination in Genetically Engineered Mouse Models of Bladder, Breast and Melanoma	$84,929
Recruitment	Vincent	Benjamin	Susan G Komen for the Cure	CCR17483467	8/15/17	8/14/20	Improving Immunotherapy in Triple-Negative Breast Cancer	$150,000
Recruitment	Vincent	Benjamin	Vanderbilt University Medical Center	VUMC65676	4/1/18	3/31/19	Metabolic Barriers to T Cell Activation in Clear Cell Renal Cell Carcinoma	$44,413
Recruitment	Wan	Yisong	NIH National Institute of Allergy and Infectious Diseases	5-R01-AI123193-01-02	12/12/16	11/30/21	Functional protein networks underlying T cell growth, proliferation and differentiation	$377,975
Recruitment	Wang	Greg	Concern Foundation		7/1/14	7/15/17	The role of KDM5 histone lysine demethylases in leukemia and lymphoma	$60,000
Recruitment	Wang	Andrew	NIH National Cancer Institute	5-R01-CA178748-04-05	8/15/13	5/31/18	Nanoparticle formulations of DNA repair inhibitors to improve chemoradiotherapy	$312,079
Recruitment	Wang	Andrew	DOD DA Army Medical Research Acquisition Activity	W81XWH-16-1-0530	9/1/16	8/31/18	Tissue Engineered Cancer Metastasis to Improve the Abscopal Effect and Cancer Immunotherapy in Melanoma.	$302,451
Recruitment	Wang	Greg	American Cancer Society	RSG-16-039-01-DMC	7/1/16	6/30/20	Decipher PRC2 Dysregulation Mechanisms in Multiple Myeloma	$198,000
Recruitment	Wang	Greg	NIH National Cancer Institute	5-R01-CA211336-01-02	2/1/17	1/31/22	Cancer Epigenetics: A Novel PRC2 Dysregulation Mechanism in Multiple Myeloma	$351,578
Recruitment	Wang	Greg	NIH National Cancer Institute	5-R01-CA211336-01-02	2/1/17	1/31/22	Cancer Epigenetics: A Novel PRC2 Dysregulation Mechanism in Multiple Myeloma	$39,065
Recruitment	Wang	Greg	NIH National Cancer Institute	5-R01-CA215284-01-02	4/1/17	3/31/22	Determining the Role of DNA Methylation Deregulation in Oncogenesis	$313,726
Recruitment	Wang	Greg	NIH National Cancer Institute	5-R01-CA215284-01-02	4/1/17	3/31/22	Determining the Role of DNA Methylation Deregulation in Oncogenesis	$34,858
Recruitment	Wang	Greg	Gilead Sciences, Inc.		6/21/17	6/20/19	Decipher and target epigenetic dependency in acute myeloid leukemia with DNMT3A mutation	$65,000
Recruitment	Wang	Greg	Icahn School of Medicine at Mount Sinai	0255-3281-4609	6/8/17	5/31/19	Targeting Lysine Methyltransferases EZH2 and EZH1 for Treating MLL-rearranged Leukemias	$249,644
Recruitment	Wang	Greg	Leukemia and Lymphoma Society	1363-19	7/1/18	6/30/23	Decipher and Target AML Cell Dependency on Epigenetic Mutations	$110,000
Recruitment	Wang	Greg	When Everyone Survives Foundation		7/1/18	6/30/19	To understand and target epigenetic vulnerability in AML with DNMT3A somatic	$50,000
Innovation Award	Waters	Marcey	National Science Foundation	CHE-1608333	9/1/16	8/31/19	Development & Application of Synthetic Receptors For Methylated Lysine & Arginine For Methyltransferase Assays	$158,120
Innovation Award	Waters	Marcey	NIH National Institute of General Medical Sciences	1-R01-GM118499-01A1	9/1/17	8/31/21	Origins of Ligand Binding and Selectivity in Methyllysine Reader and Writer Proteins	$277,305

UCRF	Last Name	First Name	Sponsor	Number	Begin	End	Title	Total Cost $
Innovation Award	Waters	Marcey	EpiCypher, Inc.		1/1/18	7/31/19	SBIR: Developing an Unbiased Discovery Platform for Epigenetic Research	$50,000
Recruitment	Weiss	Jared	OSI Pharmaceuticals, Inc.		5/15/12	8/31/18	Phase II Study Of Stereotactic Radiosurgery or Other Local Ablation Followed by Erlotinib for Patients with EGFR Mutation Who Have Previously Progressed on an EGFR-TKI	$37,867
Recruitment	Weiss	Jared	Novartis Pharmaceuticals Corporation		6/26/12	6/25/22	LCCC 1125 Multimodality Risk Adapted Therapy including Carboplatin/Paclitaxel/Lapatinib as Induction for Squamous Cell Carcinoma of the Head and Neck Amenable to Transoral Surgical Approaches	$76,000
Recruitment	Weiss	Jared	Celgene Corporation		8/29/12	5/15/22	LCCC 1210 Second line treatment with nab-paclitaxel for the elderly patient with advanced lung cancer which has progressed on at least 1 prior regimenA	$67,421
Recruitment	Weiss	Jared	Pfizer, Inc.		8/27/13	8/26/19	Phase 1 Safety, Pharmacokinetic and Pharmacodynamic Study of PF-02341066, A C-Met/HGRF Selective Tyrosine Kinase Inhibitor, Administered Orally to Patients with Advanced Cancer	$3,066
Recruitment	Weiss	Jared	Merck Sharp and Dohme		3/23/15	3/22/18	A Phase II Clinical Trial of Single Agent Pembrolizumab (MK-3475) in Subjects withRecurrent or Metastatic Head and Neck Squamous Cell Carcinoma (HNSCC) Who HaveFailed Platinum and Cetuximab	$86,254
Recruitment	Weiss	Jared	Alliance Foundation Trials, LLC		4/14/15	4/13/18	A Phase I Dose Escalation and Phase 2 Randomized, Placebo-Controlled Study of the Efficacy and tolerability of Veliparib in Combination with Paclitaxel/Carboplatin-Based Chemoradiotherapy Followed by Veliparib and Paclitaxel/Carboplatin Consolidation in Subjects with Stage III Non-Small Cell Lung Cancer (NSCLC)	$2,390
Recruitment	Weiss	Jared	AstraZeneca Pharmaceuticals LP		1/14/16	1/13/19	A Phase III Randomized, Open-label, Multi-center, Global Study of MEDI4736 in Combination with Tremelimumab versus Standard of Care in the Treatment of First-line Recurrent or Metastatic Squamous Cell Head and Neck Cancer Patients	$53,148
Recruitment	Weiss	Jared	Merck Sharp and Dohme Corp.		12/7/15	12/7/19	Pembrolizumab and Radiation for Locally Advanced Squamous Cell Carcinoma of the Head and Neck (SCCHN) not Eligible for Cisplatin Therapy	$84,412
Recruitment	Weiss	Jared	G1 Therapeutics		1/29/16	1/30/26	Phase 1b/2a Safety and Pharmacokinetic Study of G1T28 in Patients with Extensive-Stage Small Cell Lung Cancer (SCLC) Receiving Etoposide and Carboplatin Chemotherapy	$7,177
Recruitment	Weiss	Jared	Merck Sharp and Dohme Corp.		5/26/16	6/6/18	A Randomized, Non-comparative Three Arm Phase II Trial of Sequential Consolidation with Pembrolizumab followed by Nab-paclitaxel, Sequential Consolidation with Nab-paclitaxel followed by Pembrolizumab and Concurrent Consolidation with Nab-paclitaxel and Pembrolizumab after Standard First-Line Induction Chemotherapy in Advanced	$366,341
Recruitment	Weiss	Jared	inVentiv Clinical LLC		10/19/16	10/18/18	A phase 1b study of PF-05082566 in combination with mogamulizumab KW-0761) in patients with advanced solid tumors	$37,026
Recruitment	Weiss	Jared	AstraZeneca Pharmaceuticals LP		4/28/17	8/31/22	Multimodality Therapy with Induction Carboplatin/nab-Paclitaxel/Durvalumab (MEDI4736) Followed by Surgical Resection and Risk-adapted Adjuvant Therapy for the Treatment of Locally-Advanced and Surgically Resectable Squamous Cell Carcinoma of	$128,375
Recruitment	Wheeler	Stephanie	Pfizer, Inc.		6/1/16	12/31/18	Developing a Medication Assistance Program for Uninsured and Underinsured Metastatic Breast Cancer Patients	$147,761
Recruitment	Williams	David	Virginia Commonwealth University	PD302900-SC-105276	7/1/13	5/31/18	Dissection of the structural basis of MEIG1 in assembling sperm flagella	$11,134
Recruitment	Williams	Scott	NIH National Institute of Dental and Craniofacial Research	5-K08-DE026537-01-02	9/12/16	8/31/21	Mechanisms of Oral Epithelial Differentiation	$89,580
Recruitment	Williams	Scott	NIH National Institute of Dental and Craniofacial Research	5-F31-DE026956-02	3/1/17	2/28/19	FELLOW: KENDALL LOUGH Cell-cell adhesion in regulation of mammalian palatogenesis	$33,223
Investment	Wiltshire	Tim	North Carolina State University	2015-3275-02	6/1/16	4/30/18	Systems Toxicogenomics of Endocrine Disrupting Chemicals in Brain	$100,729
Investment	Wiltshire	Tim	North Carolina State University	2011-2427-05	4/1/17	3/31/18	Genetic Etiology of Cancer Drug Response	$217,470
Investment	Wiltshire	Tim	American Heart Association	18PRE33960079	7/1/18	6/30/19	FELLOW:OLVIA DONG Pharmacogenomic Testing with DNA2RXTM in Cardiac Catheterization Laboratory Patients	$26,844
Recruitment	Wood	William	Incyte Corporation		9/18/17	12/31/20	A phase III randomized open-label multi-center study of ruxolitinib vs. best available therapy in patients with corticosteroid-refractory chronic graft vs host disease after allogenic stem cell transplantation (REACH 3)	$21,000
Recruitment	Woods	Michael	Medpace, Inc.		7/1/16	6/14/19	A Phase III, Open Label Study to Evaluate the Safety and Efficacy of INSTILADRIN (rAD-IFN/Syn3) Administered Intravesically to Patients with High Grade, BCG Unresponsive Non-Muscle Invasive Bladder Cancer (NMIBC)	$23,059

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Recruitment	Woods	Michael	MDxHealth Inc,		1/31/17	1/31/19	Prospective Validation of Prostate Bio markers for Repeat Biopsy:The PRIORITY Study	$11,530
Recruitment	Woods	Michael	MDxHealth Inc,		1/31/17	1/31/19	Multi-Institutional Study To Evaluate DNA Methylation Markers For Detection Of Primary Bladder Cancers In Urine Samples From A Cohort Of Patients With Hematuria	$20,930
Retention	Yeh	Jen Jen	NIH National Cancer Institute	5-R01-CA193650-01-03	5/1/15	7/31/20	The adaptive kinome in pancreatic cancer	$593,093
Retention	Yeh	Jen Jen	NIH National Cancer Institute	5-R01-CA199064-01-02	8/1/16	7/31/21	Tumor subtypes and therapy response in pancreatic cancer	$600,010
Retention	Yeh	Jen Jen	University of Rochester	416909-G	9/1/16	8/31/19	Targeting macrophages to improve chemotherapy in metastatic pancreas cancer.	$125,657
Retention	Yeh	Jen Jen	Princeton University	SUB0000166	9/15/16	8/31/18	Pathway and Network Integration of Cancer Genomics and Clinical Data	$91,000
Retention	Yeh	Jen Jen	NIH National Cancer Institute	1-F30-CA213916-01	7/1/17	6/30/20	FELLOW:M LIPNER FOLFOX-induced kinome reprogramming in pancreatic cancer tumor xenografts	$30,078
Recruitment	Zamboni	William	ChemoGLO, LLC		11/1/16	10/31/19	ChemoGLO - Service Agreement	$20,463
Recruitment	Zamboni	William	Glolytics, LLC		1/10/17	1/9/21	Glolytics Exploratory Analysis to Address Whether the Mononuclear Phagocyte System (MPS)	$82,152
Recruitment	Zamboni	William	ZY Therapeutics, Inc.		2/7/17	2/6/20	Separation and quantitation of ZY-010 drug forms in rat plasma (associated, released-protein bound and released-unbound paclitaxel) dual filter method	$42,310
Recruitment	Zamboni	William	Meryx, Inc.		2/1/18	2/1/19	Quantitation of MRX-2843 and metabolite M40 in plasma in a phase I does-escalation study of the safety, pharmacokinetic, and pharmacodynamics of MRX-2843 in adult subjects with relapsed/refractory advanced and/or metastatic solid tumors	$120,530
Recruitment	Zeidner	Joshua	Tolero Pharmaceuticals, Inc.		11/30/15	5/28/19	A Phase 2, Randomized, Biomarker-driven, Clinical Study in Patients with Relapsed or Refractory Acute Myeloid Leukemia (AML)	$83,682
Recruitment	Zeidner	Joshua	Merck Sharp and Dohme Corp.		12/18/15	9/30/20	Phase 2 Study of High Dose Cytarabine Followed by Pembrolizumab in Relapsed and Refractory Acute Myeloid Leukemia	$168,625
Recruitment	Zeidner	Joshua	Millennium Pharmaceuticals, Inc.	218558	8/22/16	8/21/18	A Ph 2, Random, Control Opn-Lbl, Clinical Stdy of the Efficacy & Safety of Pevonedistat Plus Azacitidine Versus Single-Agent Azacitidine in Patients With Higher-Risk Myelodysplastic Syndromes, Chronic Myelomonocytic Leukemia, and Low-Blast Acute Myelogenous Leukemia	$19,740
Recruitment	Zeidner	Joshua	Tolero Pharmaceuticals, Inc.		1/9/18	1/31/23	Phase 1, Open-label, Dose-escalation, Safety and Biomarker Prediction of Alvocidib and Cytarabine/Daunorubicin (7+3) in Patients with Newly Diagnosed Acute Myeloid Leukemia (AML)	$35,039
Recruitment	Zhang	Qi	NIH National Institute of General Medical Sciences	5-R01-GM114432-01-03	5/1/15	4/30/20	Riboswitch and Ribozyme Dynamics at Atomic Resolution	$28,592
Recruitment	Zhang	Qi	NIH National Institute of General Medical Sciences	5-R01-GM114432-01-04	5/1/15	4/30/20	Riboswitch and Ribozyme Dynamics at Atomic Resolution	$285,918
Recruitment	Zhang	Qing	Susan G Komen for the Cure	CCR15331322	10/3/15	10/2/18	Control of Mitochondrial Function by EglN2 in Breast Cancer	$150,000
Recruitment	Zhang	Qing	DOD DA Army Medical Research Acquisition Activity	W81XWH-15-1-0599	9/30/15	9/29/18	Validation of ZHX2 as a Novel pVHL E3 Ligase Substrate and Its Role in Kidney Cancer	$179,307
Recruitmnet	Zhang	Qing	Department of Defense	W81XWH-17-1-0016	1/15/17	1/14/20	FDXR Regulates ER Positive Breast Tumorigenesis via Reprogramming Metabolism	$140,505
Recruitment	Zhang	Qi	University of California at Irvine	2017-3475	8/1/17	7/31/21	Molecular Mechanisms of Telomere Length Homeostasis	$22,735
Recruitment	Zhang	Qi	National Science Foundation	MCB-1652676	2/15/17	1/31/22	CAREER: RNA conformational dynamics in the regulation of microRNA biogenesis	$197,487
Recruitment	Zhang	Qing	Mary Kay Foundation	017-62	7/1/17	6/30/19	Hairless (HR) as a Novel Therapeutic Target in Basal-Like Breast Cancer	$50,000
Recruitment	Zhang	Qing	NIH National Cancer Institute	1-R01-CA211732-01A1	9/30/17	8/31/22	Exploration of ZHX2 as a novel substrate of pVHL and an oncogenic driver of renal cancer	$411,162
Recruitment	Zhang	Qing	NIH National Cancer Institute	1-R21-CA223675-01	1/1/18	12/31/19	OTUB1 as a Novel Therapeutic Target in Kidney Cancer by Deubiquitinating HIF2alpha	$169,106
Recruitment	Zhang	Qing	American Cancer Society	RSG-18-059-01-TBE	7/1/18	6/30/22	EglN2-FDXR action on mitochondrial function regulates ER+ breast cancer	$198,000
Investment	Zhou	Otto	Carestream Health, Inc.		4/30/12	10/31/18	Portable tomosynthesis system using carbon nanotube x-ray source array	$64,000

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