UNC | LINEBERGER COMPREHENSIVE CANCER CENTER

# UNIVERSITY CANCER RESEARCH FUND 2020 LEGISLATIVE REPORT

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

Submitted November 1, 2020, in accordance with G.S.116-29.1

Since its creation in 2007 – the same year that cancer overtook cardiovascular disease as the leading cause of death in North Carolina – the University Cancer Research Fund has played a critical role in promoting collaborative and innovative research in cancer prevention, treatment and outcomes.

This landmark investment by the North Carolina General Assembly has not only helped make the UNC Lineberger Comprehensive Cancer Center a global leader in cancer research and care – it also has led to a meaningful difference in the health and economic well-being of North Carolina. As chair of the Cancer Fund Research Committee, I am pleased to submit our legislative report highlighting some of the many ways the UCRF has benefited our state.

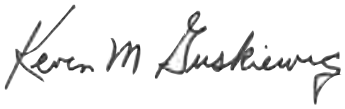
Our world-class faculty are the driving force behind great research. This past year, UNC Lineberger used UCRF support to recruit and retain 27 faculty who are at the top of their fields or show tremendous promise. The UCRF has also allowed us to forge important partnerships with other universities in North Carolina and around the world to share and advance our knowledge about this deadly disease. During the past 13 years, UCRF funding has enabled us to recruit and retain 300 faculty in total. Moreover, the UCRF has funded critical investments in equipment, technology, shared resources and community projects to help patients in all 100 North Carolina counties.

The Fund continues to bring beneficial financial gains to our state. To date, we've seen outstanding economic return reaching more than $10 for every dollar of UCRF investment this fiscal year. Some noteworthy economic highlights include:

- Expanding the state's economy: UCRF generated more than $656.4 million in total economic impact in North Carolina in FY 2020. This includes direct spending of more than $335.9 million within the state.
- Creating jobs: UCRF directly supported employment in FY 2020 of more than 1,094 jobs in North Carolina and an additional 1,975 jobs through both the indirect and induced impacts of those direct jobs and the spending generated from the UCRF within North Carolina.
- Generating tax revenue: UCRF investments provided more than $20.8 million in local and state tax revenue in FY 2020.
- Leveraging federal research funds: Researchers used findings from UCRF-funded research to attract more than $173.8 million in federal research grants, bringing the total to more than $216 million in external funding in FY 2020 alone.

As it has since its inception, the UCRF continues to positively affect our state's economy and the health of cancer patients in North Carolina and beyond. On behalf of our faculty who are working together to improve cancer research and care – and on behalf of all the patients they serve – thank you for your ongoing support of this tremendous investment in the fight against our state's deadliest disease.

Sincerely,



Kevin M. Guskiewicz, PhD
Chair, Cancer Research Fund Committee

# INTRODUCTION

The leading cause of death in our state, cancer is a disease that touches about 40% of all North Carolinians. For researchers and care providers seeking ways to improve prevention, treatment and outcomes for cancer patients, the University Cancer Research Fund (UCRF) has been a vital resource that is benefiting patients in North Carolina and beyond.

The General Assembly created the UCRF in 2007 to support world-class research at the UNC Lineberger Comprehensive Cancer Center, the only public National Cancer Institute-designated center of excellence in North Carolina and a global leader in cancer research.

The health and research impacts of this investment have been tremendous: The UCRF allows UNC Lineberger to recruit, retain and support the research of outstanding faculty who are top experts in their fields of study. It also supports cutting-edge facilities, equipment and technology that are critically essential to collaborative, transformative research.

In keeping with UNC Lineberger's historical mission of education, research and public service, UCRF funding supports innovative research partnerships with other North Carolina organizations, a large clinical trials network, educational outreach initiatives, technology and shared data resources, and community-based interventions that have reached patients and providers in all 100 counties.

UCRF investments in cancer research, faculty and facilities have helped elevate the reputation of North Carolina and UNC-Chapel Hill. Nature Index, which is part of a prestigious scientific journal publishing company, ranked UNC-Chapel Hill as one the top 15 most productive institution in the world for publishing cancer research studies. The ranking was based on a review of more than 20,000 research articles published in 82 prominent natural science journals from 2015 to 2019.

In addition to these important research impacts, since its creation the University Cancer Research Fund has generated significant economic benefits for North Carolina including:

- Directly supporting 1,094 research-related employees in FY 2020.
- Creating the equivalent of 1,975 new induced or indirect jobs, based on an independent economic evaluation.
- Having an overall economic impact that increases each year, reaching $656.4 million in FY 2020.
- Leveraging more than $216 million in outside funding in FY 2020 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 10-to-1 return in FY 2020.

## HISTORY

The General Assembly created the University Cancer Research Fund in 2007, the year when cancer became the leading cause of death in North Carolina. 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.

In 2013, the legislature consolidated all earmarked tobacco settlement monies into the General Fund, eliminating that source of UCRF support and thereby reducing the UCRF's funding stream by roughly 16%. The portion of UCRF revenue from non-cigarette tobacco product sales has risen as the population expanded and has varied year by year. In FY 2020, the state's total allocation to the UCRF was $52.6 million.

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:

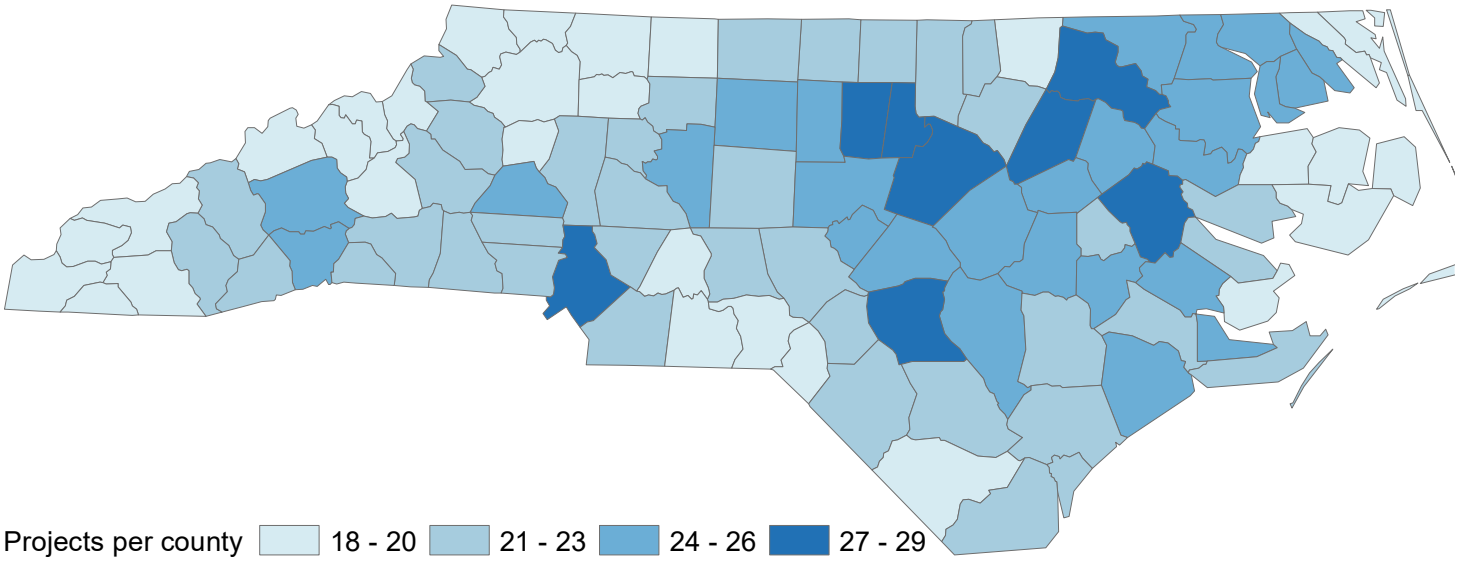
- Strategic research priorities in genetics, novel therapies, and North Carolina cancer outcomes;
- Clinical excellence through selective opportunities that enable UNC Lineberger to continue to be a leader in a rapidly changing field of research; and
- Critical infrastructure such as technology, training,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

Complementing the UCRF's significance in ongoing research, infrastructure and public service are the state's two major capital investments in cancer care. The N.C. Cancer Hospital opened in 2009 and serves patients from all 100 counties. Last year, more than 208,000 outpatient appointments took place in the hospital, UNC Lineberger's home for clinical care and research, and its affiliated clinics. In 2014, Marsico Hall opened as a cross-disciplinary collaborative research facility, with cutting-edge equipment and technology that further accelerates research capabilities.

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.

The University Cancer Research Fund has been a vital investment for North Carolina. It has generated considerable economic and health benefits that will only continue to grow as UNC Lineberger remains a global leader in the fight against cancer.

## OUTREACH ACROSS NORTH CAROLINA




**Cancer Data Resources**

Cancer Information and Population Health

Carolina Breast Cancer Study

Carolina Senior Registry

Lung Cancer Screening Registry

UNC Health Registry

**Understanding Cancer Disparities**

CDC CRC simulation modeling

CHANCE

Comparative Effectiveness and Survivorship health in bladder cancer

Comparative Effectiveness of breast cancer screening and diagnostic evaluation by breast density

Economic burden of breast cancer

Effect of HPV self-collection on cervical cancer screening in high risk women

Effect of the breast density legislation on supplemental screening

GMaP: Geographic Management of Cancer Health Disparities Program

Molecular, Treatment and Behavioral factors in BrCA Race disparities

NCCU-LCCC Partnership in Cancer Research

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 NC

Temporal changes in rural-urban treatment patterns for early-stage non-small cell lung cancer in North Carolina, 2006 to 2015

Trends and Quality of Testicular Cancer Care in NC

Well Empowered

**Cancer Screening**

Carolina Cancer Screening Initiative

Culturally-Adapted Colorectal Cancer Screening

Decision Aid Designed for American Indians

Mailed reminders plus FIT kits to increase colorectal cancer screening

Rural Cancer P30 Supplement

SCORE: Scaling Colorectal Cancer Screening Through Outreach, Referral, and Engagement

**Cancer Survivorship**

Cancer Transitions: Improving cancer survivorship care across NC

Efficacy of PERC mHealth Intervention for Prostate Cancer patients and partners

mHealth Physical Activity Intervention for survivors of AYA Cancers

**Clinic-based Prevention**

Digital weight loss intervention

Duke – UNC Tobacco Treatment Specialist credentialing program

My Body My Test

Normalizing preteen HPV vaccination with practice-based communication strategies

**Community-based Prevention/Education**

ASPiRE: Advancing Science & Practice in the Retail Environment

Cancer Conversations

Impact of AFIX and Physician to Physician Engagement on HPV Vaccination in Primary Care

Outreach to K-12 science students and curricula

Outreach to URM STEM high school students

**Improving Treatment Outcomes**

Exploring the utilization of post-discharge care in colorectal surgery patients

From Action to Impact: Improving Breast Cancer Care in North Carolina through Navigation and Collaborative Partnerships

Improving Endocrine Therapy Utilization in Racially Diverse Populations

Lay Patient Navigation

NC ProCESS

Racial differences in financial impact of prostate cancer treatment and outcome

Rural financial toxicity burden

Tobacco Cessation for cancer patients

UNC Cancer Network Telehealth Lectures

UNC Cancer Network eTumor Boards

# ECONOMIC IMPACTS

To determine 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 FY 2020. Tripp Umbach examined the UCRF's immediate impact on state income growth and employment. The Fund'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 FY 2020, UCRF's total allocation was $52.6 million. Using standard methodologies, Tripp Umbach estimated that in FY 2020 the UCRF:

- Had an overall economic impact of $656.4 million, including $335.9 million in direct spending and $320.5 million in indirect and induced impact attributable to external grant funding and downstream spending by employees, vendors and contractors.
- Generated more than $10 in economic impact for every UCRF dollar expended.
- Supported more than 3,069 jobs, including the direct support of 1,094 jobs and an additional 1,975 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 $20.8 million in state and local tax revenues to North Carolina.

Tripp Umbach has been used for 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.) Though these two entities used slightly different methodologies, the calculations and reports are based on industry standards. Based on their analyses, the cumulative economic impact of the UCRF since its inception is more than $4.1 billion.

## FACULTY JOB CREATION AND RETENTION

Outstanding 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 remarkably positive impact on cancer research faculty:

- **Recruitment:** The UCRF has supported the recruitment of 20 faculty this year. These faculty are developing a wide range of research programs in cancer genomics, tumor etiology, targeted therapies, vaccines, immunotherapies, pathology, health outcomes, multiple specific cancer types, and other areas critical to improving cancer prevention, early detection, diagnosis and treatment in our state.
- **Retention:** UCRF support has enabled the retention of seven faculty this year, inducing 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 Lineberger 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 of 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 been able to use UCRF support to underwrite research, leveraging findings from those studies to generate additional funding. Key trends include the following:

- FY 2020 funding from outside sources that is directly attributable to the UCRF totaled $216 million in annual total cost dollars.

  This amount is based on a snapshot of active attributable extramural funding held by faculty in the first quarter of FY 2020. The dollars represent one year of funding. A complete list of the awards is included in the Appendix.

  The positive effects of faculty recruitment and retention, technology enhancement, and developmental projects continue to accumulate. UCRF-attributable extramural funding has increased by more than 40-fold since FY 2008, from $5 million to $216 million.

- The $216 million in external funding in FY 2020 represents a nearly 9.4% increase from FY 2019.

## INTELLECTUAL PROPERTY, INNOVATION, AND ENTREPRENEURSHIP

The UCRF supports innovative research and discoveries that have led to notable job creation and the launch of companies dedicated to converting key research findings into clinical advances. In partnership with UNC's North Carolina Translational and Clinical Sciences Institute, the UCRF promotes an entrepreneurial mindset at UNC, and supports specialized staff to maximize the development and licensing of university intellectual property. More than 60 startup companies have launched or expanded their reach thanks to the UCRF. Nearly all of them are located in North Carolina and employ a workforce of more than 500 in seven North Carolina counties.

## GUIDING PRINCIPLES FOR UCRF INVESTMENT

In 2009, the Cancer Research Fund Committee that was created to oversee the UCRF adopted a strategic plan to guide the best and most effective use of the state's investment. The plan recommended that UCRF funding target three specific research priorities – genomics, novel treatments, and North Carolina cancer outcomes – and that the UCRF should be leveraged in support of key clinical and infrastructure resources.

**Research Priorities:** The use of UCRF funding is guided by three specific research priorities where – with focused investments in major scientific programs, disease-based initiatives, or cutting-edge research platforms – UNC Lineberger can be a world leader and have meaningful impact:

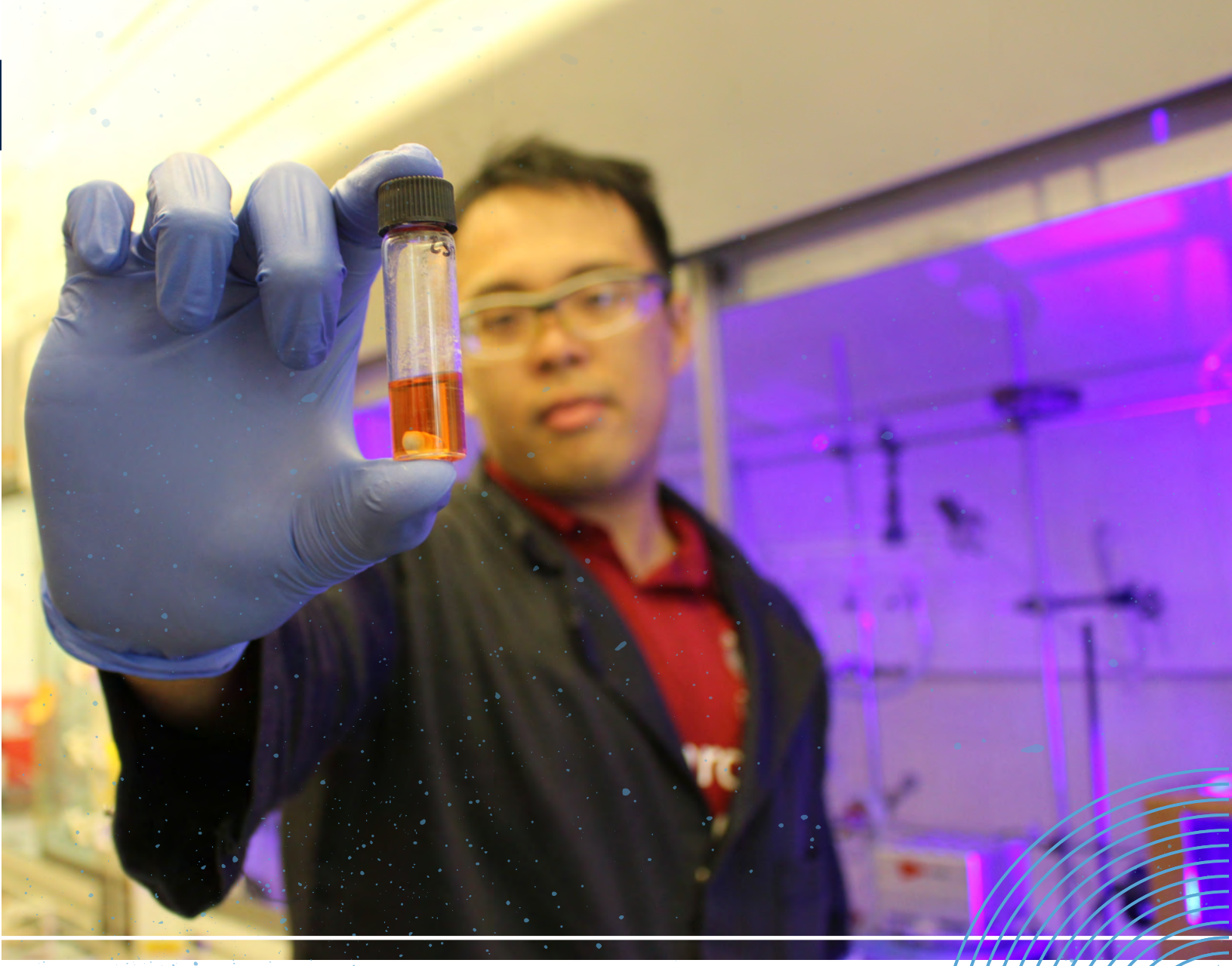
- **Understanding the Role of Genetics in Cancer Causation and Treatment:** to discover the genes that predispose families to cancer and that predispose cancer patients to poor treatment outcomes – especially by looking for the various genetic mutations in specific cancer subtypes that lead to cancer 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. This goal has expanded dramatically with the advent of immunotherapy.
- **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 and early detection. 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 Infrastructure and Excellence:** UCRF funds also are leveraged to enable UNC Lineberger to adapt to a rapidly changing field by establishing critical infrastructure and pursuing selective opportunities, outside of the three general research priorities, where the cancer center could strive for clinical excellence and have a major impact in cancer research.

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, 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.

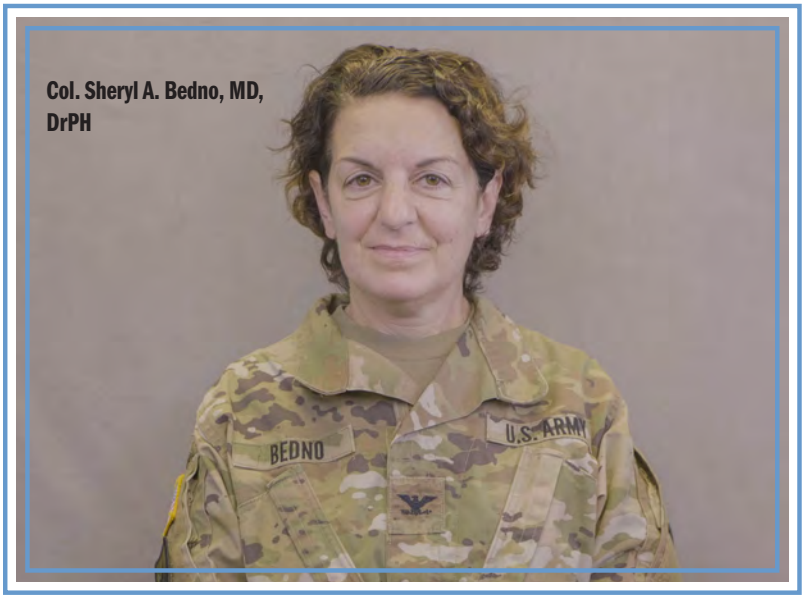
Investments in imaging, informatics and fundamental research techniques give UNC Lineberger's clinician scientists the tools they need to improve patient outcomes, while telemedicine and virtual tumor boards connect doctors and hospitals across the state with UNC Lineberger's oncology experts. The UCRF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

This year's report shows the importance of shared infrastructure and clinical excellence opportunities. It features a few key focus areas where UNC Lineberger is pushing the envelope in all three general research priorities – genomics, novel therapies, and outcomes – discusses some of the UNC Lineberger studies that have been published in high-impact journals, highlights several notable faculty research awards, and details outreach efforts across the state.



# RESEARCH IMPACTS

# UNC Lineberger partners with Fort Bragg to tackle tobacco use



Col. Sheryl A. Bedno, MD, DrPH

A strategic partnership between the UNC Lineberger Comprehensive Cancer Center, Fort Bragg Department of Public Health, and the Cumberland County health department is helping the nation's largest Army base by population rework its tobacco policies and take steps to improve the health of its soldiers and their families.

"Most of our beneficiaries and all of our civilian workforce live off-post and are not on Fort Bragg proper, so it was critical to develop relationships within the community," said Col. Sheryl A. Bedno, MD, DrPH, director of the Department of Public Health at Fort Bragg. "What's really exciting is that now, instead of people working on overlapping projects, we are working on these efforts together. A lot has happened in this short amount of time, and it's really changed the way we've done public health."

The Partnership for a Fort Bragg Tobacco-Free Community was launched in 2018, after a delegation from Fort Bragg came to Chapel Hill and met UNC Lineberger's **Kurt M. Ribisl, PhD**, a tobacco control policy expert and chair of the department of health behavior at UNC's Gillings School of Global Public Health.


Ribisl

"I was looking for an opportunity to do something with our military in North Carolina, which is the most military-friendly state in the country," said Ribisl, who had been working with the Air Force and University of Virginia on a parallel tobacco control project, "and after the initial meeting, we started brainstorming and talking about projects we could do together at Fort Bragg."

## *Weight gain prevention intervention activities with the U.S. Air Force*

*Using methodologies supported by UCRF funding, UNC Lineberger's **Deborah Tate, PhD**, professor of nutrition and health behavior, and colleagues and students from the UNC Gillings School of Global Public Health are collaborating with faculty from the University of Virginia stationed at Lackland Air Force Base in San Antonio on weight gain prevention efforts with U.S. Air Force airmen. As is true of the U.S. population at large, weight gain is a problem for military personnel.*


Tate

*This is particularly an issue for some pilots who fly aircraft with cockpits designed for thinner cohorts. There is a need for specific evidence-based interventions, adapted for military implementation, to help improve readiness and fitness in the military. The UNC-UVA team completed a 9-week pilot intervention with 391 airmen to examine the feasibility of implementing a weight gain prevention intervention in preparation for a larger and longer-term study. The team also surveyed young airmen to assess their level of concern for weight gain and interest in participating in a digital weight gain prevention intervention.*

*Based on their findings, the UNC-UVA team is developing a NIH grant proposal for submission in early 2021 that proposes to adapt a successful weight gain prevention intervention developed by Tate and colleagues for young adults using digital tools, for implementation in the adult Air Force population.*

According to the U.S. Army Public Health Center's 2019 Health of the Force report, 28% of Fort Bragg soldiers self-reported use of at least one tobacco product in the last 30 days before their annual health examination. Studies show that tobacco use affects combat readiness by contributing to, for example, greater injury risk, poorer wound healing and worse night vision. Military personnel who use tobacco have worse physical and mental health and are at greater risk of early discharge compared to their non-smoking colleagues. Annually, the Department of Defense spends more than $1.6 billion on health costs and lost productivity due to tobacco-related health issues.

UCRF funds supported the startup of the collaboration, which has since received additional grant funds from the CDC's Tobacco Prevention and Control branch. Their goal is to make policy changes and education work to lower tobacco use by Fort Bragg soldiers and their families from 26% to 17% by 2025.

Early results of the partnership's efforts have been significant – helping to leverage the additional grant funding, generating three abstracts that were accepted at the 2020 Annual Convention of the American Public Health Association, and leading to the development of the Tobacco Cessation and Prevention Fort Bragg Strategic Plan. Among the group's work:

- Finding that tobacco and vaping retailers are densely located around Fort Bragg, placing soldiers and their families at higher risk for tobacco initiation and maintenance. This work can help inform discussions about local zoning regulations.
- Determining that on-base tobacco retailers did not meet Department of Defense guidelines that tobacco prices should be no more than 5% lower than prices at off-base retailers.
- Recommending the removal of the 20 Designated Tobacco Areas (DTAs) on Fort Bragg the team evaluated after finding that none of them complied with the base's official tobacco policy.
- Conducting tobacco treatment training for health care providers, including behavioral health professionals and pharmacists who work on Fort Bragg.
- Implementing a tobacco cessation media campaign tailored to active-duty soldiers and beneficiaries who lived on Fort Bragg and within a 40-mile radius of the base.


Prentice-Dunn

The partnership is also working toward a formalized public health practicum program between UNC Gillings and the Fort Bragg Department of Public Health.

"Colonel Bedno has been so enthusiastic and willing to partner," said **Hannah Prentice-Dunn, MPH**, project manager of UNC Lineberger's Cancer Prevention and Control Program. "It is a strategic move to bring state and local health experts to the table to help the soldiers at Fort Bragg, and she really opened the doors for all of this to happen."

The partnership has enabled further ongoing collaboration with the Fort Bragg public health team and their response to COVID 19 that has so affected all aspects of health.

***Studies show that tobacco use affects combat readiness by contributing to, for example, greater injury risk, poorer wound healing and worse night vision. Military personnel who use tobacco have worse physical and mental health and are at greater risk of early discharge compared to their non-smoking colleagues.***

# UNC Lineberger cellular immunotherapy pioneers hit key milestone

Cellular immunotherapy, which uses patients' own genetically engineered immune cells to attack cancer, is a growing field of research that recently hit a key milestone at UNC Lineberger.

UNC Lineberger's cellular immunotherapy program, which was created in 2016 with resources from the University Cancer Research Fund, has designed and developed its 100th product. This means 100 personalized immunotherapy products have been created from UNC patients' immune cells in just the past three years.

"What we envisioned has come to fruition better than we initially anticipated," said program co-director **Jon Serody, MD**, the Elizabeth Thomas Professor of Medicine, Microbiology and Immunology in the UNC School of Medicine Division of Hematology/Oncology, who began pushing for a cellular immunotherapy center at UNC in 2013. "We are the only academic medical institution in the last 10 years to develop a program of our size and are treating patients. The UCRF has provided critical infrastructure and support – it's a testament to UNC Lineberger's diligence and commitment to both the science and translational components of this program. The investment has brought innovation to the therapy of North Carolinians with far advanced cancer."

Cellular immunotherapy is truly personalized cancer treatment. It involves extracting T-cells – disease-fighting immune cells – from the patient's blood, and genetically engineering them to recognize and destroy the patient's own cancer cells.

Left to right: Gianpietro Dotti, MD, Jonathan Serody, MD, and Barbara Savoldo, MD, PhD

The engineered T-cells, called chimeric antigen receptor T-cells or CAR-T cells, are then multiplied and infused back into the patient. For many patients, immunotherapy is a last resort, as their cancer has not responded to other treatments.

UNC Lineberger is one of only a few centers in the United States that has the personnel and facilities to design, produce and deliver CAR-T therapy directly to patients. Using UCRF funds, UNC Lineberger began its program by recruiting two leading cellular immunotherapy pioneers – **Gianpietro Dotti, MD,** and **Barbara Savoldo, MD, PhD**, – and building a federally certified Good Manufacturing Practices (GMP) facility to make the T-cell products that are used in its clinical trials.

"The most challenging part, and what is driving our interest, is moving this research activity into real therapeutic options for patients," said Savoldo, professor of pediatrics and assistant director of UNC Lineberger's immunotherapy program. "That requires a lot of infrastructure – from the GMP where we make the cells, to the regulatory and clinical pieces of our program. There is a lot of interest in CAR-T cells and genetic engineering, but UNC is one of only a few places where can do this from the lab into actual patients. Being able to develop something new is really unique and important."

UNC Lineberger's cellular immunotherapy program has 10 ongoing clinical trials. One of the first trials the researchers conducted has already shown promising results for patients with Hodgkin and non-Hodgkin lymphoma who have not responded well to other treatments.

***UNC Lineberger is one of only a few centers in the United States that has the personnel and facilities to design, produce and deliver CAR-T therapy directly to patients. Using UCRF funds, UNC Lineberger began its program by recruiting leading cellular immunotherapy pioneers and building a federally certified Good Manufacturing Practices (GMP) facility to make the T-cell products that are used in its clinical trials.***

The study found that an infusion of CAR-T cells after chemotherapy was safe, effective and without the toxic side effects that often accompany cancer treatments. The initial results generated the interest of Tessa, a pharmaceutical company that wants to develop this as a therapy for patients in the United States and the world. The next step is a nationwide study including UNC and about a dozen other medical institutions.

Dotti, Savoldo and Serody agree that the UCRF plays an essential role in UNC Lineberger's cellular immunotherapy center as it not only supports the costs of operating the GMP and the clinical trials, but has been used to recruit, retain and train talented researchers to grow the program. The UCRF investment has helped to generate millions in additional grant dollars – including an $8 million Stand Up To Cancer grant, the only grant funded by the program for CAR-T lymphoma treatment and research, which was awarded to UNC Lineberger and other institutions across the country last year.

In addition to trials for blood cancers like leukemia and lymphoma, UNC Lineberger researchers are planning studies using CAR-T cells for solid tumors such as ovarian and brain cancers.

"The way we proceed is very pragmatic – we don't do anything in patients without strong data," said Dotti, professor of microbiology and immunology and co-director of the immunotherapy program. "We proceed step-by-step, we learn something from a study and the next study is to find out how can we make it better. This is what we do at UNC. We are supposed to innovate."

### *Novel CAR-T immunotherapy proves effective against Hodgkin lymphoma*

*UNC Lineberger researchers have shown, for the first time, that a person's immune cells can be reprogrammed to attack hard to treat Hodgkin lymphoma with remarkable results.*

*In an early-phase clinical trial, whose results are published in the Journal of Clinical Oncology, researchers at UNC Lineberger and the Baylor College of Medicine demonstrated that CAR-T immunotherapy, which attacks cancer cells using a person's reprogrammed immune cells, was both safe and highly effective for patients with relapsed/refractory Hodgkin lymphoma. The treatment led to the complete disappearance of tumor in the majority of patients treated at the highest dose level of therapy, with almost all patients having clinical benefit after treatment.*

*One of the study's leaders is UNC Lineberger's **Natalie Grover, MD**, who was recruited using UCRF resources.*

*"Lymphodepletion prior to CAR-T cell infusion seems to produce a more favorable environment for the CAR-T cells to proliferate and attack their cancerous targets," said Grover, he study's co-first author and an assistant professor of medicine at the UNC School of Medicine.*

**Grover**

*"This is particularly exciting because the majority of these patients had lymphomas that had not responded well to other powerful new therapies," said study senior author and UNC Lineberger member Barbara Savoldo, MD, PhD, professor in the Department of Microbiology and Immunology at the UNC School of Medicine.*

*The researchers hope to do further studies of the CAR-T therapy alone and in combination with other new immune-modulating anticancer drugs.*

# Biology of Cancer course highlights health disparities, career opportunities in cancer

A new collaboration between UNC Lineberger, North Carolina Central University (NCCU) and North Carolina A&T (NC A&T) State University is giving undergraduate students a glimpse into cancer as a career field while helping them learn more about health disparities that lead to worse cancer outcomes for African Americans and other people of color.

The Biology of Cancer: Exploring the Role of Race, Class, and Socioeconomics in the Underserved and the Underrepresented, is a semester-long course that primarily introduces students attending the above-mentioned historically Black colleges and universities (HBCUs) to cancer research, treatment and public health topics. The live webinar series, which launched in the fall 2020 semester and is available for course credit at NC A&T, is free and open to any major as well as the general public and features cancer biologists, physicians and other public health experts and specialists.

Co-creators **Antonio T. Baines, PhD,** a NCCU associate professor of biological and biomedical Sciences and UNC Lineberger member with expertise in pancreatic cancer research; **Checo J. Rorie, PhD**, interim chair of the Department of Biology at NC A&T and associate professor of genetics with expertise in breast cancer health disparities; and UNC Lineberger's **Bernard Weissman, PhD**, professor of pathology and lab medicine and pediatrics at UNC School of Medicine; and a planning committee of faculty and staff from all three campuses brainstormed topics and speakers for the course. Baines and Rorie delivered the first two talks.

"We wanted to talk about cancer, of course, but we wanted to focus in on issues of why cancer seems to impact minority communities the way it does – a big part of it is environmental, and wrapped around structural racism," Baines said. "So, this class is very timely, with everything that is going on right now in the discussions about race, and the students have really connected with this course."

The lecture series has attracted large, engaged audiences – ranging from 75 to 185 attendees per event, including undergraduate students, graduate students, clinicians and researchers, faculty and students from other institutions, lecturers' friends and family members, and members of the general public. Post-lecture question and answer sessions have lasted as long as an hour.

> ***" ... we wanted to focus in on issues of why cancer seems to impact minority communities the way it does – a big part of it is environmental, and wrapped around structural racism."***
>
> - Antonio Baines, PhD

"There are not a lot of opportunities for an undergraduate student to take a course on cancer, so this gives them a broad overview of it in a different setting – it's not a traditional seminar, but more of a conversation," Rorie said. "We are also looking at this as a way to potentially recruit students to look at cancer as a career – whether it's in research, medicine, policy, public health – there is a wide range of career opportunities in cancer as a field."

Baines

Rorie

Weissman

In addition to discussing cancer disparities, each speaker is asked to share about themselves and their career path. "Hearing these great scientists discuss their journey, and what they've learned along the way, may help attract more students into this field," Weissman said. "If we're lucky, 10 years from now we are hiring some of these students as junior faculty and maybe it's because this course got them interested in cancer."

The course planning committee is already talking about next steps – expanding the series to other HBCUs, adding new topics and speakers, and soliciting feedback from students. They had hoped to bring participating students to UNC Lineberger for a visit after the fall lecture series ends, but those plans may switch to a virtual visit due to COVID-19.

"This has been a great collaboration among a lot of people at all three institutions," Baines said. "It has been a true team effort."

# UNC Lineberger's Adolescent and Young Adult cancer program celebrates five years, looks toward the future

Sophie Steiner was in ninth grade when she was diagnosed with a germ cell tumor in 2012. Receiving her care at the N.C. Cancer Hospital and UNC Children's Hospital, she felt out of place between pediatric cancer patients and adult patients, and noticed that supportive care services such as yoga and massage were only offered to adult patients. Sophie saw that teen cancer patients needed something more.

Before she passed away 18 months later, Sophie, 15, asked her family to help address the care and support shortcomings that adolescents and young adults – ages 13 to 39 – often experience during cancer treatment. Her heartfelt request led her family to establish the Be Loud! Sophie Foundation in 2014. A year later, the foundation's partnership with UNC Lineberger led to the creation of UNC's Adolescent and Young Adult (AYA) Cancer Program and the hiring of **Lauren Lux, LCSW,** to oversee it.

"We've had a lot of success in a fairly short amount of time for a culture change, and we'd really like to refine what we do and make it more efficient and effective," Lux said. "Close to 500 new 13- to 39-year-olds are diagnosed and treated at UNC every year, so that's a lot of people to try and meet. Trying to figure out how best to do that is something we're really interested in."

The foundation, which has raised more than $1.2 million since its creation, provides ongoing support toward the AYA program's annual cost and is working toward funding a permanent endowment. And in the five years since its creation, thanks to continued funds from the foundation and significant investments from UNC Lineberger and specifically the UCRF, the AYA program has grown, too – expanding to a four-person staff that has strengthened the program's ability to provide patient services, do educational outreach, and conduct research that will benefit future AYA patients and their families.

"Learning more about the long-term effects of cancer therapy, and cancer itself, on survivors is critical, especially these young people as they are transitioning from active treatment to survivorship," said AYA Medical Director **Andrew Smitherman, MD, MSc**, who provides patient care and studies survivorship care and care outcomes. "We want to be sure we address what they need to live happy, healthy lives moving forward and, at the same time, we want to investigate ways to identify, or risk stratify, patients who will need more support during that transition."

Left to right: Andrew Smitherman, MD, MSc, Lauren Lux, LCSW, and Catherine Swift, LCWSA.

In addition to Smitherman, **Catherine Swift, LCWSA,** and **Melissa Matson, MSN, RN**, have joined the program in recent years. The AYA program is adding new services like the development of an AYA advisory council, which allows patients to speak directly about their needs, and a survivorship clinic that provides support after treatments have ended.

The AYA program also is working to promote greater clinical research participation within this age group. Young adults historically have been underrepresented in clinical research, and increasing enrollment numbers could lead to advances in care.

Using Be Loud! Sophie funding, UNC Lineberger, Wake Forest Baptist Health Comprehensive Cancer Center and Duke Cancer Institute host an annual statewide symposium to bring together clinicians and researchers interested in improving care for the AYA population. The program aims to take further steps to expand its reach beyond Chapel Hill, offering support to patients across the state and helping educate providers who will be caring for them.

# Building stronger community engagement and outreach across NC

With research and outreach efforts in all 100 counties in North Carolina, UNC Lineberger has a long history of serving the state through clinical care, research policy and community engagement. UNC Lineberger's Office of Community Outreach and Engagement was launched last year to build on this work and to boost community involvement in improving cancer outcomes for all North Carolinians.

"We have multiple decades' worth of history as a cancer center doing so much of this work across cancer communities," said **Stephanie Wheeler, PhD, MPH**, associate director of Community Outreach and Engagement at UNC Lineberger. "But what we needed was more of an organizing structure to these efforts, and that's why this office was created – to help us coordinate and bring together the researchers all across the cancer center who are doing work to serve the same mission."

Wheeler

Wheeler – whose research focuses on addressing the needs of underserved populations across North Carolina – leads the Office of Community Outreach and Engagement along with assistant directors **Barbara Alvarez Martin, MPH**, and **Marjory Charlot, MD, MPH, MSc.** They recruited additional staff and established a Community Advisory Board – a group of diverse North Carolinians with an interest in improving cancer outcomes – to offer direction and support and to help UNC Lineberger build stronger relationships in the communities it serves.

Charlot

Together, the team developed a four-pronged vision and a mission for the office: Monitoring the state's cancer burden and identifying disparities in cancer treatment and outcomes; engaging diverse stakeholders at UNC-Chapel Hill and across the state in addressing and reducing the cancer burden; amplifying existing outreach and supportive care efforts; and facilitating impactful cancer research in North Carolina and beyond.

Alvarez Martin

One important way to reduce cancer disparities is by making sure clinical trials more accurately represent the patient population. While people identifying as African-American represent 22% of North Carolina's population, 18% of people recruited to interventional treatment trials at UNC Lineberger identified as African-American. And while that is a better percentage than most of the nation's cancer centers, as the public comprehensive center for North Carolina, UNC Lineberger is investing to do even better.

Charlot, a medical oncologist who treats patients with lung cancer, is leading an ongoing initiative that focuses on patient and community engagement to enhance cancer clinical trial participation among underrepresented minority populations. "One of our goals in the Office of Community Outreach and Engagement is to ensure that the representation of our patients on clinical trials mirrors the demographics of North Carolina," she said.

Several UNC Lineberger research projects have partnered with community organizations in working to reduce disparities in cancer outcomes, including:

- Wheeler's work through the Carolina Cancer Screening Initiative, led by UNC Lineberger's **Daniel Reuland, MD, MPH**, helps to boost colorectal cancer screening in underserved areas of the state.
- Wheeler and UNC Lineberger's **Don Rosenstein, MD,** are implementing financial navigation intervention program aimed at helping rural oncology practices across North Carolina address their cancer patients' unmet financial needs.
- ACCURE, or Accountability for Cancer Care through Undoing Racism, is a multi-faceted intervention developed with the Greensboro Health Disparities Collaborative to ensure patients completed treatment for early stage breast and lung cancer. Results of the ACCURE study, led by UNC Lineberger's **Samuel Cykert, MD,** showed this effort eliminated disparities in treatment completion rates between white and Black patients over the course of the study.
- Trimming Risk in Men, led by UNC Lineberger's **Laura Linnan, ScD,** used barbershops in North Carolina as a platform to educate men about prostate cancer and colorectal cancer risk as part of an effort to address disparities for Black men.

A key reason these studies succeeded was because they partnered with the communities they served, Martin said. "UNC Lineberger is such a valued resource in this state," she said. "It's important for us to remember that community partners also have a lot to offer the cancer center. The benefits flow in both directions. If we're looking for innovative ways to reduce cancer outcomes, let's look to the community for ideas and inspiration. They are the ones we are serving."

**Research Priority 1: Genetics in Cancer Causation and Treatment**

## *Pancreatic cancer tumor classification could optimize treatment decisions*

UNC Lineberger members have reported research findings that could help predict resistance to treatments for pancreatic cancer, which could lead to tailored – and more effective – therapies based on cancer subtypes.


Yeh

In the journal Clinical Cancer Research, researchers led by UNC Lineberger's **Jen Jen Yeh, MD,** and **Naim Rashid, PhD**, reported that two subtypes of pancreatic cancer respond differently to treatments. One subtype showed poor responses to common therapies and had worse survival outcomes.


Rashid

Pancreatic cancer is one of the deadliest cancer types, with less than one in 10 patients surviving five years after diagnosis. The disease is typically diagnosed in later stages, when the cancer has already spread. "We want to know what therapies are best for the patient so that we can maximize response and quality of life," said Yeh, a professor of surgery and pharmacology and vice chair for research in the UNC School of Medicine Department of Surgery. "For pancreatic cancer, where time is more limited, this becomes even more important."

In 2015, Lineberger researchers discovered two major subtypes of pancreatic cancer, while other researchers reported classification systems with three or four subtypes. Given this lack of consensus, the new study analyzed data from two recent clinical trials for pancreatic cancer to better understand which tumor classifications aligned with treatment responses.

"Our study evaluated the best way to classify tumors according to available treatment response data from prior clinical trials," Yeh said. "Our hope is that we can use this information to tailor treatments, and potentially avoid giving therapies that may not work well for certain patients."

The study found that the two-subtype classification best aligned with treatment outcome data from two clinical trials. And, after analyzing five independent pancreatic cancer studies, researchers also found that the two-subtype system best explained differences in overall patient survival, with patients classified as having basal-like tumors showing much poorer response rates to treatments, and worse survival outcomes, than the other subtype.

Yeh and Rashid also utilized machine learning to simplify and adapt their two-subtype classification method so it can be used in the clinic, and used to generate subtype predictions for a single patient. They are working with recent UCRF recruit, **Jason Merker, MD, PhD**, a molecular pathologist, to bring their classification algorithm into a form that can be used in future clinical decision making. A new trial will continue the study of how the two tumor subtypes can predict a patient's response to treatment, and to understand why the two subtypes differ. The latter information will inform the next wave of treatment innovations.


Merker

"We want to use the prediction model we developed in actual trials to ensure patients are placed on optimal therapies up front in order to enhance survival and other outcomes," Rashid said.

> ***"Our hope is that we can use this information to tailor treatments, and potentially avoid giving therapies that may not work well for certain patients."***
>
> *- Jen Jen Yeh, MD*

## *Findings could help identify which aggressive breast cancers will respond to immune treatments*

The U.S. Food and Drug Administration recently approved a chemotherapy-immunotherapy drug combination to treat an aggressive type of breast cancer, but response to this treatment has varied in clinical studies. UNC Lineberger researchers believe they have discovered biological clues that can help identify which tumors might respond to the combination treatment.

Their findings, published in the journal Cell, were drawn from studies in mice and an analysis of data from six clinical trials. If confirmed in future studies, the insights could help guide patients to the right treatments, sparing them from those that are not effective. It also could lead to an approach to make the drugs work in cancers that don't initially respond.


Perou

"Potentially, we have a new biomarker to be used to figure out which triple negative breast cancer patients should be receiving immunotherapies," said UNC Lineberger's **Charles M. Perou, PhD,** the May Goldman Shaw Distinguished Professor of Molecular Oncology Research and professor of genetics and pathology.

Triple negative breast cancer accounts for about 12% of invasive breast cancer cases in the United States. It is more likely to affect younger women, Black women and people who have a BRCA1 mutation. Because this subtype lacks three receptors that typically guide therapy, doctors typically have used chemotherapy, which bluntly attacks rapidly dividing cells in the body, to treat it.

The FDA approved the use of atezolizumab, which frees up immune cells called T-cells to find and attack cancer cells, in combination with chemotherapy for patients with triple negative breast cancer that has metastasized and that is positive for the PD-L1 protein. It was the first time the FDA approved a breast cancer treatment that included immunotherapy.

In a New England Journal of Medicine study, the atezolizumab-chemotherapy regimen led to prolonged progression-free survival for some patients. Forty-one percent of patients with triple negative breast cancer were PD-L1 positive, but not all of the tumors responded to the combination therapy.

To study why some triple negative breast cancers respond to immunotherapy and others do not, Perou and his colleagues created multiple mouse models of triple negative breast cancer and used genetic tools to define the biological features of breast tumors that do respond to the treatment. They found an important genetic clue: The patients whose cancer responded had a coordinated immune response to the cancer that involved multiple types of immune cells – including both T-cells, which can directly attack and kill tumors, and B-cells, which make antibodies that aid in the attack of tumor cells.

***Triple negative breast cancer accounts for about 12% of invasive breast cancer cases in the United States. It is more likely to affect younger women, Black women and people who have a BRCA1 mutation.***

"Our work going forward right now is to look for ways to leverage B-cells to improve treatment plans and regimens for breast cancer patients," said **Dan Hollern, PhD**, the first author of the study and a postdoctoral research associate at UNC Lineberger. "We definitely need to be looking at ways to activate B-cells more effectively with our therapies."

## *Study explores clocking DNA's recovery time after chemotherapy*

Cells damaged by chemotherapy can almost completely fix their most important DNA in as quickly as two days, according to a study published in the Journal of Biological Chemistry by Nobel laureate and UNC Lineberger member **Aziz Sancar, MD, PhD**.


Sancar

In normal cells, the circadian clock drives the rhythm of DNA repair, but this is not the case in tumors. "Most cancers do not have a functional clock and so, basically any time that it's good for the normal tissue, you can hit the cancer," said Sancar, the Sarah Graham Kenan Distinguished Professor of Biochemistry and Biophysics.

Cisplatin, a widely used chemotherapy drug for numerous cancers, often comes with serious side effects including kidney, liver and peripheral nerve injury. Since cisplatin kills both cancer and healthy cells by damaging their DNA, Sancar and his team aimed to learn more about the timing of DNA repair in healthy cells to help determine when might be the best time to administer cisplatin.

Using a technique they developed to capture and sequence fragments of damaged DNA from mice injected with cisplatin, they examined DNA recovery based on a typical clinical chemotherapy schedule, in which patients are given a dose and at least a week to recover before receiving another dose. Over the course of 70 days, researchers mapped where and when DNA damage was fixed.

They found that the DNA of transcribed genes was just about fully mended in two circadian cycles. Restoration of these genes composed the majority of repair during the first 48 hours but afterward, repair of nontranscribed DNA became dominant and proceeded for weeks. The remaining damage in nontranscribed DNA is not harmful in normal cells that aren't replicating, Sancar said. But for cancer cells which divide uncontrollably, this damage could lead to cell death.

This new information about the timetable of DNA repair could, after further study, eventually aid the design of successful chronochemotherapies, treatment strategies that aim to administer chemotherapy at times that maximize tumor damage while minimizing toxic side effects.

## *Using genetic insights to develop model for HPV-linked head and neck cancer*

A UNC Lineberger-led research team has created a genetically engineered mouse model of head and neck cancers linked to HPV (human papillomavirus) that will help improve laboratory tools for studying the disease.

**Amelio**

Their findings, published in Cell Reports, include the discovery that different subtypes of HPV-linked oropharyngeal squamous cell carcinoma exist based on the expression levels of two different viral genes. HPV is a common virus that's responsible for nearly a third of squamous cell carcinomas of the head and neck, including the oropharynx, the larynx and the oral cavity.

"By creating a model of HPV-linked head and neck cancer that faithfully reflects the biology of the disease, we can use this to better understand the molecular mechanisms that cause this cancer," said Lineberger member **Antonio Amelio, PhD**, an assistant professor in the UNC Adams School of Dentistry Division of Oral and Craniofacial Health Sciences and UNC Lineberger's Cancer Cell Biology Program.

In a study funded in part by the UCRF, Amelio and his colleagues identified the two new subtypes based on how much of the viral genes E6 and E7 are expressed in infected cells. The proteins encoded by E6 and E7 remove certain checks and balances that are present in human cells to prevent unregulated growth. Previous studies had verified the presence of E7, but the newly published research found that E6 is also present and that both HPV genes need to be activated to cause oropharyngeal cancer.

The researchers discovered the two subtypes using data from a large genetic analysis of HPV-linked oropharyngeal cancer completed as part of a collaborative national project known as The Cancer Genome Atlas (TCGA). UNC Lineberger members held several leadership roles in TCGA, and UNC Lineberger served as a genetics center for the project.

**Research Priority 2: Developing Novel Therapeutics**

## *Combination therapy shows promise in head and neck cancers*

A study by UNC Lineberger's **Jared Weiss, MD**, has yielded encouraging preliminary results for combining immunotherapy and radiation therapy for patients with locally advanced head and neck cancer.


Weiss

The study evaluated a combination of radiation and pembrolizumab – an immunotherapy drug known as a "checkpoint inhibitor" that releases immune cells to find and attack tumors – that researchers believe could offer a new treatment option for patients who are ineligible for cisplatin chemotherapy, part of standard treatment for the disease.

The single-arm phase II trial included 29 patients with locally advanced head and neck squamous cell carcinoma. The trial was designed specifically for patients who normally would receive platinum chemotherapy together with radiation, but may not be able to tolerate its side effects.

Side effects could occur due to preexisting hearing problems that place patients at risk of permanent hearing loss. Additionally, preexisting kidney and nerve damage tend to be aggravated by cisplatin and place patients at risk for permanent side effects.

"That is a common dilemma in the exam room because cisplatin, while effective, tends to be particularly toxic for patients and can lead to permanent side effects for some," said Weiss, associate professor of medicine in the Division of Oncology. "I will have patients I want to treat with platinum chemotherapy, but I also want to align treatment with their values. Is the patient willing to accept a risk of deafness or exacerbated ringing in their ears? These are not acceptable consequences for most people."

Patients were treated with three cycles of pembrolizumab and concurrent radiation therapy over six weeks, followed by three additional cycles of the immunotherapy drug. At follow-up, 76% of patients had no progression a year later and the survival rate was 86%.

"There are convincing arguments that radiation sensitizes patients to immunotherapy and can enhance its effects," said Weiss, who cautioned that findings need to be confirmed in a randomized trial before the combination would be recommended to patients. "And the opposite direction also seems to be true – radiation therapy needs a functional immune system to work, and our hope was that pembrolizumab would make radiation more effective for these patients."

## *UNC Lineberger team identifies key gene in myeloma progression, potential treatment*

UNC Lineberger researchers have discovered a gene that plays a key role in the development and progression of multiple myeloma – along with a potential treatment strategy to block the gene's effects.


Wang

In the journal Blood, UNC Lineberger's **Greg Wang, PhD**, associate professor in biochemistry and biophysics, and colleagues reported that a gene called PHF19 fuels the development and progression of multiple myeloma, a disease where plasma cells grow out of control. They also found that an experimental therapeutic, UNC1999, showed early promise in laboratory models of multiple myeloma.

> ***"We identified a crucial cancer-promoting pathway in multiple myeloma, and we have promising evidence for a potential new way to treat this type of blood cancer."***
>
> - Greg Wang, MD

"We identified a crucial cancer-promoting pathway in multiple myeloma, and we have promising evidence for a potential new way to treat this type of blood cancer," Wang said.

Multiple myeloma is a blood cancer that develops in plasma cells, which are immune cells that generate antibodies against invading diseases. Analyzing data from multiple clinical trials, researchers in Wang's lab found that high expression of PHF19 was linked with poorer prognosis. Using state-of-the-art genetic tools, Wang and his team demonstrated

how PHF19 affects the progression of myeloma and how, when it mutates, it hyperactivates a protein group that drives multiple myeloma. They also found a small molecule inhibitor that can block part of protein group, which significantly delayed tumor progression in animal models of the disease.

Wang said the researchers will continue to study the underlying mechanisms behind these proteins and this cancer type, and will work to develop even better inhibitors to suppress the action of the protein group and PHF19.

## UNC discovery would allow doctors to fine-tune cancer-hunting immune cells

A discovery by UNC Lineberger researchers could allow scientists to fine-tune genetically engineered immune cells to heighten their killing power against tumors or to decrease their activity level in the case of severe side effects.

Led by UNC Lineberger's **Gianpietro Dotti, MD**, researchers reported in Cancer Cell new findings about the regulation of co-stimulatory molecules that could be used to activate cancer-killing immune cells – chimeric antigen receptor T-cells, or CAR-T cells – or decrease their activity.

Dotti

"In immunology, it's always about balance; you don't want to have too much T-cell activation, and you don't want T-cell activation to be too low," said **Peishun Shou, PhD**, postdoctoral research associate at UNC Lineberger and the study's co-first author.

Cellular immunotherapy, or CAR-T immunotherapy, involves extracting specific immune cells from patients, engineering the cells in the lab to hunt tumor cells displaying a specific molecular target, and then infusing them back into patients to fight their cancer. Through UNC Lineberger's Cellular Immunotherapy Program, researchers have designed novel investigational CAR-T therapies for Hodgkin and non-Hodgkin lymphoma, multiple myeloma, neuroblastoma and leukemia.

"We are conducting and developing clinical studies with CAR-T cells in both liquid and solid tumors. In these studies, we are testing what we call the 'new generation' of CAR-T cells, hoping to further enhance the therapeutic index of this technology," said Dotti, a professor in the UNC School of Medicine Department of Microbiology and Immunology and director of the UNC Lineberger Cellular Immunotherapy Program. "This latest study highlights how when translational and basic science come together, we can hopefully improve therapeutic strategies."

The researchers revealed new strategies for improving two different types of modified T-cells. One type of CAR-T is co-stimulated by the CD28 protein, and another is stimulated by 4-1BB. Since each type of CAR-T has differences in terms of how long it typically lasts in the body to fight cancer, how quickly it responds and the strength of its response, Dotti and colleagues wanted to find a way to regulate these proteins to fine tune the cells' disease-fighting response.

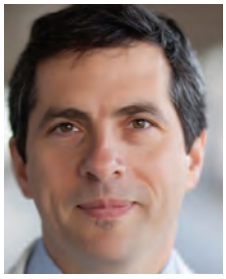
For CAR-T co-stimulated by 4-1BB, scientists found they could increase expression of a specific molecule, the LCK molecule, to increase the cells' activity. For CAR-T co-stimulated by CD28, they discovered a new "safety switch" mechanism – a drug that binds a molecule called SHP1 in the T-cell – that could reduce activity of CAR-T if patients experience severe side effects from the experimental therapy.

Researchers want to investigate using these findings to improve CAR-T treatments against blood cancers like leukemia, and to potentially improve experimental treatments for solid tumors. "Researchers in the CAR-T immunotherapy field now want to solve the solid tumor problem," Shou said.

## UNC discovers possible approach to block growth of common pediatric brain cancer

UNC Lineberger researchers have identified a potential approach to stop the growth of medulloblastoma, the most common type of brain tumor in children. **Timothy Gershon, MD, PhD,** and colleagues reported in the journal Development that by blocking a signal called GSK-3, they could control tumor growth in a subtype of the cancer.

About 80% of children with medulloblastoma survive long-term with radiation and chemotherapy, but improvements are needed to limit debilitating side effects and to develop effective treatments for children whose cancer doesn't respond to standard radiation and chemotherapy.



Gershon

"This work could lead to new insights into developmental brain malformations and also to new treatments for medulloblastoma that may spare the severe side effects of radiation and typical chemotherapy," said Gershon, an associate professor of

neurology. "Our goal would be to find ways to treat the disease that would provide fewer side effects."

In laboratory studies using mice and cells, the researchers focused on a tumor subtype that accounts for one third of medulloblastoma brain tumor cases. "For one of the more common subtypes of medulloblastoma, we found we can target a signaling pathway to block tumor growth," said **Jennifer Ocasio, PhD**, the study's first author and a former graduate student in the UNC School of Medicine Neuroscience Curriculum. "We think this would be a way to sidestep effects of radiation and chemotherapy that have a lot of side effects because we are blocking growth rather than killing these cells."

The researchers said their findings were surprising because other studies have shown that blocking GSK-3 actually stimulates growth in other parts of the brain. They caution that while this treatment might be promising for a specific subtype of medulloblastoma, it could drive growth in other brain cancers, including other medulloblastoma subtypes.

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**Research Priority 3: Outcomes**

## *Major population-based study tracks endometrial cancer across North Carolina*

UNC Lineberger researchers have launched a major research initiative to track 1,000 women across North Carolina with endometrial cancer, which is cancer in the lining of the uterus, to better understand why incidence and mortality rates are increasing and why the disease is more deadly for some women than others.

In the Carolina Endometrial Cancer Study, **Victoria Bae-Jump, MD, PhD**, and her colleagues will investigate factors contributing to these statistics, including patients' medical history and lifestyle. They will also evaluate the genetic mutations in a patient's tumor in order to potentially identify therapeutic strategies. Not only do researchers want to understand why the disease is becoming more prevalent and mortality rates have increased, but also why mortality rates are higher in Black women compared with white women.

**Bae-Jump**

"Despite being the fourth most common cancer in women, endometrial cancer has been a long under-studied cancer," said Bae-Jump, professor of gynecologic oncology at the UNC School of Medicine. "We need to spend more time and research dollars trying to figure out this cancer."

Between 2013 and 2017, uterine cancer mortality rates increased by an average annual rate of 2%, representing the largest increase for any cancer in women. It is one of the only cancers in the United States with an increasing incidence. Researchers also found that Black women have a higher risk of death from this disease, both nationally and in North Carolina. Compared to other racial and ethnic groups, Black women have a 93% higher five-year mortality rate. In North Carolina, Black women have a more than two-fold risk of death.

***Researchers want to understand why the disease is becoming more prevalent and mortality rates have increased, but also why mortality rates are higher in Black women compared with white women.***

In her laboratory, Bae-Jump is developing mouse models of endometrial cancer using tumor tissue from patients in order to study genetic differences in the cancer of Black and white women. She hopes to identify potential new treatments and to understand what may be contributing to rising mortality rates as well as racial disparities. "Endometrial cancer does harbor one of the worst disparities for African-American women," she said. "If we know what the differences are, we could target those with therapy."

Bae-Jump is investigating several factors that could be contributing to the disparity for Black women, including the presence of other diseases such as diabetes, and a lack of information on molecular subtypes of disease. When she reviewed existing studies that analyzed tumors to find what may be contributing to the disparity at the level of the gene or protein, she found Black women were under-represented in those studies.

That's why the Carolina Endometrial Cancer Study, which is funded with about $1.7 million from UNC Lineberger, is so important. The study is modeled after the nation-leading Carolina Breast Cancer Study, a decades-long population study of thousands of North Carolina women. The CBCS has revealed genetic insights that have helped researchers pinpoint reasons contributing to health disparities among breast cancer patients, leading to more effective treatments.

The Carolina Endometrial Cancer Study will investigate the molecular alterations in endometrial tumors with the goal of uncovering what may be driving more aggressive behavior or lead to worse outcomes, as well as how treatment, access to care and follow-up are all delivered. They also will evaluate the microbiome – or the naturally occurring micro-organisms present in people – that might play a role in disease outcomes. And ultimately, they believe they will uncover new ways for drug targets to improve treatment.

"We are going to look at the genomic differences on a greater scale than has ever been done before," Bae-Jump said.

## *Breast cancer treatment costs highest among young women with metastatic cancer*

For metastatic breast cancer patients – especially young women – the financial costs for treatment are much higher than for earlier-stage cancer patients, a new study by UNC Lineberger researchers has found.

Wheeler

The findings, published in the journal Breast Cancer Research and Treatment, showed that women aged 18-44 with advanced cancer had the largest expected costs; the incremental average monthly treatment cost for this group was $4,463 compared to monthly costs of $2,418 for stage 1 cancer. Breast cancer in younger women is typically diagnosed at more advanced stages, is more aggressive and less responsive to treatment.

By identifying the age groups and phases of care where medical costs are the highest, the results of this study may inform decision makers about where to invest resources – for example, which groups of patients may be in need of extra financial or psychological support.

"Our results highlight the tremendous cost burden associated with metastatic breast cancer among working-age women, particularly during the years after initial treatment of metastatic disease as well as at the end of life," said UNC Lineberger's **Stephanie Wheeler, PhD, MPH**, professor of health policy and management at the UNC Gillings School of Global Public Health.

Women living in North Carolina and treated for breast cancer between 2003 and 2014 were included in the study, which was funded by the U.S. Centers for Disease Control and Prevention. In the study group, 4,806 had metastatic breast cancer, meaning it had spread to other parts of the body, and 21,772 had non-metastatic cancer. The patient data was generated from UNC Lineberger's Cancer Information & Population Health Resource (CIPHR), a "big data" tool funded by the UCRF that links information on more than 500,000 cancer patients in North Carolina. Researchers used statistical modeling based on insurance claims data to estimate medical costs for these patients.

For women with metastatic breast cancer where the five-year survival rate is only 26.3% compared to 98.8% for localized cancer, treatment continues for longer, and it includes end-of-life care. These factors contribute to the high medical costs associated with metastatic breast cancer, which can be a financial burden for women and their families.

The finding that medical costs are higher for younger and middle-age women may reflect their desire for more aggressive treatment and willingness to pay for additional months of life, researchers said, or it may reflect breakdowns in shared decision making between patients and practitioners, leading to treatments with minimal financial and health benefits for patients.

***For women with metastatic breast cancer where the five-year survival rate is only 26.3% compared to 98.8% for localized cancer, treatment continues for longer, and it includes end-of-life care. These factors contribute to the high medical costs associated with metastatic breast cancer, which can be a financial burden for women and their families.***

"Our results suggest that we spend nearly twice as much in the last year of life for women that die of breast cancer compared to other causes of death," said UNC Lineberger's **Justin Trogdon, PhD**, professor of health policy and management at UNC Gillings. "We should work to ensure that end-of-life spending for metastatic breast cancer represents women's preferences and is of high value."

## UNC panel issues recommendations for state response to suspected cancer cluster

Concerns about suspected cancer clusters in two North Carolina communities led the General Assembly to direct the North Carolina Policy Collaboratory, based at UNC-Chapel Hill, to create an advisory panel of experts to develop strategies for assessing cancer incidence and mortality rates and patterns over time and geography. UNC Lineberger's Office of Community Outreach and Engagement provided significant support of the panel's meeting logistics and report development.


Olshan

The 22-member panel is chaired by **Andrew Olshan, PhD**, associate director of population sciences at UNC Lineberger and the Barbara S. Hulka Distinguished Professor of Epidemiology at the UNC Gillings School of Global Public Health, and includes epidemiologists, clinicians, and environmental scientists from five universities, the Iredell County Health Department, the Centers for Disease Control and Prevention, the National Cancer Institute, and the NC Department of Health and Human Services.

The panel held five meetings during the course of four months. Based on their discussions and the information they compiled, the panel members proposed five recommendations to improve how the state investigates a potential cancer cluster:

1. Improve the communication process by identifying one single point-of-contact person for local health departments, community members and other stakeholders
2. Invest in more robust infrastructure to strengthen coordination and implementation of cancer cluster investigations across the state
3. Enhance cancer data resources and analytical capabilities for cancer cluster surveillance
4. Develop a NC Environmental Public Health Tracking Web-Portal
5. Convene a cancer cluster advisory committee

The recommendations are a response to concerns about two suspected cancer clusters: one for thyroid cancer in Iredell County, NC, and one for ocular melanoma near Huntersville, NC. A cancer cluster is a greater than expected number of cancer cases within a group of people in a geographic area over a defined period of time.

"Cancer clusters provide a wide array of challenges, ranging from the appropriate approach to determining if an increase in cancer cases in an area, especially one with a small number of cancer cases, is meaningful to conducting a robust investigation to determine possible causes," Olshan said. "The panel was presented with a tall order, and I believe it has provided an excellent framework and series of diverse and impactful recommendations to help local and state officials to better address cancer cluster investigation in North Carolina."

## Five-year survival improves for certain cancers in adolescent and young adults

The five-year survival rate for adolescents and young adults with cancer has significantly improved from 1975 to 2005 in the United States overall, but this was not the case for all cancers, UNC Lineberger researchers have revealed in the Journal of the National Cancer Institute.


Nichols

The researchers identified substantial improvements in five-year mortality rates for adolescents and young adults (AYA) diagnosed with leukemia, non-Hodgkin lymphoma, Hodgkin lymphoma, central nervous system tumors, melanoma and other skin cancers, breast cancer or kidney cancer.

"Some of the most dramatic improvements were for leukemia and non-Hodgkin lymphoma," said UNC Lineberger member **Hazel B. Nichols, PhD**, the study's senior author and associate professor in the UNC Gillings School of Global Public Health. "In those groups, we saw that if you were diagnosed with leukemia, for example, in 1975, the mortality between five and 10 years was almost 30%. If you were

diagnosed with that same disease in 2005, the mortality rate was only 7%. That's pretty dramatic over a 30-year interval."

However, while mortality rates improved overall, there was no major improvement in five-year mortality rates for AYA patients with bone tumors, soft tissue sarcomas, bladder cancer, cervical and uterine cancers, or colorectal cancer. "This highlights areas where more work needs to be done," Nichols said.

Cancers among adolescents and young adults make up only about 4% of the 600,000 cancers diagnosed in the United States yearly, researchers reported. But that is still a heavy burden considering the potential for years of life lost. Studies previous to this one had indicated that survival improvement has been less dramatic in this age group.

"Cancer risk is still very low overall before 40," Nichols said. "However, we haven't seen strong representation of adolescents and young adults in clinical trials, which may be contributing to the fact that patients with certain cancer types in this age group haven't made big advancements over this time period."

## *Researchers report favorable survival, fewer side effects after reduced therapy for HPV-linked head and neck cancer*

Reducing the intensity of radiation treatment for patients with human papillomavirus-associated head and neck cancer produced a promising two-year progression-free survival rate and resulted in fewer side effects, UNC Lineberger researchers have discovered.

"A simple de-intensification strategy of reducing radiation and chemotherapy appears to be as effective at cancer control as the standard seven-week regimen," said UNC Lineberger's **Bhishamjit S. Chera, MD**, associate professor in the UNC School of Medicine Department of Radiation Oncology. "Furthermore, there were fewer toxicities."

The findings, published in the Journal of Clinical Oncology, were drawn from a phase II clinical trial that included 114 patients with HPV-linked head and neck cancer and a limited smoking history. Patients received six weeks of treatment, including a reduced intensity of radiation therapy of 60 Gray with weekly low-dose chemotherapy of cisplatin. The standard of care regimen is seven weeks of treatment 70 Gray and high-dose chemotherapy.

**Chera**

Researchers found the two-year progression-free survival was comparable to other studies using standard treatment doses (86% compared to 87%). They also found that major long-term side effects of radiation treatment – dry mouth and problems swallowing and dry mouth – were not as severe. In previous studies, the majority of patients treated with standard chemoradiotherapy require a temporary feeding tube and some have significant long-term swallowing problems. After the de-intensified treatment, patients reported that swallowing returned to normal and only 34% required a temporary feeding tube.

The results need to be validated in larger, randomized clinical trials but the benefits with respect to quality of life are clearly worth exploring. In addition, researchers want to identify additional biomarkers to drive precision medicine strategies that can continue to improve two-year progression-free response rates while achieving better side effect results.

***Researchers found the two-year progression-free survival was comparable to other studies using standard treatment doses (86% compared to 87%). They also found that major long-term side effects of radiation treatment – dry mouth and problems swallowing and dry mouth – were not as severe.***

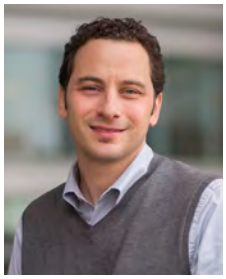
# FACULTY IMPACT: RESEARCH AND SCIENCE

## AACR honors The Cancer Genome Atlas researchers with 2020 Team Science Awards

The American Association for Cancer Research honored The Cancer Genome Atlas (TCGA), the landmark study that brought together researchers from across the globe to develop genomic profiles of 33 major cancers, with two 2020 AACR Team Science Awards – one recognizing the TCGA's founding leaders and members, including Lineberger member **Charles M. Perou, PhD**, and the other honoring members of the current TCGA project team, including UNC Lineberger's **Katherine A. Hoadley, PhD; Joel Parker, PhD; Benjamin G. Vincent, MD; and Jen Jen Yeh, MD**, for their efforts to analyze the data generated by the project.

## Noar receives 5-year, $3.35M grant to develop, test e-cigarette prevention messaging

UNC Lineberger's **Seth Noar, PhD**, professor in the UNC Hussman School of Journalism and Media, has received a five-year, $3.35 million grant from the National Institute on Drug Abuse to lead a national study to develop and test messages that discourage adolescents from using electronic cigarettes.


Noar

While cigarette smoking has declined among middle and high school students in the United States, the use of e-cigarettes and vaping among this age group has more than doubled during the past three years. Noar's study has three goals: identify promising ways to communicate with teens to prevent e-cigarette use; develop a set of e-cigarette prevention messages that reduce adolescents' desire to try or use e-cigarettes; and use a randomized controlled trial to evaluate whether evidence-based e-cigarette prevention messages sent daily via text message will reduce at-risk adolescents' willingness to use e-cigarettes.

## AACR honors Spears for longtime advocacy on behalf of cancer patients

**Patty Spears**, chair of UNC Lineberger's Patient Advocates for Research Council, received the American Association of Cancer Research 2020 Distinguished Public Service Award for Exceptional Leadership in Cancer Advocacy in recognition of her commitment to helping cancer patients through her work at the AACR, the American Society of Clinical Oncology, the National Cancer Institute, the Food and Drug Administration, Komen and other organizations.


Spears

As a research manager in the Office of Clinical & Translational Research in Oncology, Spears provides scientific leadership and guidance to advance translational trials and data management of the Alliance for Clinical Trials in Oncology breast cancer research trials. She also is part of the Office of Community Outreach and Engagement. A breast cancer survivor, Spears also educates cancer patients on the importance of participating in clinical trials, and advocates for the need to include patient-reported outcomes in clinical trials.

## Helping patients navigate the costs of cancer care

**Stephanie Wheeler, PhD, MPH, and Donald Rosenstein, MD**, were awarded a four-year, more than $1.87 million grant from the National Cancer Institute to study the impact of implementing financial navigation services at five rural cancer centers in eastern North Carolina – an intervention designed to help patients cope with the financial burdens related to cancer care. They will use the grant funds to connect cancer patients with potential financial support resources in Carteret, Dare, Jackson, Lenoir, and Nash counties. Their goal is for the intervention to improve patient's health and cancer treatment outcomes, as well as reduce racial and geographic inequities.


Wheeler


Rosenstein

## UNC Lineberger faculty ranked among most influential researchers

Eighteen UNC Lineberger members were recognized for being among the world's most influential researchers of the past decade. The Web of Science Group's 2019 Highly Cited Researchers list is limited to researchers who have published multiple highly-cited papers that rank in the top 1% by citations for field and year. Only about 6,200 researchers worldwide, or .1% of all researchers, were named to the list in 2019.

UNC Lineberger members named to the 2019 Highly Cited Researchers list:

Ralph Baric, PhD
Noel Brewer, PhD
Lisa A. Carey, MD, FASCO
Myron Cohen, MD
Katherine A. Hoadley, PhD
Leaf Huang, PhD
David M. Margolis, MD
Edward A. Miao, MD, PhD
Piotr A. Mieczkowski, PhD
Seth M. Noar, PhD
Joel S. Parker, PhD
Charles M. Perou, PhD
Barry M. Popkin, PhD
Kurt M. Ribisl, PhD
Bryan L. Roth, MD, PhD
Paschal Sheeran, PhD
Patrick F. Sullivan, MD, FRANZCP
Jenny P.Y. Ting, PhD

## Muss receives Visionary Leader Award for cancer care in older adults


Muss

The American Society of Clinical Oncology honored UNC Lineberger's Hyman B. Muss, MD, FASCO, the Mary Jones Hudson Distinguished Professor of Geriatric Oncology, with the 2020 Allen S. Lichter Visionary Leader Award for his career-long dedication to improving the care of older patients with cancer. His UNC research program was initiated and has been sustained with UCRF investments.

Muss, whose interest in the study and care of cancer in older adults dates back nearly 30 years, said eliminating misconceptions about older adults with cancer is a critical first step to providing them with better care. "Older people remain woefully underrepresented on clinical trials. There is a shortage of really good treatment-related data, especially for chemotherapy and radiation therapy in older patients, he said. "This generation of physicians will hopefully do the research to figure out how to provide the best treatment and UNC and our cancer center will continue to play a major role in these efforts."

## Damania elected to American Academy of Arts and Sciences


Damania

UNC Lineberger's Blossom Damania, PhD, vice dean for research and the Cary C. Boshamer Distinguished Professor of Microbiology and Immunology at the UNC School of Medicine, has been elected to the American Academy of Arts and Sciences, which was founded in 1780 to recognize artistic and scientific excellence and to convene researchers from various professions and perspectives.

One of the world's leading virology researchers and academic leaders, Damania co-directs UNC Lineberger's Global Oncology Program and the Virology Program. Her achievements include more than 140 peer-reviewed articles in major science journals. Among her scientific breakthroughs was discovering in great detail how viral proteins encoded by human oncogenic viruses take over a normal, healthy cell's machinery to transform it into a cancer cell.

## Legant named 2019 Packard Fellow


Legant

UNC Lineberger's **Wesley Legant, PhD,** assistant professor in the UNC-NC State Joint Department of Biomedical Engineering and the Department of Pharmacology, received a prestigious Packard Fellowship to enhance his research on new kinds of microscopy techniques to further biomedical discoveries at the UNC School of Medicine and beyond.

Legant will receive $875,000 over five years to support his research. Work in the Legant Lab spans the development of cutting-edge fluorescent microscopes, machine learning algorithms for intelligent instrument control and image analysis, and applications to fundamental biological phenomena including cell division, cell migration, and cell differentiation.

## UNC ranked among world's top 15 institutions for cancer research publications

UNC-Chapel Hill is the 15th most productive institution in the world for publishing cancer research studies, according to Nature Index. The ranking was based on a review of more than 20,000 research articles published in 82 prominent natural-science journals from 2015 to 2019.

UNC Lineberger is the nexus of laboratory, clinical and population-based cancer research at UNC-Chapel Hill and the largest research center at university. It brings together more than 400 scientists from schools and departments across the health affairs and the college to create a greater understanding of cancer, its prevention, early detection and treatment. UNC Lineberger members are also key to UNC's nationally renowned cancer care programs.

## NCI appoints Gopal director of Center for Global Health


Gopal

The National Cancer Institute chose **Satish Gopal, MD, MPH**, one of UNC Lineberger's outstanding global health physician-scientists, to lead its Center for Global Health. Gopal led the cancer program for UNC Project-Malawi, a research and care collaboration between the University of North Carolina at Chapel Hill and the Malawi Ministry of Health, since 2012.

"The global cancer burden is enormous. About two-thirds of cancer deaths occur each year in low- and middle-income countries, and that's increasing," said Gopal, who lived in Malawi with his family from 2012-2019, caring for patients at the Kamuzu Central Hospital Cancer Clinic and leading a multidisciplinary international cancer research program. "NCI can hopefully play a key role in addressing cancer as a truly global public health problem: Studying cancer everywhere should benefit cancer patients everywhere."

## Smitherman receives grant for cancer outcomes research in children and young adults


Smitherman

UNC Lineberger's **Andrew Smitherman, MD, MSc**, has received a grant from the Hyundai Hope on Wheels program to study how to identify young cancer patients who may suffer from treatment side effects later in their lives. The two-year, $200,000 Hyundai Young Investigator Grant will support Smitherman's study of approaches to identify pediatric, adolescent and young adult cancer patients most at risk for late-stage side effects from their cancer treatments. About two thirds of pediatric and adolescent cancer survivors will develop long-term side effects from their treatment, such as second cancers, heart disease and lung disease – conditions that typically occur in among people in their 60s or 70s in the general population, but occur in young cancer survivors much earlier.

## Carey elected to American Society of Clinical Oncology's board of directors


Carey

The American Society of Clinical Oncology has elected UNC Lineberger's **Lisa A. Carey, MD, FASCO**, to its Board of Directors.

Carey, the Richardson and Marilyn Jacobs Preyer Distinguished Professor in Breast Cancer Research and the deputy director of Clinical Sciences at UNC Lineberger, began her four-year term in June.

Carey is a member of ASCO's Breast Cancer Guideline Advisory Group. She previously served the society as chair of the Nominating Committee, chair of the Professional Development Committee, track leader of the annual meeting Education Committee, and a member of the Journal of Clinical Oncology editorial board.

## Ray receives Young Investigator Award to support breast cancer research


Ray

UNC Lineberger's **Emily Ray, MD, MPH**, has received a Young Investigator Award from the Conquer Cancer Foundation of the American Society of Clinical Oncology, in conjunction with the Breast Cancer Research Foundation.

Ray, an assistant professor of medicine, will use the one-year, $50,000 award to support her work to develop predictive models that accurately determine breast cancer prognosis in late-stage breast cancer patients. She and her colleagues will create a breast cancer-specific prognostic tool to assess risk of death so at-risk patients can avoid unnecessary treatments.

## Dittus and colleagues write the book on rare lymphomas

UNC Lineberger's **Christopher Dittus, DO, MPH**, assistant professor of medicine, is the editor of a new book that offers a comprehensive review of how to diagnose and manage rare lymphomas, with a focus on novel treatment approaches. Dittus said the purpose of "Novel Therapeutics for Rare Lymphomas" is to increase the understanding of these diseases, with the goal of improving patient care.

UNC Lineberger faculty and trainees contributed chapters to the volume, including **Anne Beaven, MD; Edith Bowers, MD; Catherine C. Coombs, MD; Yuri Fedoriw, MD; Natalie Grover, MD; Yara Park, MD; Raghuveer Ranganathan, MD**; and **Thomas C. Shea, MD**. UNC hematology and oncology fellows **Timothy Voorhees, MD**, and **Luis Malpica Castillo, MD,** as well as UNC surgical pathology fellow **Renee Betancourt, MD**, were also authors. Faculty from nine other academic cancer centers also contributed chapters.

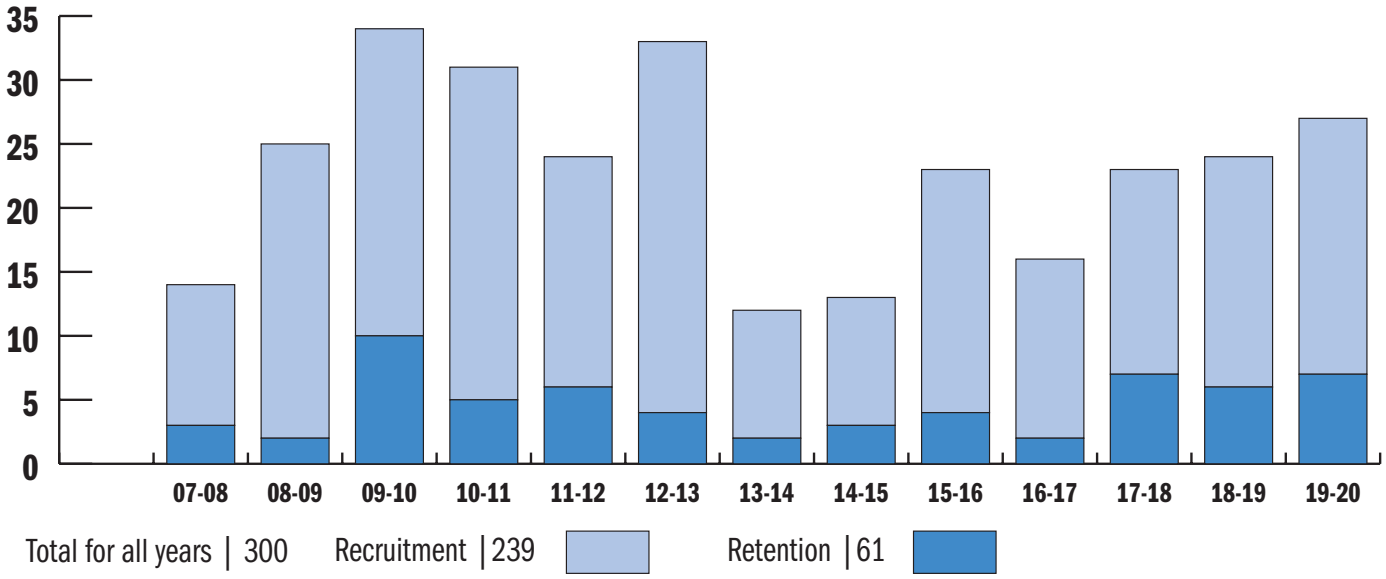
# INFRASTRUCTURE AND SHARED RESOURCES

## *Developing research partnerships*

UNC Lineberger's leadership understands the value of developing research partnerships with investigators at other University of North Carolina System institutions. In 2019, the cancer center funded four research projects at NC State, East Carolina and UNC Greensboro, which 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.

| **2019 East Carolina University Award** | | | |
|---|---|---|---|
| Principal Investigator | Other Investigators | Project Title | Category |
| Li Yang, PhD, associate professor internal medicine | | A Novel Target to Alleviate Immune-Related Adverse Events and Enhance Cancer Immunotherapy | Basic Science |
| | | | |
| **2019 North Carolina State University Award** | | | |
| Principal Investigator | Other Investigators | Project Title | Category |
| Michael Sano, PhD, assistant professor biomedical engineering | | INSPIRE Immunity: Systemic Cancer Therapy Using Immunostimulating Pulsed Electric Fields | Clinical/Translational |
| | | | |
| **2019 UNC Greensboro Award** | | | |
| Principal Investigator | Other Investigators | Project Title | Category |
| Chris Kepley, PhD, associate professor, nanoscience | Tal Kafri, MD, PhD (UNC Lineberger) | Testing Human Mast Cells as a New Strategy for Cancer Immunotherapy | Basic Science |
| | | | |
| **2019 UNC/North Carolina State University Collaborative Award** | | | |
| Principal Investigator | Other Investigators | Project Title | Category |
| Bernard Weissman, PhD, professor, pathology and laboratory medicine | Robert Smart, PhD (NC State) | Role of Activated NRF2 Signaling in the Development of Cutaneous Squamous Cell Carcinoma | Basic Science |

**Recruitment and Retention**




## Faculty recruitment

### Cancer Genetics

**John P. Morris IV, PhD**
Assistant Professor
UNC School of Medicine
Department of Pharmacology
Pancreatic cancer; Genomics
*Memorial Sloan Kettering Cancer Center*

**Jesse Raab, PhD**
Assistant Professor
UNC School of Medicine
Department of Genetics
Liver cancer; Epigenetics
*University of North Carolina at Chapel Hill*

**Philip Spanheimer, MD**
Assistant Professor
UNC School of Medicine
Department of Surgery
Breast cancer; Epigenetics
*Memorial Sloan Kettering Cancer Center*

### Critical Infrastructure

**Marc Bjurlin, MD**
Associate Professor
UNC School of Medicine
Department of Urology
Prostate and bladder cancer
*New York University*

**Dana Casey, MD**
Assistant Professor
Department of Radiation Oncology
Pediatric and breast cancer therapy
*Memorial Sloan Kettering Cancer Center*

**Shekinah Elmore, MD, MPH**
Assistant Professor
UNC School of Medicine
Department of Radiation Oncology
Genitourinary cancer; Global oncology
*Harvard/MGH*

**José Gaston Guillem, MD, MPH, MBA**
Chief, Gastrointestinal Surgery
Professor
UNC School of Medicine
Department of Surgery
Colorectal cancer of the young; Surgery
*Memorial Sloan Kettering Cancer Center*

**Eben Lichtman, MD**
Assistant Professor
UNC School of Medicine
Division of Hematology
Multiple myeloma; CAR-T
*University of North Carolina at Chapel Hill*

**Matthew Painschab, MD**
Assistant Professor
UNC School of Medicine
Division of Hematology
Global oncology; Lymphoma
*University of North Carolina at Chapel Hill*

**Daniel Richardson, MD**
Assistant Professor
UNC School of Medicine
Division of Hematology
Leukemia; Cancer outcomes
*University of North Carolina at Chapel Hill*

**Sam Rubinstein, MD**
Assistant Professor
UNC School of Medicine
Division of Hematology
Plasma cell disorders; Clinical trials
*Vanderbilt University Medical Center*

### Developing New Treatments

**Klarissa Jackson, PhD**
Assistant Professor
UNC Eshelman School of Pharmacy
Division of Pharmacotherapy and Experimental Therapeutics
Targeted cancer therapy; Drug metabolism
*Lipscomb University College of Pharmacy*

**Justin Milner, PhD**
Assistant Professor
UNC School of Medicine
Department of Microbiology and Immunology
Cancer immunotherapies
*University of California, San Diego*

**Adam Palmer, PhD**
Assistant Professor
UNC School of Medicine
Department of Pharmacology
Computational approaches to therapy
*Harvard University*

**Alex Rubinsteyn, PhD**
Assistant Professor
UNC School of Medicine
Department of Genetics
Computational Medicine Program
Personalized cancer vaccines; Cancer immunotherapy
*Icahn School of Medicine at Mount Sinai*

**Opportunity**

**Richard Baker, PhD**
Assistant Professor
UNC School of Medicine
Department of Biochemistry and Biophysics
Cryo-electron microscopy; Membrane trafficking
*University of California, San Diego*

**Jessica Bowser, PhD**
Assistant Professor
UNC School of Medicine
Department of Pathology
Cancer resistance to therapy
*University of Texas MD Anderson Cancer Center*

**Russell Broadus, MD, PhD**
Joe W. and Evelyn M. Grisham Distinguished Professor
Chair, Pathology and Laboratory Medicine
UNC School of Medicine
Department of Pathology and Laboratory Medicine
Molecular pathogenesis of endometrial cancer
*University of Texas MD Anderson Cancer Center*

**Optimizing NC Outcomes**

**Lorinda Coombs, PhD, CNS, FNP-BC, AOCNP**
Assistant Professor
UNC School of Nursing
Cancer outcomes; Cancer in older adults
*University of Utah*

**Lisa Spees, PhD**
Assistant Professor
UNC Gillings School of Global Public Health
Department of Health Policy and Management
Cancer care quality and access among minority and rural populations
*University of North Carolina at Chapel Hill*

*(Institutions from which the faculty were recruited)*

## Retention

**Opportunity**

**Alain Laederach, PhD**
Associate Professor
UNC at Chapel Hill
Department of Biology
Cancer genetics

**Cyrus Vaziri, PhD**
Professor
UNC School of Medicine
Department of Pathology and Laboratory Medicine
Regulation of DNA replication

**Developing New Treatments**

**Ben Vincent, MD**
Assistant Professor
UNC School of Medicine
Department of Medicine and Microbiology and Immunology
Cancer vaccines; Tumor immunology; Immunogenomics

**Arlene Chung, MD, MHA, MMCi**
Assistant Professor
Associate Director of the Program on Health & Clinical Informatics
UNC School of Medicine
Department of Medicine and Pediatrics
Digital health; Patient reported outcomes

**Jennifer Leeman, DrPH, MPH, MDiV**
Associate Professor
UNC School of Nursing
Cancer prevention; Implementation science

**Katherine E. Reeder-Hayes, MD, MBA, MSc**
Associate Professor
UNC School of Medicine
Department of Medicine
Breast Cancer; Race and age disparities; Cancer outcomes

**Cleo Samuel, PhD**
Associate Professor
UNC Gillings of Global Public Health
Department of Health Policy and Management
Cancer care inequities; Palliative and support care; Health informatics

In addition to supporting the recruitment and retention of world-class researchers and clinicians, the UCRF has funded critical core infrastructure and shared resources such as imaging, informatics and other research tools that are indispensable in the push to advance cancer research and care. The development of virtual tumor boards, telemedicine, community and provider partnerships, and other outreach initiatives have helped UNC Lineberger reach patients and clinical practices in all 100 North Carolina counties.

## *UNC Lineberger Cancer Network educates medical professionals, patients*

A vital part of UNC Lineberger's mission as a teaching hospital is to provide continuing education to health care providers across the state. Physicians and other health professionals can earn continuing education credits 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 Lineberger Cancer Network is a main 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. The lecture series enables practitioners to access timely, evidence-based oncology therapeutic updates from the convenience of their own practice, while earning continuing education credits. For lecture participation via the telehealth infrastructure this year, medical professionals earned:

- 49 American Medical Association Continuing Medical Education credits;
- 935 American Nurses Credentialing Center credits;
- 199 American Society of Radiologic Technologist credits; and
- 294 Accreditation Council for Pharmacy Education credits.

A total of 3,045 telehealth attendance hours were logged by medical professionals this year.

The UCRF has significantly improved UNC Lineberger's ability to connect with oncologists and cancer patients across North Carolina. Using infrastructure supported by UCRF funds, UNC faculty regularly hold virtual "tumor boards" – in-depth reviews of a particular patient's case with a team of doctors – with doctors in hospitals across the state, and consult in specialties that are not available in rural communities. This year 355 virtual tumor boards, across 17 different disciplines, helped connect community-based medical professionals with UNC oncology experts. Additionally, tumor boards are another source for continuing education and this year provided nearly 4,300 credit hours in the following specialty areas:

| | |
|---|---|
| Bone Marrow Transplant/ Cellular Therapy | 766 |
| Gastro-Intestinal | 566 |
| Hematology Oncology | 455 |
| Breast Radiology Pathology | 215 |
| Melanoma | 131 |
| Breast | 1,010 |
| Pediatrics | 505 |
| Benign Hematology | 69 |
| Head and Neck | 557 |
| **Total** | **4,274** |

- UNC Lineberger uses the telehealth network to connect in real time with health care providers to discuss best practices for patient care and cutting-edge research, and to hold community education events aiming to raise patient awareness of issues related to cancer. This year, UNC Lineberger hosted 24 telehealth lectures with almost 3,045 participants, including nurses, doctors, physician assistants, nurse practitioners, pharmacists, social workers, nutritionists and clinic managers in 17 oncology practices across the state.

- The UNC Lineberger Cancer Network North Carolina Community College Lecture Series also offered four courses designed for students enrolled in nursing and allied health sciences programs at 19 community college sites across North Carolina. These lectures provide opportunities for students to become more familiar with strategies necessary for caring for cancer patients. It is hoped that this series will lead to improvements in cancer care, and a greater interest in oncology-related professions. Workforce development at all levels will be crucial as North Carolina continues to increase in population and in the number of cancer survivors. The North Carolina Community College System could be a key contributor; therefore UNC Lineberger will enlarge this program in content and scope over the next two years.

Blue Ridge Community College, Flat Rock

Cape Fear Community College, Wilmington

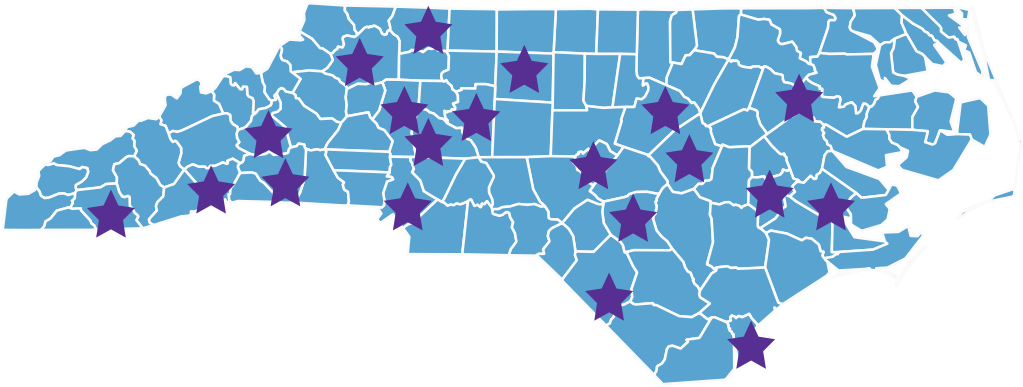
Central Carolina Community College, Sanford

Central Piedmont Community College, Charlotte

Craven Community College, New Bern

Edgecombe Community College, Tarboro

Fayetteville Technical Community College, Fayetteville



Forsyth Technical Community College, Winston-Salem

Isothermal Community College, Spindale

Johnston Community College, Smithfield

Lenoir Community College, Kinston

Mitchell Community College, Statesville

Montgomery Community College, Troy

Robeson Community College, Lumberton

Rowan-Cabarrus Community College, Salisbury

South Piedmont Community College, Polkton

Stanly Community College, Albemarle

Surry Community College, Dobson

Wilkes Community College, Wilkesboro

- At the university level, to give undergraduate students an introduction into cancer biology and disparities and hopefully spark an interest in cancer care or research as a career field, the Biology of Cancer seminar series was launched this year in partnership with North Carolina Central University (NCCU) and North Carolina A&T (NC A&T) State University.

- To support care providers and caregivers, the UNC Lineberger Cancer Network assisted with 39 Palliative Care Grand Rounds lectures, which cover topics that impact the practice of palliative medicine. UNCLCN assisted in hosting seven Caregiver Conversations sessions with the Office of Community Outreach and Engagement as well as 10 Schwartz Rounds, which focus on issues related to the emotional impacts of patient care.

- UNCLCN also worked with 15 fellowship programs in 11 states to host and record six Fellows ACHIEVE lectures focused on treating patients with COVID-19 and cancer.

# North Carolina Cancer Hospital celebrates 10th anniversary

In late 2009, North Carolina's cancer hospital opened its doors, replacing an outdated and overcrowded treatment facility and welcoming patients into a state-of-the-art cancer center designed to substantially improve patient care and to serve as the clinical home for UNC Lineberger research.

"The biggest benefit of the new hospital was giving the people of North Carolina a cancer hospital that valued them, their time, and their experience," said **Lisa Carey, MD, FASCO,** the Richardson and Marilyn Jacobs Preyer Distinguished Professor in Breast Cancer Research and deputy director of clinical sciences at UNC Lineberger.

Funded with $180 million from the state, the N.C. Cancer Hospital and adjacent office building was built to help UNC's researchers and clinicians better meet the needs of a growing population of cancer patients. With more than 320,000 square feet of space, the new hospital offered multidisciplinary clinic space, facilities for tumor assessment imaging and treatment, amenities for patient support, a healing environment, and other features – all of which are needed to support a world-class comprehensive cancer program.

"The ability to provide all of these activities under one roof is what made the construction of the N.C. Cancer Hospital a transformative event for the hospital and for our patients," said **Jonathan Serody, MD**, the Elizabeth Thomas Professor of Medicine, Microbiology and Immunology and director of the Division of Hematology. "It's a huge help to have radiology, clinics, the infusion facility and the inpatient beds in one area."


The hospital and its associated clinics oversee more than 208,000 outpatient visits annually, from all 100 counties in North Carolina. **Mary Beck**, the former senior vice president of planning and program development for UNC Health Care who helped shepherd the construction process, saw the transformation from both an administrative and a patient's lens.

"When we were planning and designing the cancer hospital, we wanted it to have lots of light – as much natural light as we could," said Beck, a cancer survivor who was treated in UNC's previous cancer clinic, which was housed in a 1950s-era tuberculosis center. "We wanted to use materials that were resilient, that felt good and were positive. We wanted to have artwork that supported the feeling of healing and the positive nature that we wanted people to feel when they came in the building."

> ***"The biggest benefit of the new hospital was giving the people of North Carolina a cancer hospital that valued them, their time, and their experience."***
>
> - Lisa Carey, MD, FASCO

# BUDGET AND EXPENDITURE INFORMATION

# BUDGET AND EXPENDITURES

The UCRF was initially funded by three sources of support: tobacco settlement funds, taxes on other (non-cigarette) tobacco products (OTP) such as snuff, and state appropriations. In the 2013-2014 budget, the General Assembly consolidated all tobacco settlement funds into the State's General Fund. That consolidation eliminated tobacco settlement funds as a source of UCRF support, resulting in a roughly 16% reduction in UCRF revenues. The OTP tax proceeds have varied from year to year, but the state's population growth has led to increases the past five years.

| **FY 2020 Anticipated and Actual Fund Revenue** | |
|---|---|
| | **Amount*** |
| Anticipated | |
| State Appropriation | $16,020,000 |
| Projected OTP Tax Receipts | $32,480,000 |
| Total | $48,500,000 |
| Actual | |
| State Appropriation | $16,020,000 |
| Actual OTP Tax Receipts | $36,627,688 |
| **Total** | **$52,647,688** |

| **FY 2020 Budget and Expenditures** | |
|---|---|
| | **Amount*** |
| Anticipated Budget | |
| Revenue | $48,500,000 |
| Carryover from FY19 | ($53,800) |
| Carryover from unrealized FY18 OTP tax receipts | $0 |
| Total | $48,446,200 |
| Actual Budget | |
| Revenue | $52,647,688 |
| Carryover from FY19 | ($53,800) |
| Carryover from unrealized FY18 OTP tax receipts | $0 |
| **Total** | **$52,593,888** |
| Expenditures | $52,643,726 |
| Balance | ($49,838) |

| **Strategic Plan Categories** | **YTD Actual*** |
|---|---|
| Tier 1: Research Priorities | |
| Optimizing NC Cancer Outcomes | $7,682,742 |
| Understanding Genetics in Cancer - Basic Approaches and Clinical Applications | $8,152,885 |
| Developing New Cancer Treatments | $7,139,659 |
| Tier 2: Opportunity Fund | $11,943,639 |
| Tier 3: Critical Infrastructure | |
| Clinical Excellence - Research & Outreach | $6,991,664 |
| Research & Tech Development and Training | $10,733,136 |
| **Total** | **$52,643,726** |

** Rounded to the nearest dollar*

## RESTRICTIONS ON THE USE OF UCRF MONIES

G.S. 116-29.1 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.

More than half the funding from UCRF has been used to recruit world-class researchers to North Carolina. Less than 2% of the total UCRF budget is used for administrative expenses.

| Strategic Plan Categories | YTD Actual* |
|---|---|
| Tier 1: Research Priorities | |
| Optimizing NC Cancer Outcomes | $7,682,742 |
| Understanding Genetics in Cancer - Basic Approaches and Clinical Applications | $8,152,885 |
| Developing New Cancer Treatments | $7,139,659 |
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| Clinical Excellence - Research & Outreach | $6,991,664 |
| Research & Tech Development and Training | $10,733,136 |
| **Total** | **$52,643,726** |

** Rounded to the nearest dollar*

## MAKING A PROFOUND POSITIVE EFFECT

From supporting dozens of renowned faculty members to funding critical technology and data sources to assist in research, from enabling community partnerships and a statewide reach that benefits patients in all 100 counties to producing ongoing and growing economic impacts, the University Cancer Research Fund continues to have a profound positive effect in North Carolina. Thank you again for continuing to support this landmark investment, and the many health and economic benefits it brings to our state.

# APPENDIX

## CANCER RESEARCH FUND COMMITTEE

The legislatively established Cancer Research Fund Committee, chaired by Kevin M. Guskiewicz, PhD, 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).

Kevin M. Guskiewicz, 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

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

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 Emeritus
Fred Hutchinson Cancer Research Center

Angela Kashuba, BSc Phm, PharmD, DABCP, FCP
Dean
UNC Eshelman School of Pharmacy
The University of North Carolina at Chapel Hill

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

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

UNC | LINEBERGER COMPREHENSIVE CANCER CENTER

## TABLE OF CONTENTS

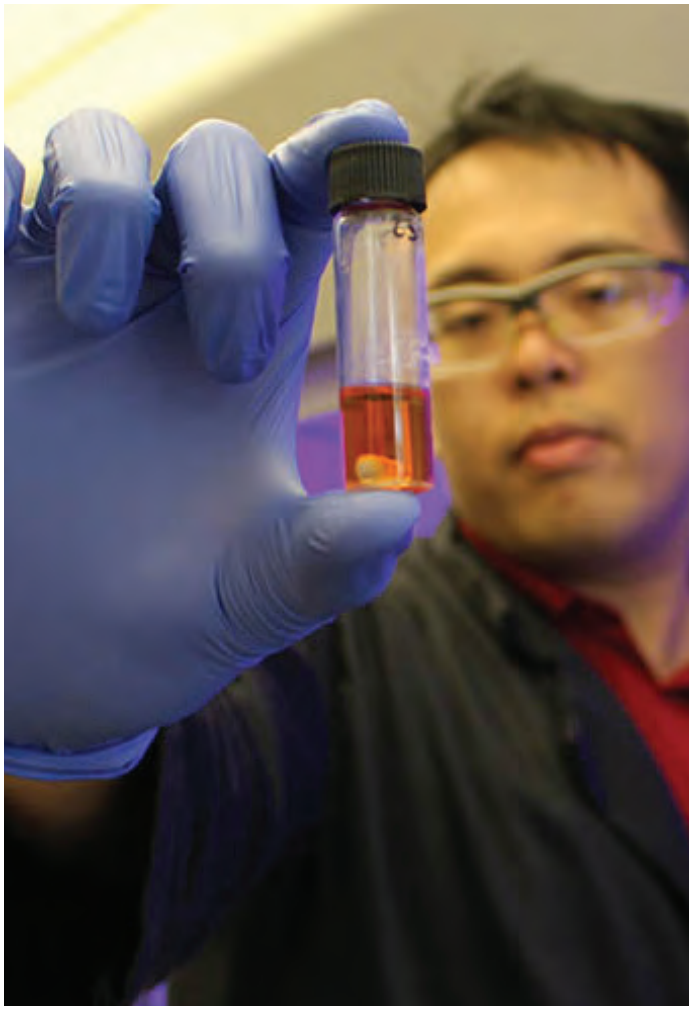
## EXECUTIVE SUMMARY

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 greater than $52.6 million for FY 2020. This year alone the FY 2020 $52.6 million investment produced an economic impact of more than $656.4 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 51 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.

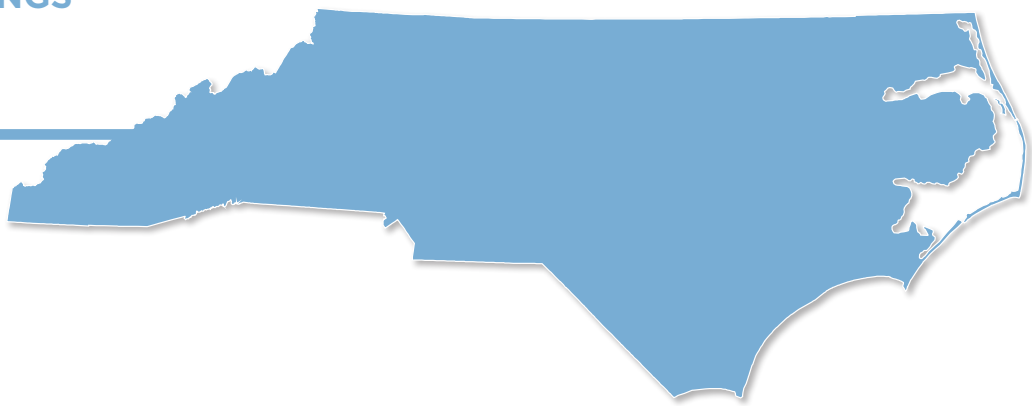
People and place are the keys to the UCRF's success. UCRF is about investing in people – promising researchers with the best ideas for cancer research and master clinicians who know how to bring those findings to patients and others. UNC Chapel Hill and UNC Lineberger have a culture of collaboration – 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, 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.



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

## KEY FINDINGS



## EXPANDING THE STATE'S ECONOMY.

Expanding the state's economy. UCRF generated more than **$656.4 million** in total economic impact in North Carolina in 2020. This includes direct spending of more than $335.9 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 **$216.0 million** in research funding received in 2020 alone. The ripple effect of in-state spending accounts for nearly **$320.5 million** in additional funds, representing downstream spending by employees, vendors, and contractors. This is just the impact of the current year (2020). Tripp Umbach estimates that through the commercialization of the discoveries made from this research, the impact by 2030 will be dramatically larger.

## CREATING JOBS

UCRF directly supported employment in 2020 of more than **1,094 jobs** in North Carolina and an additional **1,975 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 **3,069 jobs.**

## GENERATING TAX REVENUE

Tripp Umbach estimates that UCRF provided greater than **$20.8 million** in local and state tax revenue in 2020.

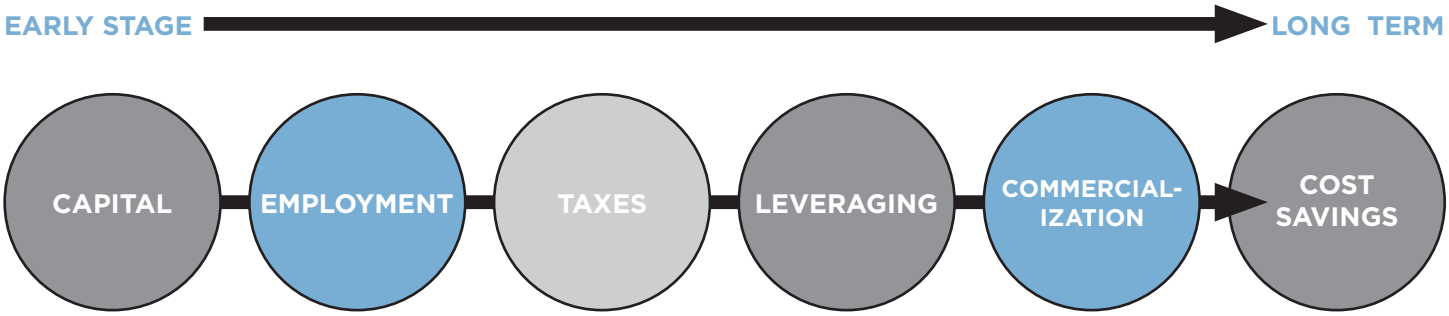
## ENCOURAGING SCIENTIFIC COLLABORATION AND LEVERAGING FEDERAL RESEARCH FUNDS

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 **$173.8 million** in federal research grants, bringing the total to more than **$216.0 million** in external funding in 2020 alone. This would not have been possible without the UCRF funding, which elevated UNC Lineberger to the top rankings.

## IMPACTS OF UCRF IN 2020

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):

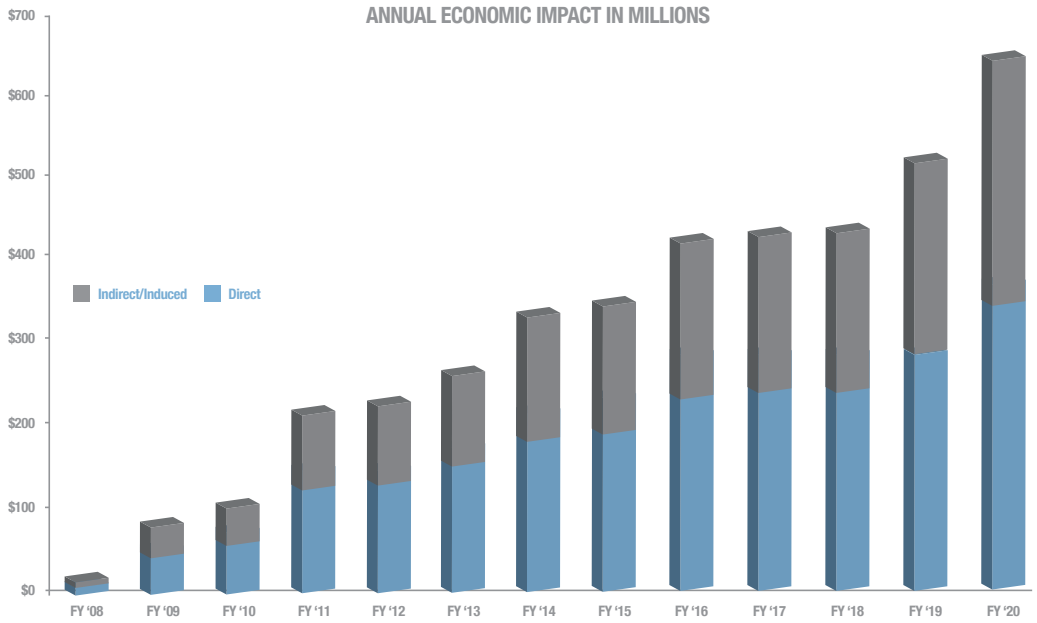
**Figure 1. Research Return on Investment Timeline**




### Early-Stage Economic Impact of Funding

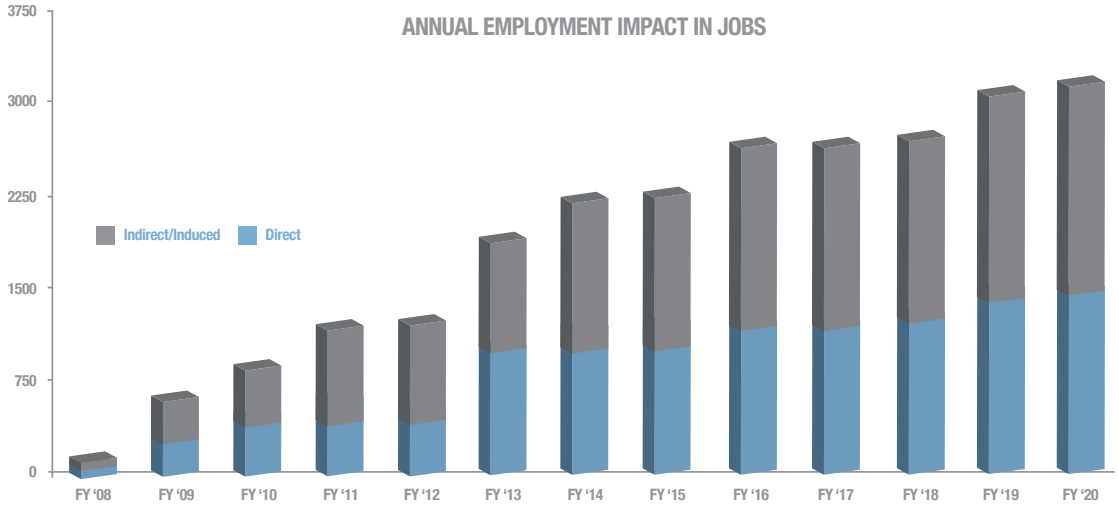
UCRF dollars invested in research in 2020 have resulted in an expansion of the state's economy by greater than $656.4 million. Tripp Umbach's economic impact analysis indicates that even in the early stage (2007-2011), program investments in capital and human resources have returned greater than three dollars to the state's economy for every one dollar invested. In 2020, this amount has risen to more than 12 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.



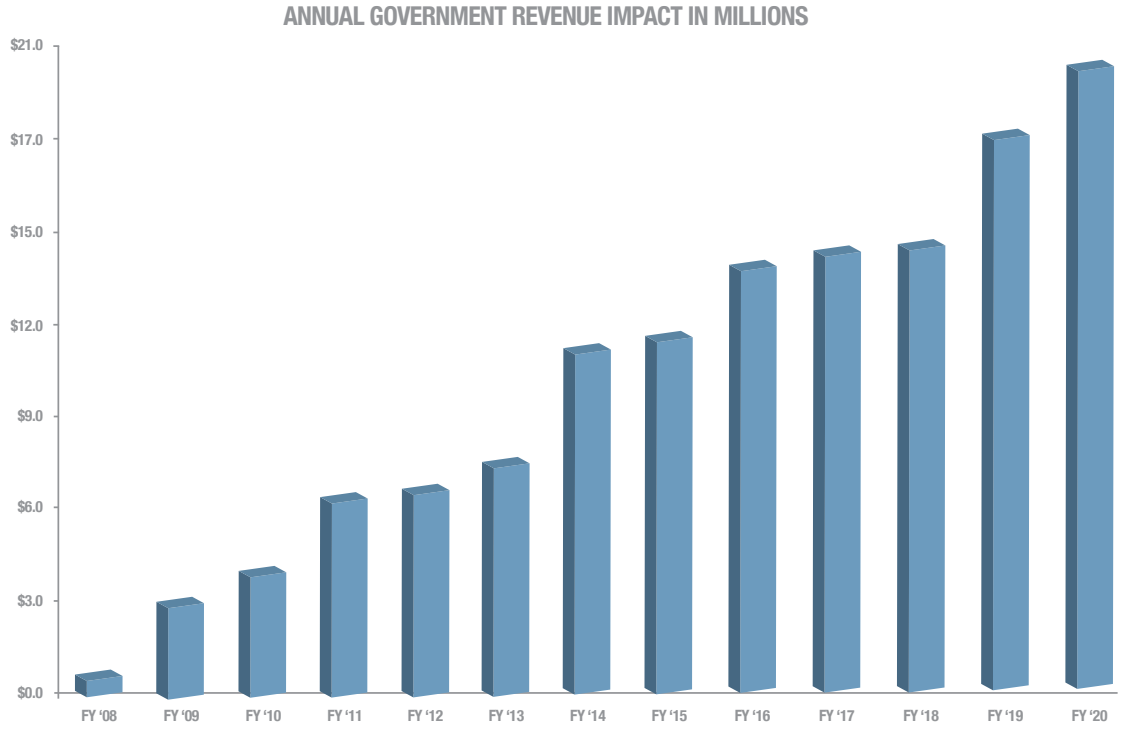
## Early-Stage Impact of UCRF Dollars on Employment

Tripp Umbach estimates that in 2020, UCRF dollars for healthcare research have created and sustained 3,069 high-paying research-related jobs throughout the state of North Carolina. This includes both the 1,094 high-paying research-related jobs directly attributed to UNC in addition to the 1,975 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 2020 have resulted in nearly $20.8 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 as 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 approximately $173.8 million, bringing the total to nearly $216.0 million in external funding in 2020 alone.

3. In 2019, 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 seven dollars 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 2030, Tripp Umbach estimates this to be from $642.6 million at a conservative level of growth scenario to $1.2 billion using the aggressive level of growth in additional economic activity within North Carolina. These activities will also create an additional 3,501 (conservative) to 6,236 jobs (aggressive) high-paying jobs. These additional economic and employment impacts will translate into additional state and local government revenue of $23.7 million to $42.6 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 2020 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 American Medical Colleges and used historical trending data from this experience in making projections.

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

## APPENDIX A: DEFINITION OF TERMS

### Study Year

Fiscal Year 2020

### 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 impacts, 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 546 different industries (generally three- or four-digit SIC code breakdown) and more than 21 different economic variables. IMPLAN sources its 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 2018. While the data is not for the current year, 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 Wexner 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 12 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 Hospital and Solove Research Institute, 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.

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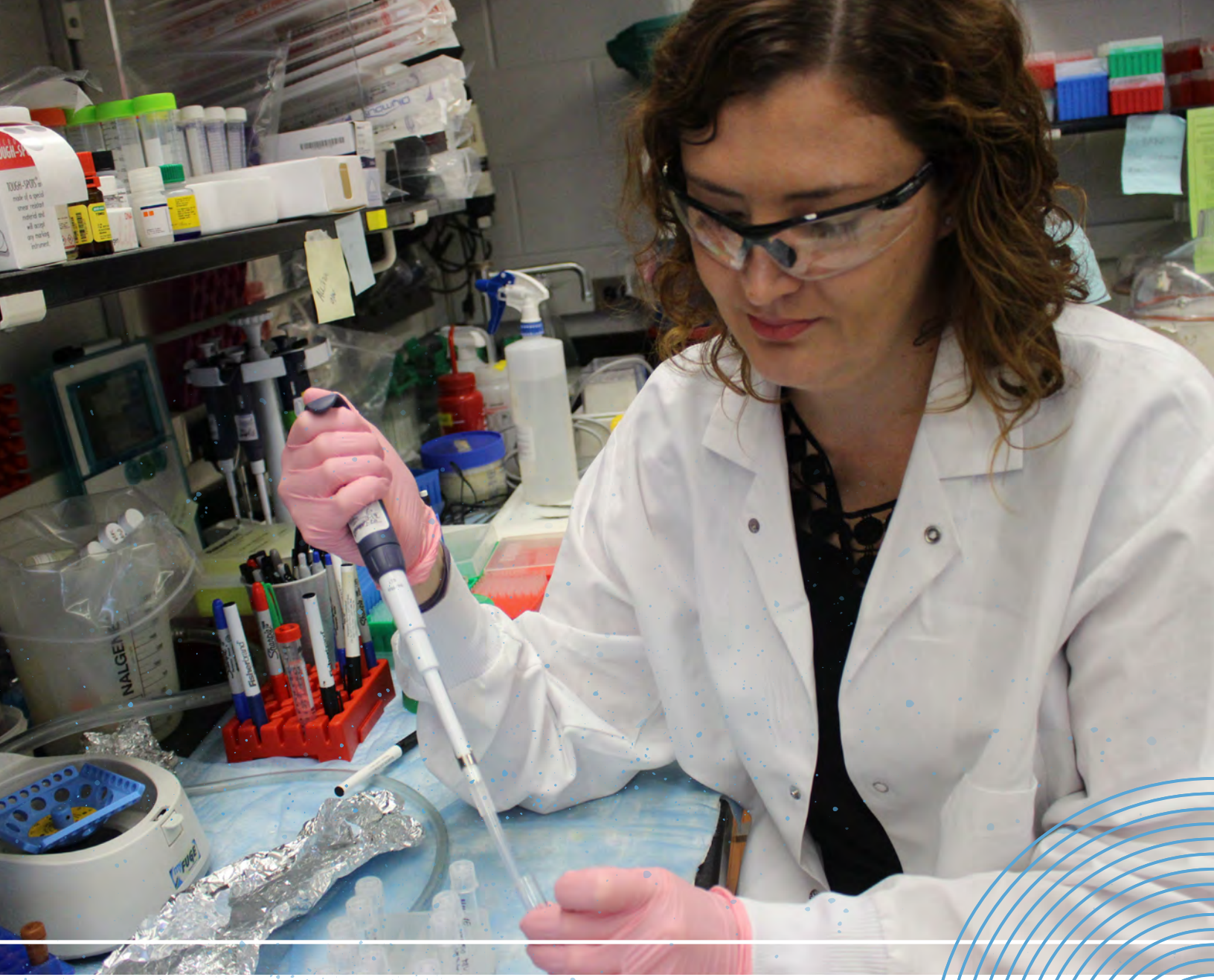


# EXPENDITURES SUMMARY

## 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.

| Fiscal Year 2020 Expenditures | | | |
|---|---|---|---|
| | | | |
| Strategy | **Annual Budget** | **Year to Date Actual** | **Cash Balance** |
| Theme 1: Optimizing NC Cancer Outcomes | $7,960,000 | $7,682,742 | $277,258 |
| Theme 2: Understanding Genetics in Cancer- Basic Approaches & Clinical Applications | $8,050,000 | $8,152,885 | ($102,885) |
| Theme 3: Develop New Cancer Treatments | $7,000,000 | $7,139,659 | ($139,659) |
| Tier 2: Opportunity Fund | $12,243,688 | $11,943,639 | $300,049 |
| Tier 3: Infrastructure- Clinical Excellence and Outreach | $7,080,000 | $6,991,664 | $88,336 |
| Infrastructure | $10,314,000 | $10,733,136 | ($419,136) |
| **Grand Total** | **$52,647,688** | **$52,643,726** | **$3,962** |

*Rounded to nearest dollar

# EXPENDITURES SUMMARY

| Expense Category | Year To Date Actual* | Expense to Total Expenditure |
|---|---|---|
| | | |
| Faculty Salaries | $16,051,770 | 30.5% |
| EPA Student Salaries | $3,117,106 | 5.9% |
| Staff Salaries | $6,234,067 | 11.8% |
| Other Staff | $407,472 | 0.8% |
| Benefits | $6,850,479 | 13.0% |
| Physicians Benefits | $228,864 | 0.4% |
| Other Staff Benefits | $322,416 | 0.6% |
| Transit Tax | $77,600 | 0.1% |
| Consultants/Contracted Services | $1,275,012 | 2.4% |
| Employee Education | $26,484 | 0.1% |
| Repairs and Maintenance | $3,314,526 | 6.3% |
| Other Current Services | $3,657,833 | 6.9% |
| Supplies, Other | $3,382,544 | 6.4% |
| Travel | $392,667 | 0.7% |
| Maintenance Contracts | $921,693 | 1.8% |
| Advertising | $15,029 | 0.0% |
| Meetings & Amenities | $9,073 | 0.0% |
| Printing and Binding | $61,754 | 0.1% |
| Communication | $99,392 | 0.2% |
| Computer Services | $165,692 | 0.3% |
| Rental/Lease Facilities | $1,116,497 | 2.1% |
| Equipment | $3,724,011 | 7.1% |
| Study Subject Expenses | $71,623 | 0.1% |
| HCS Residents | $74,697 | 0.1% |
| Insurance | $2,880 | 0.0% |
| Student Support | $972,913 | 1.8% |
| Utilities | $52,011 | 0.1% |
| Legal Fees | $17,621 | 0.0% |
| **Grand Total** | **$52,643,726** | **100.0%** |

*Rounded to nearest dollar

| ***UCRF Funding by Strategy and Expense*** | |
|---|---|
| Expenditures for Fiscal Year 2020 Rounded to Nearest Dollar | |
| | |
| Expense Category | **Year to Date Actual *** |
| **Theme 1: Optimizing NC Cancer Outcomes** | |
| Faculty Salaries | $2,878,457 |
| EPA Student Salaries | $326,820 |
| Staff Salaries | $1,280,437 |
| Other staff | $188,052 |
| Benefits | $1,332,219 |
| Physicians Benefits | $9,671 |
| Other Staff Benefits | $63,626 |
| Transit Tax | $14,226 |
| Consultants/Contracted Services | $111,018 |
| Employee Education | $8,395 |
| Repairs and Maintenance | $2,339 |
| Other Current Services | $501,564 |
| Supplies, Other | $126,375 |
| Travel | $119,125 |
| Maintenance Contracts | $40 |
| Advertising | $301 |
| Meetings & Amenities | $239 |
| Printing and Binding | $22,150 |
| Communication | $22,494 |
| Computer Services | $9,078 |
| Rental/Lease Facilities | $328,144 |
| Equipment | $90,470 |
| Study Subject Expenses | $17,764 |
| Student Support | $227,838 |
| Legal Fees | $1,900 |
| **Theme 1: Optimizing NC Cancer Outcomes Total** | **$7,682,742** |

*Rounded to nearest dollar

| Theme 2: Understanding Genetics in Cancer - Basic Approaches & Clinical Applications | Year to Date Actual * |
|---|---|
| Faculty Salaries | $2,656,273 |
| EPA Student Salaries | $635,925 |
| Staff Salaries | $890,603 |
| Other staff | $75,444 |
| Benefits | $1,176,127 |
| Physicians Benefits | $6,463 |
| Other Staff Benefits | $63,918 |
| Transit Tax | $12,760 |
| Consultants/Contracted Services | $68,383 |
| Employee Education | $500 |
| Repairs and Maintenanc | $4,518 |
| Other Current Services | $622,317 |
| Supplies, Other | $724,858 |
| Travel | $63,275 |
| Maintenance Contracts | $372,035 |
| Advertising | $4,355 |
| Printing and Binding | $12,157 |
| Communication | $7,447 |
| Computer Services | $141,634 |
| Rental/Lease Facilities | $173,411 |
| Equipment | $342,342 |
| Study Subject Expenses | $89 |
| Insurance | $43 |
| Student Support | $45,621 |
| Utilities | $52,011 |
| Legal Fees | $375 |
| **Theme 2: Understanding Genetics in Cancer - Basic Approaches & Clinical Applications Total** | **$8,152,885** |

*Rounded to nearest dollar

| Theme 3: Developing New Cancer Treatments | Year to Date Actual * |
|---|---|
| Faculty Salaries | $1,861,579 |
| EPA Student Salaries | $284,270 |
| Staff Salaries | $903,598 |
| Other staff | $86,911 |
| Benefits | $876,569 |
| Physicians Benefits | $9,368 |
| Other Staff Benefits | $38,982 |
| Transit Tax | $9,387 |
| Consultants/Contracted Services | $12,477 |
| Employee Education | $1,956 |
| Repairs and Maintenance | $30,275 |
| Other Current Services | $920,245 |
| Supplies, Other | $633,066 |
| Travel | $25,479 |
| Maintenance Contracts | $229,125 |
| Advertising | $1,239 |
| Meetings & Amenities | $610 |
| Printing and Binding | $3,789 |
| Communication | $21,910 |
| Computer Services | $437 |
| Rental/Lease Facilities | $406,403 |
| Equipment | $738,556 |
| Insurance | $2,722 |
| Student Support | $38,807 |
| Legal Fees | $1,900 |
| **Theme 3: Developing New Cancer Treatments Total** | **$7,139,659** |

*Rounded to nearest dollar

| Tier 2: Opportunity Fund | Year to Date Actual * |
|---|---|
| Faculty Salaries | $1,149,118 |
| EPA Student Salaries | $700,202 |
| Staff Salaries | $721,982 |
| Other staff | $53,069 |
| Benefits | $684,780 |
| Physicians Benefits | $15,026 |
| Other Staff Benefits | $28,443 |
| Transit Tax | $7,898 |
| Consultants/Contracted Services | $3,025 |
| Employee Education | $437 |
| Repairs and Maintenance | $3,273,978 |
| Other Current Services | $888,735 |
| Supplies, Other | $1,256,548 |
| Travel | $147,857 |
| Maintenance Contracts | $220,913 |
| Advertising | $947 |
| Printing and Binding | $21,358 |
| Communication | $15,953 |
| Computer Services | $8,209 |
| Rental/Lease Facilities | $208,540 |
| Equipment | $2,264,858 |
| Study Subject Expenses | $53,770 |
| HCS Residents | $49,697 |
| Insurance | $96 |
| Student Support | $156,624 |
| Legal Fees | $11,576 |
| **Tier 2: Opportunity Fund Total** | **11,943,639** |

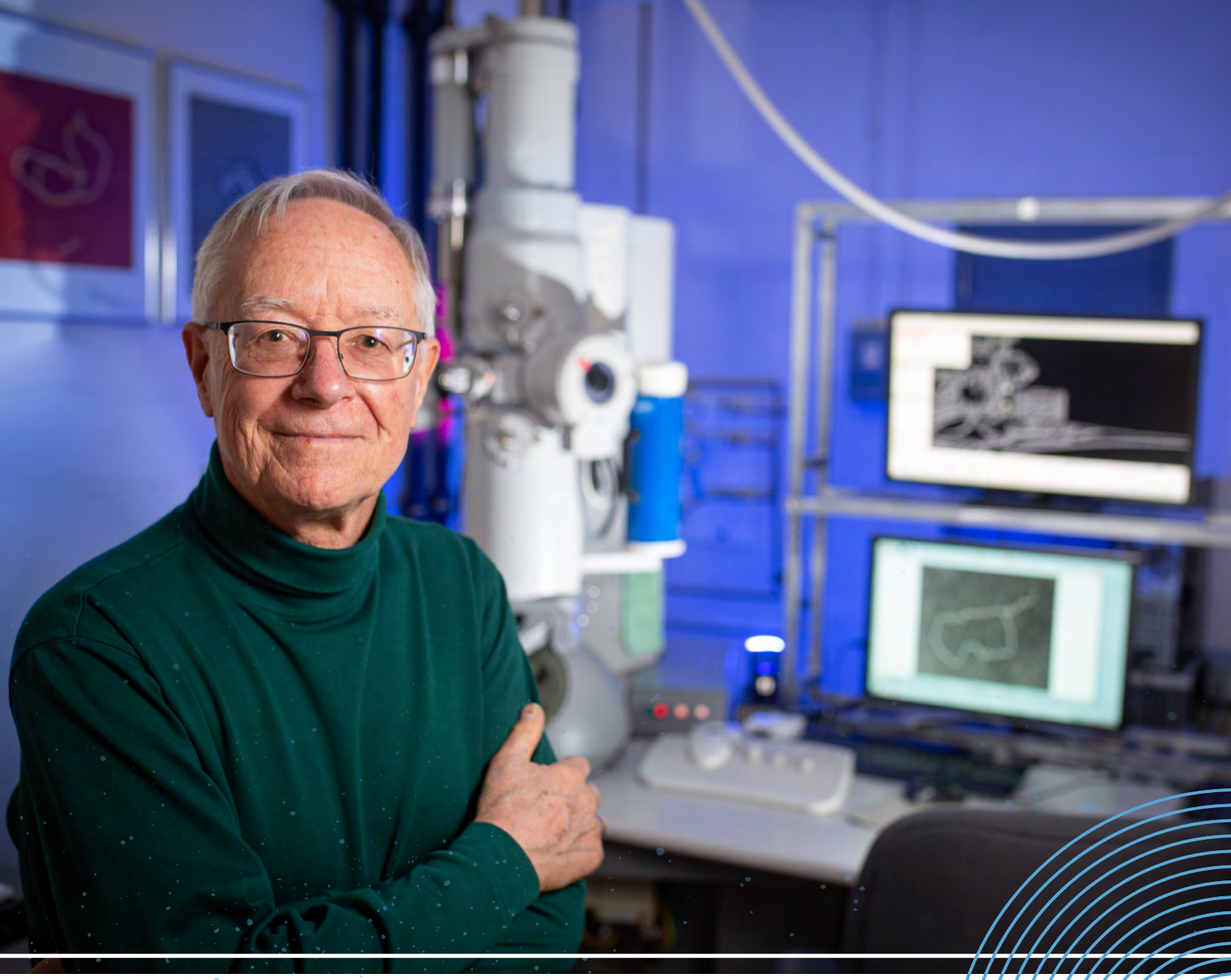
*Rounded to nearest dollar

| Tier 3: Infrastructure - Clinical Excellence and Outreach | Year to Date Actual * |
|---|---|
| Faculty Salaries | $4,627,626 |
| EPA Student Salaries | $75,077 |
| Staff Salaries | $267,245 |
| Other Staff | $2,100 |
| Benefits | $1,031,491 |
| Physicians Benefits | $178,697 |
| Other Staff Benefits | $37,595 |
| Transit Tax | $14,948 |
| Consultants/Contracted Services | $156,496 |
| Employee Education | $10,250 |
| Repairs and Maintenance | $180 |
| Other Current Services | $109,575 |
| Supplies, Other | $419,252 |
| Travel | $6,235 |
| Maintenance Contracts | $7,950 |
| Advertising | $834 |
| Printing and Binding | $68 |
| Communication | $4,011 |
| Computer Services | $3,941 |
| HCS Residents | $25,000 |
| Insurance | $20 |
| Student Support | $13,074 |
| **Tier 3: Infrastructure - Clinical Excellence and Outreach Total** | **$6,991,664** |

*Rounded to nearest dollar

| Infrastructure | Year to Date Actual * |
|---|---|
| Faculty Salaries | $2,878,717 |
| EPA Student Salaries | $1,094,811 |
| Staff Salaries | $2,170,201 |
| Other Staff | $1,895 |
| Benefits | $1,749,294 |
| Physicians Benefits | $9,639 |
| Other Staff Benefits | $89,852 |
| Transit Tax | $18,381 |
| Consultants/Contracted Services | $923,613 |
| Employee Education | $4,947 |
| Repairs and Maintenance | $3,236 |
| Other Current Services | $615,396 |
| Supplies, Other | $222,445 |
| Travel | $30,697 |
| Maintenance Contracts | $91,630 |
| Advertising | $7,353 |
| Meetings & Amenities | $8,224 |
| Printing and Binding | $2,232 |
| Communication | $27,577 |
| Computer Services | $2,393 |
| Equipment | $287,785 |
| Student Support | $490,950 |
| Legal Fees | $1,870 |
| **Infrastructure Total** | **$10,733,136** |
| | |
| **Grand Total** | **$52,643,726** |

*Rounded to nearest dollar



# EXTRAMURAL AWARDS

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Recruitment | Akulian | Jason | Becton Dickinson (BD) and Company | | 12/4/18 | 12/3/20 | Respiratory Sample Collection and Procurement for BD Research and Development | $51,758.72 |
| 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 | $46,563.84 |
| Recruitment | Alexander | Thomas | St. Jude Children's Research Hospital, Inc. | | 3/22/18 | 10/31/21 | VENAML: A Phase I and Expansion Cohort Study of Venetoclax in Combination with Chemotherapy in Pediatric Patients with Refractory or Relapsed Acute Myeloid Leukemia | $23,342.59 |
| Recruitment | Alexander | Thomas | St Baldricks Foundation | 638311 | 7/1/19 | 12/31/20 | Exploring the Biology of Residual Disease in Acute Lymphoblastic Leukemia | $94,800.00 |
| Recruitment | Amelio | Antonio | NIH National Institute of Dental and Craniofacial Research | 5-F31-DE028749-02 | 7/1/19 | 6/30/23 | FELLOW: R. MURPHY Investigating the role of NRF2 in promoting radioresistance in oral squamous cell carcinoma. | $46,320.00 |
| Recruitment | Amelio | Antonio | Scripps Research Institute | SUBK00011786 | 8/1/19 | 7/31/20 | Development and Validation of a Genetically Engineered Model of Neurofibromatosis Type 2 to Facilitate Discovery of Neurotherapeutics | $24,118.00 |
| Recruitment | Andermann | Tessa | National Marrow Donor Program | 32979 | 8/1/19 | 12/31/23 | Modulation of CAR-T Cell Therapy Efficacy by the Intestinal Microbiome in Patients with Leukemia and Lymphoma | $80,000.00 |
| Recruitment | Armistead | Paul | NIH National Cancer Institute | 5-R01-CA201225-01-05 | 2/1/16 | 1/31/21 | Leukemia Specific Splice Isoforms as Neo-Antigens for T-Cell Immunotherapy | $450,736.00 |
| Recruitment | Armistead | Paul | BioFluidica, Inc. | | 3/1/17 | 2/29/20 | SBIR: Rapid Detection of Minimal Residual Disease in Acute Myeloid Leukemia from Peripheral Blood | $213,308.00 |
| Innovation Award | Armistead | Paul | Cell Microsystems, Inc. | | 7/3/17 | 6/30/20 | STTR: CellRaft Array for Screening and Isolation of Highly Effective Cytotoxic T Cells | $55,870.00 |
| Recruitment | Armistead | Paul | American Society of Hematology | | 7/1/19 | 6/30/20 | FELLOW: L.CASTILLO Antigenic and Immunogenic Evaluation of Afro-Caribbean Adult T-Cell Leukemia/Lymphoma for the Optimization of Interferon-Based Therapy | $70,000.00 |
| Recruitment | Arthur | Janelle | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 1-R01-DK124617-01 | 6/1/20 | 5/31/25 | Microbiota-mediated fibrotic remodeling in the inflamed intestine | $404,903.00 |
| Recruitment | Aube | Jeff | University of Kansas Center for Research, Inc. | FY2016-020 | 7/8/15 | 5/31/21 | Molecular Cancer Therapy Targeting HuR-ARE Interaction | $80,817.00 |
| Recruitment | Aube | Jeff | University of Kansas Center for Research, Inc. | FY2016-006 | 7/1/15 | 3/31/20 | HTS to identify small molecules to disrupt abnormal huntingtin interactions in hd | $77,520.00 |
| Recruitment | Aube | Jeff | Scripps Research Institute | 5-27127 | 5/1/16 | 1/31/21 | Novel Probes of the Kappa Opioid Receptor: Chemistry, Pharmacology, and Biology | $146,516.00 |
| Recruitment | Aube | Jeff | Scripps Research Institute | 5-27127 | 2/1/20 | 1/31/21 | Novel Probes of the Kappa Opioid Receptor: Chemistry, Pharmacology, and Biology | $142,121.00 |
| Recruitment | Aubé | Jeff | NIH National Cancer Institute | 5-F31-CA239322-02 | 2/19/19 | 2/18/21 | Chimeric Inhibitors of Androgen Biosynthesis and Signaling | $36,844.00 |
| 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 | $198,000.00 |
| Retention | 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 | $200,000.00 |
| Retention | Bae-Jump | Victoria | NIH National Cancer Institute | 5-R21-CA220269-01-02 | 9/25/17 | 8/31/20 | Inter-relationship between microbiota diversity, obesity and race in Endometrial Cancer | $169,106.00 |
| Retention | Bae-Jump | Victoria | NIH National Cancer Institute | 5-R37-CA226969-01-03 | 3/14/18 | 2/28/23 | Obesity-driven Metabolic and Molecular Biomarkers of Metformin Response in Endometrial Cancer | $355,706.00 |
| Retention | Bae-Jump | Victoria | Oncoceutics, Inc. | | 5/11/18 | 8/31/21 | Single Agent ONC201 in Recurrent or Metastatic Endometrial Cancer | $42,588.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Recruitment | Baker | Rick | Cornell University | 87367-11331 | 1/1/20 | 3/31/24 | MOLECULAR REGULATION OF THE AP2 CLATHRIN ADAPTOR COMPLEX | $99,180.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI110700-01-05 | 4/20/15 | 3/31/21 | Mechanisms of MERS-CoV Entry, Cross-species Transmission and Pathogenesis | $721,207.00 |
| Theme Investment (CC) | Baric | Ralph | University of Minnesota | N005402801 | 6/7/16 | 5/31/20 | Receptor recognition and cell entry of coronaviruses | $120,384.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI132178-01-04 | 8/9/17 | 7/31/22 | Broad-spectrum antiviral GS-5734 to treat MERS-CoV and related emerging CoV | $1,166,670.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | HHSN272201700036I | 7/14/17 | 7/13/24 | Animal Models II Umbrella | $1,698,537.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | U19AI100625-08S1 | 4/16/20 | 8/31/21 | Systems Immunogenetics of Influenza Virus Infection in the Collaborative Cross | $563,507.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | U19AI100625-08 7727 Supp | 9/1/19 | 8/31/20 | Systems Immunogenetics of Emerging Coronavirus Infections in the Collaborative Cross | $428,666.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | 3U19AI100625-08S2 | 6/17/20 | 8/31/22 | Testing the Role of NLRP3 and Other NLR Family Members in COVID19 Pathogenesis | $103,161.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | U19AI100625-08 | 8/5/12 | 8/31/22 | Systems Immunogenetics of Biodefense and Emerging Pathogens in the Collaborative Cross | $2,769,729.00 |
| Theme Investment (CC) | Baric | Ralph | Vanderbilt University Medical Center | VUMC 41666 | 3/1/18 | 2/28/21 | Determinants of Coronavirus Fidelity in Replication and Pathogenesis | $293,121.00 |
| Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | 5-U01-AI149644-02 | 4/19/19 | 3/31/24 | Respiratory Virus Vaccine and Adjuvant Exploration | $1,000,000.00 |
| Theme Investment (CC) | Baric | Ralph | North Carolina Biotechnology Center | 2020-GTF-6905 | 12/1/19 | 11/30/21 | Structure-guided Evolution of Human Airway tropic AAV vectors to prevent Severe Coronavirus Infections | $190,340.00 |
| Theme Investment (CC) | Baric | Ralph | Pfizer International, LLC (Corporate Office New York) | 20-4207 | 3/15/20 | 9/15/20 | Assessment of activity of a novel SARS-CoV 3CL protease inhibitor against COVID-19 in a primary human airway epithelial cell assay | $323,614.00 |
| Theme Investment (CC) | Baric | Ralph | NIH National Institute of Allergy and Infectious Diseases | 1-R01-AI148260-01 | 3/5/20 | 2/28/25 | Antibody Landscape following Human Norovirus Infection and Vaccination | $767,330.00 |
| Theme Investment (CC) | Baric | Ralph | Eli Lilly and Company | | 4/15/20 | 4/14/21 | Therapeutic Antibody Evaluations | $242,511.00 |
| Theme Investment (CC) | Baric | Ralph | Takeda Vaccines Inc. | | 4/24/20 | 4/23/21 | SARS CoV-2 Counter Measure Testing with Takeda Inc. | $413,919.00 |
| Recruitment | Baron | John | NIH National Cancer Institute | 5-R01-CA226086-01-02 | 4/9/19 | 3/31/24 | The immune contexture of colorectal adenomas and serrated polyps | $625,529.00 |
| Recruitment | Basch | Ethan | Mayo Clinic | UNC-194321-04 / 66188158 | 8/1/14 | 7/31/19 | Alliance NCORP Research Base | $70,282.00 |
| Retention | Basch | Ethan | Patient-Centered Outcomes Research Institute | ME-1507-32079 | 8/1/16 | 12/31/20 | Patient-Reported Outcomes-based Performance Measures (PRO-PMs) | $224,209.00 |
| Retention | 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 | $524,718.00 |
| Retention | Basch | Ethan | NIH National Cancer Institute | 5-T32-CA116339-13 | 7/1/05 | 7/31/23 | Cancer Care Quality Training Program | $256,704.00 |
| Retention | Basch | Ethan | NIH National Cancer Institute | 5-U01-CA233046-03 | 9/30/18 | 8/31/23 | Analyzing and Interpreting PRO-CTCAE with CTCAE and Other Clinical Data to Characterize Drug Tolerability | $530,934.00 |
| Retention | Basch | Ethan | Mayo Clinic | CCH-259713/PO66962983 | 8/14/19 | 7/31/25 | Alliance NCORP Research Base | $39,237.00 |
| Recruitment | Batrakova | Elena | NIH National Institute of Neurological Disorders and Stroke | 5-R01-NS102412-01A1-03 | 3/1/18 | 11/30/22 | Cell-based Platform for Gene Delivery to the Brain | $338,579.00 |
| Recruitment | Batrakova | Elena | NIH National Institute of Neurological Disorders and Stroke | 5-R01-NS112019-01-02 | 9/1/19 | 6/30/24 | Extracellular Vesicles for CNS Delivery of Therapeutic Enzymes to Treat Lysosomal Storage Disorders | $295,003.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Recruitment | Batrakova | Elena | Michael J Fox Foundation for Parkinson's Research | 17846 | 1/1/00 | 8/14/21 | Bio-inspired Nanoformulation of GDNF for Treatment of Parkinson's Disease (PD) | $297,001.56 |
| Innovation Award | Bautch | Victoria | NIH National Heart, Lung, and Blood Institute | 5-R35-HL139950-03 | 1/1/18 | 12/31/24 | MOLECULAR AND CELLULAR CONTROL OF ANGIOGENESIS | $922,295.00 |
| Innovation Award | Bautch | Victoria | Johns Hopkins University | 2004080385 | 8/15/18 | 7/31/20 | New Roles for VEGFR1 in Angiogenesis | $200,516.00 |
| Innovation Award | Bear | James | NIH National Institute of General Medical Sciences | 3-R01-GM111557-04S1 | 9/1/14 | 8/31/19 | The role of the Arp2/3 complex in cellular actin dynamics | $73,100.00 |
| Retention | Bear | James | National Science Foundation | CBET-1706019 | 7/1/17 | 6/30/20 | Collaborative Research: Mechanisms of Gradient Sensing by 'Feel' in Cell Migration Directed by Extracellular Matrix | $283,371.00 |
| Retention | Bear | James | North Carolina State University | 2014-0702-02 | 7/1/18 | 5/31/22 | Multiscale modeling of wound healing | $350,398.00 |
| Retention | Bear | James | NIH National Institute of General Medical Sciences | 5-R35-GM130312-01-02 | 2/1/19 | 1/31/24 | Systematic analysis of the actin cytoskeleton and directed cell migration | $581,059.00 |
| Retention | Bear | James | NIH National Institute of General Medical Sciences | 5-F32-GM131578-02 | 4/1/19 | 8/12/20 | FELLOW: M.BUTLER Spatiotemporal regulation of branched actin in cells | $25,527.00 |
| Retention | Bear | James | NIH National Institute of General Medical Sciences | 1-F31-GM133094-02 | 8/1/19 | 7/31/22 | FELLOW: Z.KING Dissecting the mechanistic contributions of Coronin 1B and Coronin 1C to directed cell migration. | $45,520.00 |
| Recruitment | Bennett | Antonia | Alliance for Clinical Trials in Oncology Foundation | PCS-1505-30497 | 7/1/16 | 6/30/23 | Comparison of Operative to Medical Endocrine Therapy (COMET) for Low-Risk DCIS | $67,246.00 |
| Recruitment | Bennett | Antonia | Duke University | A030254 | 9/30/17 | 6/29/20 | Admin Core - Enhancing Clinical Meaningfulness And Usefulness Of PROMIS Pediatric Measures Via Validation In Children And Adolescents With Rheumatic Disease, Cancer, Or Inflammatory Bowel Disease | $24,164.00 |
| Recruitment | Bennett | Antonia | Duke University | A030250 | 9/30/17 | 6/29/20 | BIOS Core - Enhancing Clinical Meaningfulness And Usefulness Of PROMIS Pediatric Measures Via Validation In Children And Adolescents With Rheumatic Disease, Cancer, Or Inflammatory Bowel Disease | $18,704.00 |
| Recruitment | Bennett | Antonia | Boston University Board of Trustees | 4500003048 | 7/1/18 | 12/31/21 | Access to and Value of Treatment Innovation Study | $189,138.00 |
| Recruitment | Bennett | Antonia | Duke University | 2037090 | 9/30/17 | 6/29/20 | RP1 - Enhancing Clinical Meaningfulness And Usefulness Of PROMIS Pediatric Measures Via Validation In Children And Adolescents With Rheumatic Disease, Cancer, Or Inflammatory Bowel Disease | $21,162.00 |
| Recruitment | Bennett | Antonia | Duke University | A030251 | 9/30/17 | 6/29/20 | RP2 - Enhancing Clinical Meaningfulness And Usefulness Of PROMIS Pediatric Measures Via Validation In Children And Adolescents With Rheumatic Disease, Cancer, Or Inflammatory Bowel Disease | $26,400.00 |
| Theme Investment (CIPHR) | Bensen | Jeannette | SUNY Buffalo Roswell Park Cancer Institute | 309-01 | 7/1/18 | 6/30/21 | Racial differences in financial impact of prostate cancer treatment and outcome | $27,354.00 |
| Recruitment/ Theme Investment | Berg | Jonathan | NIH National Institute of Child Health and Human Development | 3-U19-HD077632-05S2 | 9/5/13 | 8/31/19 | NC NEXUS, North Carolina Newborn Exome Sequencing for Universal Screening | $350,000.00 |
| Recruitment/ Theme Investment | Berg | Jonathan | NIH National Human Genome Research Institute | 5-U01-HG006487-08 | 12/5/11 | 5/31/21 | North Carolina Clinical Genomic Evaluation by Next-gen Exome Sequencing 2 | $2,748,319.00 |
| Recruitment/ Theme Investment | Berg | Jonathan | NIH National Human Genome Research Institute | 5-U41-HG009650-03 | 9/12/17 | 7/31/21 | The Clinical Genome Resource - Expert Curation and EHR Integration | $3,297,416.00 |
| Recruitment | Bowers | Albert | NIH National Institute of General Medical Sciences | 5-R35-GM125005-01-03 | 9/5/17 | 8/31/22 | Chemoenzymatic Synthesis, Mode of Action and Evolution of Natural Product-based Macrocycles | $383,398.00 |
| Recruitment | Branca | Rosa | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 5-R01-DK108231-01-05 | 9/25/15 | 8/31/21 | Sensitive and Specific Detection of BAT Tissue and Activity by Magnetic Resonance with Hyperpolarized Xe-129 | $333,016.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Theme Investment | Brenner | Alison | Colon Cancer Coalition | | 7/1/17 | 6/30/20 | Mailed reminders plus fecal immunochemical testing (FIT) to increase colorectal cancer screening among patients of Roanoke Chowan Community Health Center | $25,000.00 |
| Innovation Award | Brewer | Noel | Centers for Disease Control and Prevention | 5-U01-IP001073-03 | 8/1/17 | 7/31/21 | Impact of AFIX and Physician-to-Physician Engagement on HPV Vaccination in Primary Care: An RCT | $499,752.00 |
| Innovation Award | Brewer | Noel | American Cancer Society | 64922 | 1/1/20 | 11/30/20 | ACS contract VACS | $49,555.00 |
| Innovation Award | Brewer | Noel | NIH National Institute on Drug Abuse | 1-R01-DA048390-01A1 | 7/1/20 | 4/30/25 | Informing ENDS policies: Studying the impact of e-cigarette warnings on behavior | $566,914.00 |
| Recruitment | Brown | Nicholas | NIH National Institute of General Medical Sciences | 5-R35-GM128855-01-03 | 8/1/18 | 7/31/23 | Spindle Assembly Checkpoint Silencing | $388,750.00 |
| Recruitment | Brudno | Yevgeny | North Carolina State University | 572654 | 3/15/19 | 4/15/20 | Biomaterial-Assisted In Situ Generation of CAR-T Cells | $7,500.00 |
| Recruitment | Brudno | Yevgeny | North Carolina State University | 572956 | 2/1/20 | 1/31/22 | Image-guided, ultrasound-enhanced long-term intracranial drug delivery | $58,003.00 |
| Recruitment | Bryant | Ashley | American Cancer Society | DSCN-20-076-01-SCN | 9/1/20 | 8/31/22 | Chemotherapy-related Cognitive Impairment in Adults with Acute Leukemia | $30,000.00 |
| Investment (GeriOnc) | Busby-Whitehe | Jan | American Geriatrics Society | | 3/15/16 | 9/30/22 | Geriatrics Workforce Enhancement Program (GWEP) Coordinating Center | $197,587.00 |
| Investment (GeriOnc) | Busby-Whitehe | Jan | HRSA Bureau of Health Workforce | 5-U1Q-HP28734-05-00 | 7/1/15 | 6/30/24 | Carolina Geriatric Workforce Enhancement Program | $755,000.00 |
| Investment (GeriOnc) | Busby-Whitehe | Jan | NIH National Institute on Aging | 2-T35-AG038047-11 | 6/1/20 | 5/31/25 | UNC-CH Summer Research Training in Aging for Medical Students (MSTAR) | $105,365.00 |
| Investment (GeriOnc) | Busby-Whitehe | Jan | DHHS Health Resources and Services Administration | 1-T1M-HP39080-01 | 5/1/20 | 4/30/21 | Geriatrics Workforce Enhancement Program COVID | $90,625.00 |
| Recruitment | Calabrese | Mauro | NIH National Institute of General Medical Sciences | 5-R01-GM121806-01-04 | 1/23/17 | 12/31/21 | Mechanisms of gene silencing induced by long noncoding RNAs | $316,144.00 |
| Recruitment | Calabrese | Mauro | NIH National Institute of General Medical Sciences | 1-R01-GM136819-01 | 5/1/20 | 2/29/24 | Cooperative control of Polycomb Repressive Complexes by long noncoding RNAs, CpG island DNA, and RNA-binding proteins | $386,784.00 |
| Recruitment | Calabrese | Mauro | NIH National Institute of Child Health and Human Development | 1-F31-HD103370-01 | 8/1/20 | 7/31/23 | FELLOW:KEENAN BRACEROS Control of gene silencing by long noncoding RNAs in trophoblast stem cells | $37,408.00 |
| Recruitment | Calabrese | Mauro | NIH National Institute of Child Health and Human Development | 1-F31-HD103334-01 | 8/1/20 | 7/31/23 | Regulation of Polycomb by long noncoding RNAs during pre-implantation development | $37,027.00 |
| Retention | Campbell | Sharon | NIH National Institute of General Medical Sciences | 5-R01-GM115597-01-04 | 4/1/16 | 3/31/21 | Mechanisms of vinculin activation and force transmission | $380,388.00 |
| Retention | Campbell | Sharon | NIH National Institute of General Medical Sciences | 3-R35-GM134962-01S1 | 2/1/20 | 1/31/25 | Structure and Mechanism of G-proteins and cell adhesion proteins in regulation of cell growth and motility | $577,069.00 |
| Investment (Protocol) | Carey | Lisa | Genentech, Inc. | | 7/3/13 | 12/31/20 | Defining the HER2 positive (+) Breast Cancer Kinome Response to Trastuzumab, Pertuzumab, Combination Trastuzumab +Pertuzumab, or Combination Trastuzumab + Lapatinib | $74,220.72 |
| Investment (Protocol) | Carey | Lisa | Alliance for Clinical Trials in Oncology Foundation | | 12/2/14 | 7/15/21 | 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 | $49,507.95 |
| Investment (Protocol) | Carey | Lisa | Clinipace Worldwide | | 8/9/16 | 3/16/20 | 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 | $12,141.13 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Investment (Protocol) | Carey | Lisa | Syndax Pharmaceuticals, Inc. | | 12/15/17 | 1/2/23 | LCCC 1639: A non-randomized, non-comparative, open-label, window trial of entinostat in patients with TNBC (Part 1) or entinostat with or without exemestane in patients with newly diagnosed, Stage I-IIIC, hormone receptor - positive (HR+) breast cancer (P | $55,434.34 |
| Investment (Protocol) | Carey | Lisa | Susan G Komen for the Cure | SAB180006 | 11/19/18 | 11/18/22 | Optimizing HER2-targeting using RNA and DNA-based predictive algorithms | $400,000.00 |
| Investment (Protocol) | Carey | Lisa | Immunomedics, Inc. | | 8/14/18 | 8/13/28 | An International, Multi-Center, Open-Label, Randomized, Phase III Trial of Sacituzumab Govitecan versus Treatment of Physician Choice in Patients with Metastatic Triple-Negative Breast Cancer Who Received at Least Two Prior Treatments | $26,979.00 |
| Investment (Protocol) | Carey | Lisa | Breast Cancer Research Foundation | | 10/1/18 | 9/30/20 | The Assessment of Genomic Instability in Breast Cancer Patients | $250,000.00 |
| Investment (Protocol) | Carey | Lisa | NIH National Cancer Institute | 5-R01-CA229409-01-02 | 6/1/19 | 5/31/24 | Optimizing HER2-targeting using RNA- and DNA-based predictive algorithms | $616,954.00 |
| Investment (Protocol) | Carey | Lisa | NIH National Cancer Institute | 5-UG1-CA233373-02 | 5/1/19 | 2/28/25 | UNC Lead Academic Participating Site | $505,201.00 |
| Innovation Award | Caron | Kathleen | NIH National Institute of Child Health and Human Development | 5-R01-HD060860-06-10 | 4/1/09 | 7/31/21 | Adrenomedullin Signaling at the Maternal-Fetal Interface | $310,847.00 |
| Recruitment | Charlot | Marjory | V Foundation for Cancer Research | DM2020-004 | 1/15/20 | 1/15/21 | Use of Artificial Intelligence and the Electronic Health Record to Enhance Enrollment of Minority Cancer Patients in Cancer Clinical Trials | $80,000.00 |
| Investment (Protocol) | Coghill | James | Millennium Pharmaceuticals, Inc. | | 10/24/19 | 12/1/27 | A Randomized, Double-Blind, Placebo-Controlled, Multicenter Study to Evaluate the Efficacy and Safety of Vedolizumab in the Prophylaxis of Intestinal Acute Graft-Versus-Host Disease in Subjects Undergoing Allogeneic Hematopoietic Stem Cell Transplantation | $27,378.08 |
| Investment (HTSF) | Conlon | Frank | NIH National Heart, Lung, and Blood Inst | 5-R01-HL126509-01-04 | 4/1/17 | 2/28/21 | Gene Regulatory Networks for Cardiac Morphogenesis | $276,391.21 |
| Recruitment | Coombs | Catherine | Incyte Corporation | | 1/31/17 | 8/31/20 | INCB 57643-101 A Phase 1/2, Open-Label, Dose-Escalation/Dose-Expansion, Safety and Tolerability Study of INCB057643 in Subjects with Advanced Malignancies | $240,448.70 |
| Recruitment | Coombs | Catherine | H3 Biomedicine Inc. | | 12/4/17 | 7/28/22 | An Open-label, Multicenter Phase 1 Trial to Evaluate the Safety, Pharmacokinetics and Pharmacodynamics of Splicing Modulator H3B-8800 for Subjects With Myelodysplastic Syndromes, Acute Myeloid Leukemia, and Chronic Myelomonocytic Leukemia | $53,610.77 |
| Recruitment | Coombs | Catherine | Prostate Cancer Foundation | 19YOUN07 | 10/1/19 | 9/30/22 | Examining the interaction between clonal hematopoiesis and clinical outcomes among patients with metastatic castration-resistant prostate cancer treated on A031201 | $225,000.00 |
| Investment (HTSF) | Carroll | Ian | NIH National Institute of Mental Health | 5-R01-MH105684-01-05 | 8/17/17 | 6/30/20 | Microbiome-mediated weight, anxiety, and stress dysregul | $90,858.55 |
| Investment (Training) | Cox | Adrienne | NIH National Cancer Institute | 5-T32-CA071341-23 | 9/30/96 | 8/31/22 | Cancer Cell Biology Training Program | $234,992.00 |
| Investment (HTSF) | Crowley | James | NIH National Institute of Mental Health | 5-R01-MH110427-01-04 | 8/1/16 | 4/30/22 | OCD: Novel Comparative Genomic Approaches to Identify Disease and Treatment Mechanisms | $601,239.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Investment (HTSF) | Crowley | James | NIH National Institute of Mental Health | 5-R21-MH112963-01-02 | 8/15/17 | 7/31/20 | Investigating the molecular mechanisms and consequences of assortative mating in major psychiatric disorders: completing a missing piece of the psychiatric genetics puzzle | $144,247.00 |
| Investment (HTSF) | Crowley | James | Massachusetts General Hospital | 234362 | 4/1/19 | 1/31/24 | Large-scale collaborative genetic and epigenetic studies of Tourette Syndrome | $90,828.00 |
| Retention | Damania | Blossom | NIH National Cancer Institute | 3-U54-CA190152-05S1 | 9/1/14 | 8/31/21 | 'Addressing Herpesvirus-Associated Cancers Through The UNC-Malawi Cancer Consortium | $298,262.00 |
| Retention | Damania | Blossom | NIH National Cancer Institute | 5-P01-CA019014-37-41 | 5/1/97 | 6/30/21 | Herpesviral, Oncogenesis, Latency and Reactivation | $1,812,045.00 |
| Retention | Damania | Blossom | NIH National Cancer Institute | 5-K99-CA230178-02 | 7/16/18 | 6/30/20 | FELLOW: Z.MA Role of DNA Sensing Pathways in KSHV Associated Cancers | $113,624.00 |
| Retention | Damania | Blossom | NIH National Cancer Institute | 5-R01-CA096500-16-18 | 7/15/02 | 7/31/23 | Role of KSHV Viral Proteins in Signaling and Pathogenesis | $314,888.00 |
| Retention | Damania | Blossom | NIH National Institute of Dental and Craniofacial Research | 5-R01-DE028211-01-03 | 9/11/18 | 6/30/23 | Modulation of Innate Immunity by KSHV | $427,505.00 |
| Investment (HTS) | Dangl | Jeff | National Science Foundation | IOS-1917270 | 9/1/19 | 8/31/22 | Synthetic bacterial communities to dissect and direct plant microbiome function | $650,000.00 |
| Innovation Award | Davis | Ian | Vanderbilt University Medical Center | VUMC 58792 | 9/30/15 | 8/31/20 | Chromatin Maintenance in Cancer Progression | $292,875.00 |
| Investment (Training) | Davis | Ian | Duke University | 3021646 | 5/1/19 | 4/30/21 | Unified Program for Therapeutics in Children (UPTiC) | $462,708.00 |
| Retention | Dayton | Paul | NIH National Cancer Institute | 5-R01-CA189479-01-04 | 9/4/14 | 8/31/21 | Academic-Industrial Partnership for Translation of Acoustic Angiography | $509,325.00 |
| Retention | Dayton | Paul | North Carolina State University | 570253 | 4/13/15 | 2/28/21 | Ultrasound Molecular Imaging to Assess Therapeutic Response | $81,024.00 |
| Retention | Dayton | Paul | NIH National Cancer Institute | 5-R01-CA220681-01-03 | 8/10/17 | 7/31/22 | High Frame Rate 3-D Super Resolution Ultrasound Microvascular Imaging | $541,705.00 |
| Retention | Dayton | Paul | NIH National Cancer Institute | 5-R01-CA232148-01-03 | 6/1/18 | 5/31/23 | Treating Tumoral Hypoxia via Ultrasound-Guided Oxygen Release for Improving Radiation Therapy | $637,817.00 |
| Retention | Dayton | Paul | Triangle Biotechnology, Inc. | | 7/5/18 | 6/30/20 | Towards commercialization of cavitation-enhancing nanodroplets for DNA sample fragmentation in NGS applications | $64,370.00 |
| Retention | Dayton | Paul | North Carolina State University | 572402 | 7/1/18 | 3/31/22 | Acoustic Angiography Using Dual-Frequency and Ultrawideband CMUT Arrays | $98,498.00 |
| Retention | Dayton | Paul | North Carolina State University | 572469 | 8/15/18 | 6/30/22 | Forward viewing catheter-delivered microbubble enhanced sonothrombolysis (FV-CAMUS) | $41,790.00 |
| Retention | Dayton | Paul | NIH National Cancer Institute | 1-F31-CA243177-01 | 8/1/19 | 7/31/21 | Toward Clinical Translation of Acoustic Angiography: Optimization of Microvascular Ultrasound Imaging on a Novel Dual-frequency Array | $36,940.00 |
| Retention | Dayton | Paul | NIH National Cancer Institute | 1-R21-CA246550-01A1 | 4/1/20 | 3/31/22 | Parametric optimization of ultrasound-mediated immuno-modulation for pancreatic cancer therapy | $179,226.00 |
| Retention | Dayton | Paul | Triangle Biotechnology, Inc. | 19-5475 | 2/1/20 | 1/31/21 | SBIR: Design of custom ultrasonic lens for uniform sonication of biological samples in microplates | $74,250.00 |
| Retention | Dees | Claire | 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 Ovarian Cancer | $5,822.00 |
| Retention | Dees | Claire | H3 Biomedicine Inc. | | 4/12/18 | 4/30/28 | A Phase I-II multicenter, open label trial of H3B-6545, a covalent antagonist of estrogen receptor alpha, in women with locally advanced or metastatic estrogen receptor-positive, HER2 negative breast cancer | $69,997.33 |

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|---|---|---|---|---|---|---|---|---|
| Retention | Dees | Claire | G1 Therapeutics | | 6/20/18 | 6/30/28 | A Phase 1, Open-Label, Multicenter Study to Assess the Safety, Tolerability, Pharmacokinetics, and Preliminary Antitumor Activity of Ascending Doses of G1T48 in Women with Estrogen Receptor-Positive, HER2-Negative Advanced Breast Cancer | $236,654.86 |
| Retention | Dees | Claire | Meryx, Inc. | | 7/19/18 | 7/31/28 | A Phase I Dose Escalation Study of the Safety, Pharmacokinetics and Pharmacodynamics of MRX-2843 in Adult Subjects with Relapsed/Refractory Advanced and/or Metastatic Solid Tumors | $112,750.00 |
| Retention | Dees | Claire | Boehringer Ingelheim Pharmaceuticals, Inc. | | 11/19/18 | 11/18/28 | An open label, phase Ib, dose-escalation study evaluating the safety and tolerability of xentuzumab and abemaciclib in patients with locally advanced or metastatic solid tumours and in combination with endocrine therapy in patients with locally advanced o | $1,536.00 |
| Retention | Dees | Claire | Debiopharm International SA | | 5/13/19 | 5/23/29 | A Phase II basket study of the oral selective pan-FGFR inhibitor Debio 1347 in subjects with solid tumors harboring a fusion of FGFR1, FGFR2 or FGFR3 (Study # Debio 1347-201) | $143,991.21 |
| Retention | Dees | Claire | NRG Oncology | | 3/1/19 | 2/28/25 | NRG Oncology Prime eIPF | $9,125.00 |
| Retention | Dees | Elizabeth | Merck Sharp and Dohme Corp. | | 7/24/13 | 7/31/22 | A Phase Ib Multi-Cohort Study of MK-3475 in Subjects with Advanced Solid Tumors | $12,224.52 |
| Retention | Dees | Elizabeth | Duke University | A031027 | 4/1/16 | 2/28/21 | Duke-UNC-Wash U Partnership for Early Phase Clinical Trials in Cancer | $87,689.00 |
| Investment (HTSF) | De Paris | Kristina | NIH National Institute of Dental and Craniofacial Research | 5-R01-DE028146-01-03 | 9/6/18 | 6/30/23 | Sublingual-parenteral vaccination to prevent oral HIV tr | $258,451.73 |
| Investment (HTSF) | Dennis | Ann | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI135970-01-03 | 3/5/18 | 2/28/23 | Timely monitoring and response to HIV transmission netwo | $766,005.65 |
| Investment (Proteomics) | Der | Channing | NIH National Cancer Institute | 3-U01-CA199235-04S1 | 9/1/15 | 6/30/20 | Identification of synthetic lethal interactors in pancreatic cancer | $323,651.00 |
| Innovation Award | Der | Channing | NIH National Cancer Institute | 5-P01-CA203657-01-05 | 6/1/16 | 5/31/21 | Defining RAS isoform- and mutation-specific roles in oncogenesis | $1,609,444.00 |
| Investment (Proteomics) | Der | Channing | NIH National Cancer Institute | 5-T32-CA009156-45 | 7/1/80 | 7/31/21 | Integrated Training in Cancer Model Systems | $935,418.00 |
| Investment (Proteomics) | Der | Channing | Washington University in St. Louis School of Medicine | WU-20-97 / 2940691H | 7/28/16 | 6/30/21 | Combination Inhibition of ERK for Pancreatic Cancer Treatment | $44,395.00 |
| Investment (Proteomics) | Der | Channing | Dana-Farber Cancer Institute | 1203002 | 6/8/18 | 3/31/23 | The Role of RHOA in Diffuse Gastric Cancer | $183,205.00 |
| Investment (Proteomics) | Der | Channing | NIH National Cancer Institute | 5-R35-CA232113-03 | 9/1/18 | 8/31/25 | Targeting undruggable RAS for cancer treatment | $918,610.00 |
| Investment (Proteomics) | Der | Channing | The Slomo and Cindy Silvian Foundation, Inc. | | 1/1/19 | 12/31/20 | Revolutionizing pancreatic cancer treatment by targeting | $30,000.00 |
| Investment (Proteomics) | Der | Channing | NIH National Cancer Institute | 5-F32-CA232529-02 | 1/2/19 | 1/1/22 | FELLOW: C. STALNECKER Defining the contributions of wild-type RAS in RAS-mutant lung cancer | $65,310.00 |
| Investment (Training) | Deshmukh | Mohanish | NIH National Institute of General Medical Sciences | 5-T32-GM008719-22 | 7/1/99 | 6/30/24 | Medical Scientist Training Program | $1,170,524.00 |
| Retention | Dittmer | Dirk | NIH National Institute on Drug Abuse | 5-R01-DA040394-01-05 | 7/1/15 | 6/30/21 | HIV and substances of abuse influence exosomes and endothelial cell function | $367,675.00 |
| Retention | Dittmer | Dirk | NIH National Cancer Institute | 5-R01-CA163217-06-10 | 9/1/11 | 7/31/21 | Targeted Therapies for HIV-Associated Kaposi Sarcoma and Lymphoma | $342,759.00 |
| Retention | Dittmer | Dirk | NIH National Cancer Institute | 5-R01-CA228172-01-03 | 6/1/18 | 5/31/23 | Impact of HIV on the tumor microenvironment | $387,192.00 |

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|---|---|---|---|---|---|---|---|---|
| Retention | Dittmer | Dirk | NIH National Cancer Institute | 5-R01-CA239583-01-02 | 5/1/19 | 4/30/24 | Mechanisms of KSHV transmission | $550,989.00 |
| Retention | Dittmer | Dirk | NIH National Institute of Dental and Craniofacial Research | 5-R01-DE018304-11-12 | 5/15/07 | 4/30/24 | ART Modulation of Viral Pathogenesis | $369,313.00 |
| Retention | Dittmer | Dirk | Tulane University | TUL-HSC-558039-20/21 | 4/1/20 | 2/28/21 | Exploratory Research on HIV Contribution to Heart and Lung Comorbidities | $77,750.00 |
| Recruitment | Dittus | Christopher | Molecular Templates, Inc. | | 11/23/15 | 12/31/20 | Pharmacokinetics, Pharmacodynamics, Safety and Tolerability of Multiple Dose Regimens of MT-3724 for the Treatment of Patients with Relapsed non-Hodgkin's B-Cell Lymphoma | $33,964.38 |
| Recruitment | Dittus | Christopher | University of California at Los Angeles | 1568 G UA023 | 9/1/16 | 8/31/20 | Clinical trials unit (CTU) for the AIDS Malignancy Clinical Trials Consortium (AMC) | $77,750.00 |
| 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 | $18,575.70 |
| Recruitment | 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 | $45,004.80 |
| Recruitment | Doerschuk | Claire | NIH National Heart, Lung, and Blood Institute | 5-T32-HL007106-44 | 7/1/75 | 4/30/22 | Multidisciplinary research training in pulmonary diseases | $499,146.00 |
| Recruitment | Dominguez | Daniel | Yale University | GR 109212 (CON-80002335) | 6/1/20 | 5/31/23 | Altered mRNA splicing dependent on mutant p53 identifies novel therapeutic vulnerability in pancreatic cancer | $34,591.00 |
| Recruitment | Dotti | Gianpietro | NIH National Cancer Institute | 5-R01-CA193140-01-05 | 2/1/16 | 1/31/21 | Targeting the Ig-Light Chains with CAR-T Cells in Lymphoid Tumors | $542,644.00 |
| Recruitment | Dotti | Gianpietro | DOD DA Army Medical Research Acquisition Activity | W81XWH-16-1-0501 | 9/1/16 | 8/31/20 | Strategies to Counteract Resistance Mechanisms in CAR + T Cell-based Immunotherapy for Triple Negative Breast Cancer | $202,500.00 |
| Recruitment | Dotti | Gianpietro | Bellicum Pharmaceuticals, Inc. | | 6/2/17 | 6/2/20 | Bellicum CAR.CD19 Manufacturing Support for LCCC 1541 | $190,690.00 |
| Recruitment | Dotti | Gianpietro | Alex's Lemonade Stand Foundation | | 2/1/18 | 1/31/20 | Targeting Chondroitin Sulphate Proteoglycan 4 (CSPG4) in Glioblastoma | $125,000.00 |
| Recruitment | Dotti | Gianpietro | Mary Kay Foundation | 24-18 | 7/1/18 | 6/30/20 | Natural Killer T Cells (NKTS) Specific for Triple Negative Breast Cancer | $50,000.00 |
| Recruitment | Dotti | Gianpietro | Lymphoma Research Foundation of America | | 3/1/19 | 2/28/22 | A new and augmented form of CAR_T cells targeting the kappa light chain on B cell lymphomas for clinical evaluation | $75,000.00 |
| Recruitment | Dotti | Gianpietro | Massachusetts General Hospital | 233220 | 9/1/18 | 7/31/23 | T cell plasticity, fusion proteins and CAR T cell-based immunotherapy of head and neck cancer | $108,850.00 |
| Recruitment | Dotti | Gianpietro | NIH National Cancer Institute | 5-R21-CA229938-01-02 | 4/1/19 | 3/31/21 | Targeting and Delivering CAR-Ts in Glioblastoma | $169,106.00 |
| Recruitment | Dotti | Gianpietro | Baylor University College of Medicine | 7000000853 | 3/1/19 | 2/28/21 | Tailoring CAR-Based Immunotherapy Strategies to T Cell Lymphoma | $700,000.00 |
| Recruitment | Dotti | Gianpietro | NIH National Cancer Institute | 5-R01-CA243543-01-02 | 9/1/19 | 8/31/24 | Cellular Immunotherapy of Ovarian Cancer | $395,109.00 |
| Recruitment | Dotti | Gianpietro | Lung Cancer Initiative of North Carolina | | 1/1/20 | 12/31/20 | Targeting Brain Metastasis of Non-Small Cell Lung Cancer by enhancing CAR-T cell migration via CCR2 | $30,000.00 |
| Recruitment | Dowen | Jill | NIH National Institute of General Medical Sciences | 5-R35-GM124764-01-04 | 9/1/17 | 7/31/22 | Regulation of chromosome structure and gene expression by architectural proteins | $386,074.00 |
| Recruitment | Dowen | Rob | NIH National Institute of General Medical Sciences | 1-R35-GM137985-01 | 7/1/20 | 5/31/25 | Regulation of lipid homeostasis by proliferative signaling pathways | $385,143.00 |

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|---|---|---|---|---|---|---|---|---|
| Recruitment | Downs-Canner | Stephanie | American College of Surgeons | | 7/1/19 | 6/30/21 | Inhibition of Th17 into Treg conversion as a novel component of immunotherapy in triple negative breast cancer | $80,000.00 |
| Recruitment | Downs-Canner | Stephanie | American College of Surgeons | | 7/1/20 | 6/30/22 | Identification of tumor-specific antibodies in triple negative breast cancer | $60,000.00 |
| Investment (CBCS) | Earp | Shelton | Susan G Komen for the Cure | OGUNC1202 | 5/1/12 | 4/30/21 | Carolina Breast Cancer Study: PHASE III | $241,666.67 |
| Theme Investment | Earp | Shelton | NIH National Cancer Institute | 3-P30-CA016086-44 | 6/1/97 | 11/30/20 | Cancer Center Core Support Grant | $7,635,872.00 |
| Investment (CBCS) | Earp | Shelton | NIH National Cancer Institute | 5-U54-CA156733-10 | 9/28/10 | 8/31/20 | NCCU-LCCC Partnership in Cancer Research (2 of 2) | $943,823.00 |
| Retention | Elston | Timothy | NIH National Institute of General Medical Sciences | 5-T32-GM067553-15 | 7/1/05 | 6/30/21 | Predoctoral Training Program in Bioinformatics and Computational Biology | $231,524.00 |
| Retention | Elston | Timothy | NIH National Institute of General Medical Sciences | 5-R35-GM127145-01-03 | 7/1/18 | 6/30/23 | Mathematical modeling of cellular signaling systems | $450,950.00 |
| Recruitment | Elston 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 | $35,857.56 |
| Recruitment | Elston Lafata | Jennifer | Henry Ford Health System | B45233UNC | 4/15/18 | 3/31/23 | Center for Research to Optimize Precision Lung Cancer Screening in Diverse Populations | $37,684.00 |
| Recruitment | Elston Lafata | Jennifer | Memorial Sloan-Kettering Cancer Center | BD525155B | 9/25/18 | 8/31/23 | Using a Mixed Methods Approach to Understand Shared Decision-Making in Lung Cancer Screening | $29,677.00 |
| Recruitment | Emanuele | Michael | NIH National Institute of General Medical Sciences | 5-R01-GM120309-01-05 | 9/1/16 | 8/31/21 | SCF Ubiquitin Ligases in Cell Cycle Control and Chromosome Stability | $301,840.00 |
| Recruitment | Emanuele | Michael | American Cancer Society | RSG-18-220-01-TBG | 1/1/19 | 12/31/22 | Ubiquitin Ligases in Breast Cancer Proliferation and Therapeutic Resistance | $198,000.00 |
| Recruitment | Emanuele | Michael | NIH National Cancer Institute | 5-F99-CA245724-02 | 9/19/19 | 8/31/21 | FELLOW: M.AGAJANIAN Mechanistic studies and therapeutic targeting of the WNT signaling pathway. | $33,328.00 |
| Recruitment | Emanuele | Michael | NIH National Institute of General Medical Sciences | 1-R01-GM134231-01A1 | 5/1/20 | 2/29/24 | Deubiquitinases in Cell Cycle Control | $352,617.00 |
| Investment (HTSF) | Farrell | Marty | NIH National Institute of Mental Health | 5-K01-MH108894-01-04 | 8/8/16 | 3/31/21 | MARTILIAS FARRELL The Genomics of Highly Treatment Resistant Schizophrenia | $141,831.00 |
| Recruitment | Flick | Matthew | NIH National Cancer Institute | 5-R01-CA211098-03-04 | 6/19/17 | 5/31/22 | Thrombin-dependent mechanisms of pancreatic ductal adenocarcinoma disease | $459,478.00 |
| Recruitment | Flick | Matthew | NIH National Heart, Lung, and Blood Institute | 7-U01-HL143403-02 | 8/1/18 | 7/31/23 | Targeting the Plasminogen Activation System to Limit Pancreatic Cancer Progression and Associated Thrombosis | $892,860.00 |
| Recruitment | Flick | Matthew | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 7-R01-DK112778-02 | 12/20/18 | 11/30/22 | Fibrin(ogen) control of metabolic inflammation and obesity | $376,526.00 |
| Recruitment | Flick | Matthew | Michigan State University | RC105176UNC | 7/1/19 | 6/30/21 | Novel anti-fibrotic mechanisms in chemical-induced liver injury | $59,892.00 |
| Recruitment | Flick | Matthew | Michigan State University | RC110120 UNC | 7/1/19 | 3/31/24 | Novel determinants of fibrinogen pro-repair activity in acetaminophen-induced liver toxicity | $69,706.00 |
| Recruitment | Flick | Matthew | Fibriant, B.V. | | 1/6/20 | 1/5/21 | Recombinant Fibrinogen as a Therapy for S. Aureus Infection | $73,900.00 |
| Retention | Foster | Matthew | MacroGenics, Inc. | | 5/18/16 | 5/17/28 | 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 Sy | $12,422.00 |
| Retention | Foster | Matthew | Beat AML, LLC | | 2/25/19 | 11/2/22 | BAML16-001 (BEAT)_Phase 1/2 Umbrella Study-A Master Protocol for Biomarker-Based Treatment of AML (The Beat AML Trial) | $44,945.36 |

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|---|---|---|---|---|---|---|---|---|
| Recruitment | Franco | Hector | DOD DA Army Medical Research Acquisition Activity | W81XWH1910049 | 3/1/19 | 2/28/22 | Mechanisms of Non-Coding Enhancer RNA Function in the Triple Negative Breast Cancer | $194,375.00 |
| Recruitment | Franco | Hector | Susan G Komen for the Cure | CCR19608601 | 9/5/19 | 9/4/22 | Crosstalk Between Estrogen and Inflammatory Signaling in Metastatic Breast Cancer. | $450,000.00 |
| Recruitment | Franco | Hector | V Foundation for Cancer Research | V2019-015 | 11/1/19 | 11/1/21 | Mining Transcriptional Enhancers to Identify Regulatory Addictions in Ovarian Cancer | $200,000.00 |
| Recruitment | Franco | Hector | American Cancer Society | 134261-PF-20-059-01-RMC | 9/1/20 | 8/31/22 | Defining Enhancer RNA Function in the Pathogenesis of Breast Cancer | $119,500.00 |
| Recruitment | Frerichs | Leah | NIH National Heart, Lung, and Blood Institute | 5-K01-HL138159-01-04 | 8/1/17 | 7/31/22 | Identifying and disentangling social and physical environmental effects on physical activity in diverse adolescent and young adult populations | $151,156.00 |
| Retention | Fry | Rebecca | NIH National Institute of Environmental Health Sciences | 5-T32-ES007018-44 | 7/1/77 | 6/30/21 | Biostatistics for Research in Environmental Health | $1,252,939.00 |
| Retention | Fry | Rebecca | NIH National Institute of Environmental Health Sciences | 1-P42-ES031007-01 | 2/20/20 | 1/31/25 | The UNC Chapel Hill Superfund Research Program (UNC-SRP) | $2,733,717.00 |
| Recruitment | Frye | Stephen | NIH National Institute of General Medical Sciences | 5R01-GM100919-05-08 | 5/1/12 | 7/31/21 | Discovery of Chemical Probes for Chromatin Readers | $416,687.00 |
| Recruitment | Frye | Stephen | NIH National Cancer Institute | 5-R01-CA218392-01-03 | 4/1/18 | 3/31/21 | DISCOVERY OF IN VIVO CHEMICAL PROBES FOR POLYCOMB CBX DOMAINS | $520,558.00 |
| Recruitment | Frye | Stephen | Emory University | A246253 | 9/30/19 | 8/31/24 | Open Drug Discovery Center for Alzheimer's Disease | $1,751,801.00 |
| Retention | Gallagher | Kristalyn | University of Pittsburgh Medical Center | | 3/1/16 | 9/23/20 | A Trial of Endocrine Response in Women with Invasive Lobular Breast Cancer | $11,282.00 |
| Retention | Gallagher | Kristalyn | Alliance Foundation Trials, LLC | | 4/17/18 | 6/30/23 | Comparison Of Operative To Monitoring and Endocrine Therapy (COMET) Trial For Low Risk DCIS: A Phase III Prospective Randomized Trial | $13,800.00 |
| Retention | Gallagher | Kristalyn | Johns Hopkins University | TBCRC 2019 2004353973 | 7/1/19 | 6/30/21 | TBCRC 2019 - Infrastructure Support Task Order | $75,000.00 |
| Recruitment | Gershon | Timothy | NIH National Institute of Neurological Disorders and Stroke | 5-R01-NS102627-01-03 | 6/1/18 | 4/30/23 | Bcl-xL-regulated apoptosis in cerebellar development and medulloblastoma treatment | $408,894.00 |
| Recruitment | Gershon | Timothy | NIH National Institute of Neurological Disorders and Stroke | 5-R01-NS106227-01-03 | 9/15/18 | 6/30/23 | Defining the crucial role of MAGOH in cerebellar development and the potential for targeting the EJC in medulloblastoma treatment | $336,535.00 |
| Recruitment | Gershon | Timothy | SpringWorks Subsidiary 3, Inc | MEK-NF-201 | 7/30/19 | 8/31/22 | A Phase 2b Trial of the MEK 1/2 Inhibitor (MEKi) PD-0325901 in Adult and Pediatric Patients with Neurofibromatosis Type 1 (NF1)-Associated Inoperable Plexiform Neurofibromas (PNs) that are Progressing or Causing Significant Morbidity | $248,123.12 |
| Recruitment | Gilkey | Melissa | NIH National Cancer Institute | 5-R21-CA241518-01-02 | 9/20/19 | 7/31/21 | Evaluating the feasibility of a mobile coaching intervention to improve HPV vaccine delivery. | $208,144.00 |
| Recruitment | Gilkey | Melissa | Robert Wood Johnson Foundation | 77291 | 3/1/20 | 2/28/22 | Engaging specialty care teams to help families discuss and manage the cost of asthma care | $400,000.00 |
| Theme Investment (HTS) | Giusti | Paola | Karolinska Institute | ZZC8ANALMQ C850803103 | 4/1/20 | 3/31/21 | CNV mouse models and RNA splicing | $209,286.00 |
| Innovation Award | Goldstein | Bob | NIH National Institute of General Medical Sciences | 5-R01-GM083071-09-12 | 6/1/08 | 7/31/21 | C. elegans Gastrulation: a Model for Understanding Apical Constriction Mechanisms | $334,215.00 |
| Investment (HTS) | Gordon-Larsen | Penny | NIH National Institute of Child Health and Human Development | 5-R01-HD057194-06-10 | 1/1/08 | 6/30/21 | Exome Variants Underlying Weight Gain from Adolescence to Adulthood | $557,306.00 |
| Investment (HTS) | Gordon-Larsen | Penny | NIH National Heart, Lung, and Blood Institute | 5-R01-HL143885-02 | 4/1/19 | 3/31/23 | Leveraging multi-omics approaches to examine metabolic challenges of obesity in relation to cardiovascular diseases | $2,313,286.00 |

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|---|---|---|---|---|---|---|---|---|
| Theme Investment (CC) | Gralinski | L | NIH National Institute of Allergy and Infectious Diseases | 1R21AI145372-01A1 | 6/2/20 | 5/31/22 | Identifying Genetic Regulators and New Models of Wild Type Coronavirus Pathogenesis | $194,375.00 |
| Recruitment | Grilley-Olson | Juneko | Pharmaceutical Product Development, LLC | | 5/13/14 | 6/12/20 | 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 | $74,951.21 |
| 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 Agents. | $8,850.20 |
| 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 | $23,295.70 |
| Recruitment | Grilley-Olson | Juneko | MedImmune, Inc. | | 9/29/15 | 3/28/21 | A Phase I, First-Time-in-Human Study of MEDI9197, a TLR 7/8 Agonist, Administered Intratumorally in Subjects with a Solid Tumor Cancer | $39,780.67 |
| Recruitment | Grilley-Olson | Juneko | Bayer HealthCare | | 11/16/16 | 10/31/26 | A Phase II Basket Study of the Oral TRK Inhibitor LOXO-101 in Subjects with NTRK Fusion-Positive Tumors | $20,965.67 |
| Recruitment | Grilley-Olson | Juneko | NanoCarrier Co., Ltd. | | 1/15/18 | 1/30/23 | A Phase 1b/2 Dose-Escalation and Expansion Trial of NC-6300 (Nanoparticle Epirubicin) in Patients with Advanced Solid Tumors or Advanced, Metastatic, or Unresectable Soft Tissue Sarcoma | $23,619.70 |
| Recruitment | Grilley-Olson | Juneko | Iovance Biotherapeutics, Inc. | | 11/29/18 | 11/28/28 | A Phase 2, Multicenter Study to Evaluate the Efficacy and Safety of Autologous Tumor Infiltrating Lymphocytes (LN-145) for the Treatment of Patients with Recurrent and/or Metastatic Squamous Cell Carcinoma of the Head and Neck | $78,317.90 |
| Recruitment | Grilley-Olson | Juneko | Seattle Genetics, Inc | | 4/18/19 | 5/14/29 | Open Label Phase 2 Study of Tisotumab Vedotin for Locally Advanced or Metastatic Disease in Solid Tumors. | $101,241.50 |
| Recruitment | Grover | Natalie | Lymphoma Research Foundation of America | | 7/1/20 | 6/30/23 | CD30-Directed CAR-T Cells Co-Expressing CCR4 in Relapsed/Refractory Hodgkin Lymphoma | $225,000.00 |
| Recruitment | Gupta | Gaorav | Burroughs Wellcome Fund | 1012285.01 | 1/1/15 | 8/31/20 | DNA Damage Responses in Breast Cancer Pathogenesis | $140,000.00 |
| Recruitment | Gupta | Gaorav | NIH National Cancer Institute | 5-R37-CA227837-01-02 | 12/1/18 | 11/30/23 | Mre11-Dependent DNA Damage Responses in Breast Cancer Pathogenesis | $409,161.00 |
| Recruitment | Gupta | Gaorav | Conquer Cancer Foundation | | 7/1/19 | 6/30/20 | Circulating Tumor DNA (ctDNA) in Locally Advanced Head and Neck Squamous Cell Carcinoma | $50,000.00 |
| Recruitment | Gupta | Gaorav | V Foundation for Cancer Research | T2019-010 | 11/1/19 | 11/1/22 | Overcoming Immunotherapy Resistance with Radiotherapy and PARP Inhibition in Luminal Subtype Metastatic Breast Cancer | $600,000.00 |
| Recruitment | Gupton | Stephanie | NIH National Institute of General Medical Sciences | 3R35-GM135160-01 | 12/1/19 | 11/30/24 | Coordinated Cytoskeletal Dynamics and Membrane Remodeling in Cellular Shape Change | $579,642.00 |
| Recruitment | Gupton | Stephanie | NIH National Institute of Neurological Disorders and Stroke | 5-R01-NS112326-01-02 | 8/1/19 | 4/30/24 | Exocytosis fuels plasma membrane expansion in developing neurons | $384,007.00 |
| Recruitment | Gupton | Stephanie | NIH National Institute of Neurological Disorders and Stroke | 1-F31-NS113381-01 | 9/1/19 | 8/31/22 | FELLOW: L.MCCORMICK VASP ubiquitination regulates actin dynamics in dendritic spines | $36,456.00 |
| Retention | Hahn | Klaus | University of Wisconsin at Madison | 647K662 | 12/8/15 | 11/30/20 | Mechanisms of cell migration on aligned matrices | $93,188.00 |
| Retention | Hahn | Klaus | NIH National Institute of General Medical Sciences | 5-R35-GM122596-01-04 | 4/1/17 | 3/31/22 | Dissecting signaling in vivo via precise control and visualization of protein activity | $789,940.00 |

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|---|---|---|---|---|---|---|---|---|
| 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 | $57,348.00 |
| Retention | Hahn | Klaus | BASF Global Chemical Company | 20-2595 | 12/18/19 | 6/18/20 | Identification of the site of action of a BASF insecticide | $80,000.00 |
| Recruitment | Han | Zongchao | NIH National Eye Institute | 5-R01-EY026564-01-05 | 4/1/16 | 3/31/21 | Targeting Retinitis Pigmentosa Using Nanoparticle-Mediated Delivery of Genomic DNA | $373,796.00 |
| Recruitment | Han | Zongchao | BrightFocus Foundation | M2019063 | 7/1/19 | 6/30/21 | Selective targeting reactive oxygen species for age-related macular degeneration | $200,000.00 |
| Recruitment | Han | Zongchao | North Carolina Biotechnology Center (NCBC) | 2020-GTF-6902 | 1/1/20 | 12/31/21 | Thermoresponsive polymer nanoparticle-mediated AAV delivery for gene therapy | $190,340.00 |
| Innovation Award | Hanson | Laura | NCDHHS Division of Health Service Regulation (DHSR) | 37289 | 1/1/19 | 6/30/21 | Disseminating Comfort Matters: A Web-based Training Toolkit for Comfort-focused Dementia Care | $498,981.00 |
| Recruitment | Hathaway | Nate | NIH National Institute of General Medical Sciences | 5-R01-GM118653-01-04 | 7/1/17 | 6/30/22 | MECHANISM OF HP1-MEDIATED HETEROCHROMATIN ASSEMBLY AND DURABILITY IN LIVE CELLS | $383,860.00 |
| Recruitment | Hathaway | Nate | Epigenos Bioscience, Inc. | 20-0678 | 4/1/20 | 3/31/21 | STTR: Chemically controlling chromatin to treat Friedriech's Ataxia | $120,000.00 |
| Theme Investment (CC) | Heise | Mark | NIH National Institute of Allergy and Infectious Diseases | 5-U19-AI100625-08 | 8/5/12 | 8/31/22 | Systems Immunogenetics of Biodefense and Emerging Pathogens in the Collaborative Cross | $3,436,397.00 |
| Theme Investment (CC) | Heise | Mark | NIH National Institute of Allergy and Infectious Diseases | 5-U19-AI100625-08 Supp | 9/1/19 | 8/31/20 | Systems Immunogenetics of Influenza Virus Infection in the Collaborative Cross | $499,496.00 |
| Investment (HTS) | Henderson | Gail | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI127024-01-04 | 6/15/16 | 5/31/21 | Integrating Decision Making Studies into HIV Cure Trials: A real-time longitudinal assessment | $546,615.00 |
| Retention | Henderson | Louise | University of California at Davis | 201600303-08 | 9/1/16 | 8/31/20 | Comparative Effectiveness of Breast Cancer Screening and Diagnostic Evaluation by Extent of Breast Density | $23,829.00 |
| Retention | 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 | $57,157.00 |
| Retention | Henderson | Louise | University of California at Davis | 201603696-08/ A18-0177-S008 | 7/1/17 | 5/31/22 | Risk-based Breast Cancer Screening and Surveillance in Community Practice | $286,312.00 |
| Retention | Henderson | Louise | NIH National Cancer Institute | 5-R01-CA212014-01-03 | 9/20/17 | 8/31/22 | Evaluating Lung Cancer Screening Patterns and Outcomes through a North Carolina Registry | $618,327.00 |
| Retention | Henderson | Louise | Georgetown University | 411518_GR412884-UNC | 1/1/18 | 12/31/20 | Comorbidity and screening outcomes among older women undergoing mammography | $15,021.30 |
| Retention | Henderson | Louise | NIH National Cancer Institute | 1-R01-CA251686-01 | 7/15/20 | 6/30/24 | Comorbidity and Functional Status in a Population Undergoing Lung Cancer Screening | $327,967.00 |
| Recruitment | Hingtgen | Shawn | NIH National Institute of Neurological Disorders and Stroke | 5-R01-NS097507-01-05 | 6/1/16 | 5/31/21 | Nanofiber matrices to improve neural stem cell-mediated cancer therapy | $330,099.00 |
| Recruitment | Hingtgen | Shawn | NIH National Institute of Neurological Disorders and Stroke | 5-R01-NS099368-01-04 | 9/26/17 | 6/30/22 | Engineering stem cell therapies to understand and overcome glioblastoma adaption | $317,149.00 |
| Recruitment | Hingtgen | Shawn | Accelerate Brain Cancer Cure, Inc. | | 6/1/19 | 5/31/21 | Tumor-homing beacons as a novel approach to cellular therapy for glioblastoma. | $169,291.00 |
| Recruitment | Hingtgen | Shawn | NIH National Cancer Institute | 5-F30-CA243270-02 | 7/11/19 | 7/10/23 | Therapeutic Engineered Stem Cells as a New Adjuvant Therapy for Non-Small Cell Lung Cancer Brain Metastases | $37,027.00 |
| Recruitment | Hingtgen | Shawn | Duke University | 2833585 | 5/1/20 | 1/31/21 | Pediatric Brain Tumor Organotypic Brain Slice Model experiments_Project 1 | $59,655.00 |
| Investment (HTSF) | Hoadley | Katherine | Susan G Komen for the Cure | CCR16376756 | 7/7/16 | 7/6/20 | Therapeutic Relevance of Genetic Subtypes Within Basal-Like Breast Cancer | $112,500.00 |
| Investment (HTS) | Hoadley | Katherine | NIH National Cancer Institute | 5-U24-CA210988-04 | 9/1/16 | 8/31/21 | RNA sequencing analysis of Cancer | $403,697.00 |
| Recruitment | Hoadley | Katherine | Translational Breast Cancer Research Consortium (TBCRC) | | 3/28/17 | 2/16/22 | TBCRC AURORA Clinical Data Coordinating Center ( | $128,870.00 |

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|---|---|---|---|---|---|---|---|---|
| Recruitment | Hoadley | Katherine | University of Minnesota Board of Regents | P006781501 | 9/1/18 | 8/31/20 | Bidimensional integration for pan-omics pan-cancer analysis | $11,953.00 |
| Recruitment | Hoadley | Katherine | Johns Hopkins University | 2044261072 | 1/1/19 | 6/30/22 | AURORA US: Prospective Biospecimen Repository in Metastatic Breast Cancer | $679,862.00 |
| Investment (Nanotech) | Huang | Leaf | NIH National Cancer Institute | 5-U54-CA198999-05 | 8/1/15 | 7/31/21 | Nano Approaches to Modulate Host Cell Response for Cancer Therapy | $2,191,356.00 |
| Recruitment | Hursting | Stephen | NIH National Cancer Institute | 5-R35-CA197627-05 | 8/1/15 | 7/31/22 | Breaking the Obesity-Cancer Link: New Targets and Strategies | $703,530.00 |
| Recruitment | Hursting | Stephen | NIH National Cancer Institute | 5-F30-CA225142-03 | 7/3/18 | 7/2/22 | FELLOW: S. MCDONNELL Evaluating the impact of obesity-associated inflammation on breast cancer heterogeneity and metastasis using single-cell RNA-seq | $49,506.00 |
| Recruitment | Hursting | Stephen | Breast Cancer Research Foundation | BCRF-19-073 | 10/1/18 | 9/30/20 | Combining Intermittent Energy Restriction and Anti-Inflammatory Regimens to Mimic the Anticancer Effects of Bariatric Surgery | $249,995.00 |
| Recruitment | Hursting | Stephen | Purdue University | 11000823-020 | 2/1/19 | 1/31/24 | Obesity, Metabolism and Breast Cancer Metastasis | $157,444.00 |
| Retention | Ibrahim | Joseph | Merck & Co., Inc. | 8100058892 | 7/1/09 | 12/31/20 | Methods for Interim Analysis with Incomplete Adjudication of Events | $154,500.00 |
| Investment (Bios/HTS) | Ibrahim | Joseph | NIH National Institute of General Medical Sciences | 5-R01-GM070335-17-20 | 3/1/96 | 6/30/21 | Bayesian Approaches to Model Selection for Survival Data | $383,181.00 |
| Investment (Bios/HTS) | Ibrahim | Joseph | NIH National Cancer Institute | 5-T32-CA106209-15 | 5/1/04 | 7/31/21 | Biostatistics for Research in Genomics and Cancer | $208,980.00 |
| Investment (Bios/HTS) | Ibrahim | Joseph | NIH National Institute of Mental Health | 7-R01-MH086633-10 | 3/1/10 | 6/30/21 | Statistical Analysis of Biomedical Imaging Data in Curved Space | $285,524.04 |
| Recruitment | Innocenti | Federico | Alliance for Clinical Trials in Oncology Foundation | | 6/1/15 | 5/31/22 | ACTO_Appendix IIB to CALGB/SWOG C80405 | $422,033.00 |
| Recruitment | Innocenti | Federico | Alliance for Clinical Trials in Oncology Foundation | | 2/1/19 | 1/31/21 | A Phase III Randomized Study of Sorafenib plus Doxorubicin versus Sorafenib in Patients with Advanced Hepatocellular Carcinoma (HCC) - CALGB 80802 and Correlative Substudy - CALGB 150902. | $64,008.00 |
| Investment (Protocol) | Jamieson | Katarzyna | National Marrow Donor Program | 10020-#1506 | 5/24/18 | 2/1/23 | A Multi-center, Randomized, Double-blind, Placebo-controlled Phase III Trial of the FLT3 Inhibitor Gilteritinib Administered as Maintenance Therapy Following Allogeneic Transplant for Patients with FLT3/ITD AML | $73,467.00 |
| Investment (Proteomics) | Johnson | Gary | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 5-U24-DK116204-03 | 9/1/17 | 8/31/23 | Illuminating Function of the Understudied Druggable Kinome | $2,265,987.00 |
| Investment (Proteomics) | Johnson | Gary | University of Alabama at Birmingham | 000525294-SC001 | 9/15/19 | 11/30/20 | Credentialing next-generation human and murine models for glioma preclinical drug development | $28,671.00 |
| Recruitment | Jolly | Trevor | Odonate Therapeutics LLC | | 10/29/18 | 11/6/28 | A Multinational, Multicenter, Randomized, Phase 3 Study of Tesetaxel plus a Reduced Dose of Capecitabine versusCapecitabine Alone in Patients with HER2 Negative, Hormone Receptor Positive, Locally Advanced or Metastatic Breast Cancer Previously Treated wi | $25,929.60 |
| Recruitment | Jolly | Trevor | Dana-Farber Partners Cancer Care, Inc | | 12/28/18 | 11/18/28 | DF-HCC 17-101: Palbociclib After CDK and Endocrine Therapy (PACE): A Randomized Phase II Study of Fulvestrant, Palbociclib, and Avelumab for Endocrine Pre-treated ER+/HER2- Metastatic Breast Cancer (Protocol #: 17-101) | $43,353.20 |
| Theme investment (HTSF) | Jones | Corbin | Duke University | A03-1446 | 5/1/19 | 4/30/21 | Epigenetic reprogramming of behaviors with sensory experience | $63,043.00 |

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|---|---|---|---|---|---|---|---|---|
| Theme investment (HTSF) | Jones | Corbin | Leidos Biomedical Research | | 11/17/16 | 8/30/19 | RNA- Seq Services to the Genome Characterization Center | $1,234,689.36 |
| Theme investment (HTSF) | Jones | Corbin | NIH National Cancer Institute | 75N91019D00033 | 8/31/19 | 8/30/24 | Genome Characterization Center for RNA-seq Services | $2,016,159.25 |
| Recruitment | Kabanov | Alexander | NIH National Cancer Institute | 5-U01-CA198910-05 | 8/14/15 | 7/31/21 | Targeted Core Shell Nanogels for Triple Negative Breast Cancer | $545,618.00 |
| Recruitment | Kabanov | Alexander | NIH National Cancer Institute | 5-T32-CA196589-05 | 7/1/15 | 6/30/20 | CAROLINA CANCER NANOTECHNOLOGY TRAINING PROGRAM (C-CNTP) | $379,286.00 |
| Recruitment | Kabanov | Alexander | NIH National Cancer Institute | 5-R21-CA220148-01-03 | 8/1/17 | 7/31/21 | Targeted Magneto-Mechanic Nanotherapeutics for Cancer | $113,823.00 |
| Recruitment | Kabanov | Alexander | NIH National Cancer Institute | 2-T32-CA196589-06 | 7/1/15 | 6/30/25 | CAROLINA CANCER NANOTECHNOLOGY TRAINING PROGRAM (C-CNTP) | $467,108.00 |
| Investment (CC) | Kelada | Samir | NIH National Heart, Lung, and Blood Institute | R01HL122711-04 | 8/15/15 | 5/31/20 | Systems-level Transcriptomic Analyses to Identify Mouse Models of Asthma | $213,908.30 |
| Retention | Key | Nigel | NIH National Heart, Lung, and Blood Institute | 5-T32-HL007149-44 | 7/1/75 | 6/30/22 | Research Training in Hematology at UNC Chapel Hill | $303,041.00 |
| Retention | Key | Nigel | NIH National Heart, Lung, and Blood Institute | 5-R01-HL146226-01-02 | 1/1/19 | 12/31/21 | Fibrinolysis Evaluation in A-TREAT ('FEAT' Study) | $391,250.00 |
| Retention | Key | Nigel | National Hemophilia Foundation | | 3/1/20 | 2/28/22 | Evaluating the Mechanism of Emicizumab-related Thrombotic Microangiopathy | $180,000.00 |
| 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 | $28,296.87 |
| Recruitment | Khagi | Simon | Novocure Ltd. | | 10/2/17 | 10/7/22 | METIS: Pivotal, open-label, randomized study of radiosurgery with or without Tumor Treating Fields (TTFields) for 1-10 brain metastases from non-small cell lung cancer (NSCLC) | $2,000.00 |
| Recruitment | Khagi | Simon | DNAtrix, Inc. | | 5/9/18 | 5/18/28 | A Phase II, Multi-center, Open-label Study of a Conditionally Replicative Adenovirus (DNX-2401) with Pembrolizumab (KEYTRUDA®) for Recurrent Glioblastoma or Gliosarcoma | $26,519.91 |
| Recruitment | Khagi | Simon | Inovio Pharmaceuticals, Inc. | | 10/5/18 | 10/30/28 | An Open-Label, Multi-Center Trial of INO-5401 and INO-9012 Delivered by Electroporation (EP) in Combination with REGN2810 in Subjects with Newly- Diagnosed Glioblastoma (GBM) | $33,122.75 |
| Recruitment | Kibbe | Melina | Department of Veterans Affairs | 558-D72052 | 7/1/17 | 9/30/20 | IPA NICK TSIHLIS Bioengineering Catalytically Active Grafts for Vascular Surgery | $68,400.00 |
| Recruitment | Kibbe | Melina | Department of Veterans Affairs | 558-D72053 | 7/1/17 | 9/30/20 | IPA FOR LU YU Bioengineering Catalytically Active Grafts for Vascular Surgery | $54,660.00 |
| Recruitment | Kibbe | Melina | Department of Veterans Affairs | 558-D72054 | 7/1/17 | 9/30/20 | IPA FOR ROBIN SILETZKY Bioengineering Catalytically Active Grafts for Vascular Surgery | $22,488.00 |
| Recruitment | Kibbe | Melina | Department of Veterans Affairs | 558-D82031 | 1/1/18 | 9/30/20 | IPA DAVID GILLIS Bioengineering Catalytically Active Grafts for Vascular Surgery | $51,444.00 |
| Recruitment | Kibbe | Melina | American Heart Association | 18POST33960499 | 7/1/18 | 9/30/20 | Targeted, Niche-Responsive Peptide Amphiphile Nanofibers as Injectable Drug Delivery Vehicles to Treat Atherosclerosis | $104,060.00 |
| Retention | Kim | William | Novartis AG | | 6/14/11 | 12/31/20 | Neoadjuvant Pazopanib: A Phase II Study to Evaluate the Effect on Disease esponse and Recurrence and to Establish Predictive Biomarkers of Drug Activity in Renal Cell Carcinoma | $158,857.20 |

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|---|---|---|---|---|---|---|---|---|
| Retention | Kim | William | Merck Sharp and Dohme Corp. | | 9/19/16 | 12/31/20 | Prediction or Response and Rapid Development of Pembrolizumab-based Combination in Genetically Engineered Mouse Models of Melanoma and Breast | $498,584.32 |
| Retention | Kim | William | Acerta Pharma BV | 17-0214 | 6/1/16 | 11/30/21 | Comprehensive tumor immune microenvironment profiling to discover determinants of response to pembroluzimab with or without BTK inhibition | $199,867.00 |
| Retention | Kim | William | NIH National Cancer Institute | 5-R01CA202053-01-05 | 8/1/16 | 7/31/21 | Kinase Inhibition in Kidney Cancer | $432,423.00 |
| Retention | Kim | William | GeneCentric Therapeutics, Inc. | | 7/26/18 | 7/26/20 | Bladder cancer sample identification, sample procurement, imaging, and performance of assays or delivery of sample for performance of assays. | $136,500.00 |
| Retention | Kim | William | NIH National Cancer Institute | 5-K12-CA120780-13 | 9/17/07 | 6/30/23 | UNC Oncology Clinical/Translational Research Training Program (OCT-RTP) | $712,771.00 |
| Retention | Kim | William | University of Texas Southwestern Medical Center | GMO201204/PO#0000001914 | 9/30/19 | 9/29/21 | TBK1 serves as a novel therapeutic target in kidney cancers with VHL loss | $71,620.00 |
| Retention | Kim | William | NIH National Cancer Institute | 1-F31-CA247250-01 | 2/1/20 | 1/31/23 | FELLOW ANDREW TRUONG Effect of APOBEC3 on Bladder Cancer Biology and Response to Immunotherapy | $45,520.00 |
| Retention | Kim | William | NIH National Cancer Institute | 1-R01-CA241810-01A1 | 8/1/20 | 4/30/25 | Chemotherapy and the Bladder Cancer Immune Microenvironment | $566,138.00 |
| Recruitment | Kistler | Christine | Duke University | 245360 7912 | 9/30/19 | 8/31/26 | PREVENTABLE STUDY CLINICAL RESEARCH STEERING COMMITTEE AGREEMENT | $35,000.00 |
| Investment (Bios/HTS) | Kosorok | Michael | University of Rochester | 417654G/URFAO:GR510988 | 9/30/19 | 8/31/20 | Analizing Sequential Multiple Assignment Randomized Trials in the Presence of Partial Compliance | $63,990.00 |
| Investment (Bios/HTS) | Kosorok | Michael | Wake Forest University Health Sciences | 100710-552612 | 3/1/20 | 2/28/22 | Analytical Tools for Complex Brain Networks: Fusing Novel Statistical Methods and Network Science to Understand Brain Function | $62,082.00 |
| Investment (Protocol) | Kuzmiak | Cherie | ECOG-ACRIN Cancer Research Group | EA1151 | 10/20/17 | 10/19/24 | ECOG-ACRIN LAPS: Protocol EA1151, Tomosynthesis Mammographic Imaging Screening Trial (TMIST) | $487,288.76 |
| Recruitment | Laederach | Alain | NIH National Institute of General Medical Sciences | 5-R01-GM101237-05-07 | 5/1/12 | 8/31/21 | Structural and functional consequences of disease SNP's on the transcriptome | $392,644.00 |
| Recruitment | Laederach | Alain | Georgia Institute of Technology - The Georgia Tech Research Corporation | RJ-193-G1/PO-5007401 | 8/1/17 | 7/31/22 | Collaborative Research: Multimodal RNA structural motifs in alphavirus genomes: discovery and validations | $112,850.00 |
| Recruitment | Laederach | Alain | NIH National Institute of General Medical Sciences | 5-F31-GM130040-02 | 1/1/19 | 12/31/20 | A novel melanoma therapeutic target: Elucidating the structure and mapping functional domains of the lncRNA SAMMSON | $35,486.00 |
| Recruitment | Laederach | Alain | NIH National Heart, Lung, and Blood Institute | 5-R01-HL111527-06-07 | 1/1/12 | 4/30/23 | Non-coding RNA Structure Change in Chronic Obstructive Pulmonary Disease | $517,347.00 |
| Recruitment | Laederach | Alain | Alpha-1 Foundation | Application ID 615028 | 7/1/19 | 6/30/21 | Developing an Accurate Model of a-1-antitrypsin Protein Expression through RNA Structure | $143,783.00 |
| Recruitment | Lai | Sam | David and Lucile Packard Foundation | 2013-39274 | 10/15/13 | 11/30/21 | Harnessing antibody-mucin interactions to achieve precise control of microbial communities in the gut | $875,000.00 |
| Recruitment | Lai | Sam | North Carolina Biotechnology Center (NCBC) | 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 | $95,170.00 |
| Recruitment | Lai | Sam | NIH National Heart, Lung, and Blood Institute | 5-R01-HL141934-01-03 | 5/10/18 | 4/30/22 | Overcoming anti-PEG immunity to restore prolonged circulation and efficacy of PEGylated therapeutics | $685,484.00 |
| Recruitment | Lai | Sam | National Science Foundation | DMR-1810168 | 8/1/18 | 7/31/21 | Dynamic tuning of barrier properties of hydrogels using weakly adhesive third-party crosslinkers | $170,591.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Recruitment | Lai | Sam | Mucommune, LLC | | 7/8/18 | 6/30/20 | SBIR: Development of a biologic for non-hormonal contraception | $67,288.00 |
| Recruitment | Lai | Sam | Mucommune, LLC | | 5/7/18 | 4/30/20 | SBIR: Sustained vaginal delivery of monoclonal antibodies for preventing HIV transmission | $61,235.00 |
| Recruitment | Lai | Sam | Mucommune, LLC | | 9/17/18 | 8/31/20 | SBIR: Capsule-intravaginal ring providing sustained release of antibodies for non-hormonal contraception and prevention of vaginal HIV transmission | $56,771.00 |
| Recruitment | Lai | Sam | Boston University Board of Trustees | 4500002926 | 9/14/18 | 3/31/20 | Antibody-based Contraceptive MPTs: Preclinical and Clinical Research | $149,981.00 |
| Recruitment | Lai | Sam | AI Tracking Solutions, Inc. | | 9/13/18 | 9/12/20 | STTR: An integrated neural network analysis and video microscopy platform for fully automated particle tracking | $85,241.00 |
| Recruitment | Lai | Sam | Kimberly-Clark Corporation | 19-5318 | 8/1/19 | 1/31/20 | Kimberly-Clark Expert Service Agreement - Lai Lab | $49,952.00 |
| Recruitment | Lai | Sam | Pharmaceutical Research and Manufacturers of America Foundation | | 1/1/20 | 12/31/21 | Engineering of novel sperm-binding antibody constructs for non-hormonal contraception. | $50,000.00 |
| Recruitment | Lai | Sam | NIH National Institute of Child Health and Human Development | 1-R01-HD101562-01 | 4/1/20 | 3/31/24 | Engineering bispecific antibodies for non-hormonal contraception | $523,187.00 |
| Recruitment | Lazear | Helen | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI139512-01-02 | 1/1/19 | 12/31/23 | The Role of Interferon Lambda signaling in flavivirus transmission and pathogenesis at the maternal-fetal interface | $388,750.00 |
| Recruitment | Lazear | Helen | NIH National Institute of Allergy and Infectious Diseases | 5-R21-AI144631-01-02 | 2/25/19 | 1/31/21 | Protective Immune Mechanisms against Zika Virus Infection in the Female Reproductive Tract | $230,238.00 |
| Investment (CC) | Lazear | Helen | NIH National Institute of Allergy and Infectious Diseases | 5-R21-AI145377-01-02 | 6/11/19 | 5/31/21 | Identifying Novel Immune Factors Controlling Flavivirus Pathogenesis | $194,034.00 |
| Investment (CC) | Lazear | Helen | NIH National Institute of Allergy and Infectious Diseases | 5-F31-AI143237-02 | 9/1/19 | 8/31/24 | FELLOW: C.LOPEZ The Role of Dengue Virus Antibodies in Vector-independent transmission of Zika Virus | $37,064.00 |
| Recruitment | Lee | Carrie | QuintilesIMS | | 12/9/13 | 11/30/20 | A Phase Ib Study of the Safety and Pharmacology of MPDL3280A Administered with Cobimetinib in Patients with Locally Advanced or Metastatic Solid Tumors | $31,527.30 |
| Recruitment | Lee | Carrie | V Foundation for Cancer Research | DM2019-001 | 1/15/19 | 1/15/21 | The Use of Clinical Trial Navigators to Increase Minority Patient Enrollment and Retention in Cancer Clinical Trials | $71,000.00 |
| Recruitment | Lee | Michael | Pfizer International, LLC (Corporate Office New York) | | 1/8/18 | 11/1/21 | Phase II study of the combination of palbociclib and cetuximab in KRAS/NRAS/BRAF wild-type metastatic colorectal cancer | $40,000.00 |
| Recruitment | Lee | Michael | Genentech, Inc. | 4100853BP29889 | 11/13/18 | 12/24/28 | An Open-Label, Multicenter, Dose Escalation Phase IB Study With Expansion Cohorts To Evaluate The Safety, Pharmacokinetics, Pharmacodynamics And Therapeutic Activity Of RO7009789 (CD40 Agonistic Monoclonal Antibody) In Combination With Vanucizumab (Anti- | $109,530.75 |
| Recruitment | Lee | Michael | Hoosier Cancer Research Network | | 1/7/19 | 12/18/28 | A single arm, multi-center Phase 2 trial of mFOLFOX6 + trastuzumab + avelumab in first-line, metastatic, HER2-amplified gastric and esophageal adenocarcinomas | $31,404.70 |
| Recruitment | Lee | Michael | Exelixis, Inc. | | 4/30/19 | 5/16/29 | A Randomized, Controlled Phase 3 Study of Cabozantinib (XL184) in Combination with Atezolizumab versus Sorafenib in Subjects with Advanced Hepatocellular Carcinoma Who Have Not Received Previous Systemic Anticancer Therapy | $68,243.60 |

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|---|---|---|---|---|---|---|---|---|
| Recruitment | Lee | Michael | Rafael Pharmaceuticals, Inc. | | 10/23/19 | 10/3/29 | A Phase III Multicenter Open-Label Randomized Trial to Evaluate Efficacy and Safety of FOLFIRINOX (FFX) versus Combination of CPI-613 with modified FOLFIRINOX (mFFX) in Patients with Metastatic Adenocarcinoma of the Pancreas | $285,353.45 |
| Recruitment | Lee | Michael | Academic and Community Cancer Research United | | 10/31/19 | 8/30/29 | Combination of MEK Inhibitor Binimetinib and CDK4/6 Inhibitor Palbociclib in KRAS and NRAS Mutant Metastatic Colorectal Cancers | $43,920.00 |
| Recruitment | Lee | Yueh | DOD DA Army Medical Research Acquisition Activity | W81XWH1820043 | 9/15/18 | 9/14/21 | Development and Evaluation of a Solid State Head CT | $1,284,246.00 |
| Recruitment | Lee | Yueh | NIH National Cancer Institute | 5-R21-CA216780-01-02 | 9/18/18 | 8/31/21 | Clinical Evaluation of Primary Sampling Scatter Correction for Chest Tomosynthesis | $191,949.00 |
| Recruitment | Lee | Yueh | Kitware, Inc. | K002789-00-S02 | 9/30/18 | 8/31/21 | STTR: Automated Assessment of Leptomeningeal Collaterals on CT Angiograms, Phase II | $200,000.00 |
| Recruitment | Lee | Yueh | NIH National Institute of Biomedical Imaging and Bioengineering | 1-R01-EB028283-01 | 9/15/19 | 5/31/23 | Stationary Digital Tomosynthesis for Transbronchial Biopsy Guidance | $770,451.00 |
| Retention | Leeman | Jennifer | Centers for Disease Control and Prevention | 200-2014-61279 | 9/23/15 | 9/22/20 | Diabetes Self-Management Education (DSME) Toolkit, Training and Technical Assistance | $88,000.00 |
| Recruitment | Legant | Wesley | Arnold and Mabel Beckman Foundation | 19-2609 | 9/1/19 | 8/31/23 | Intelligent Microscopes to Observe and Interact With Dynamic Biological Specimens | $600,000.00 |
| Recruitment | Legant | Wesley | Searle Scholars Program | SSP-2019-107 | 7/1/19 | 6/30/22 | Single molecule dynamics of differentiation | $300,000.00 |
| Recruitment | Legant | Wesley | NIH National Institute of General Medical Sciences | 1-DP2-GM136653-01 | 9/30/19 | 5/31/24 | Connecting the dots between single molecule dynamics and cell differentiation | $457,902.00 |
| Recruitment | Legant | Wesley | David and Lucile Packard Foundation | 2019-69652 | 10/15/19 | 10/14/24 | AI-enhanced microscopy | $875,000.00 |
| Recruitment | Lemon | Stanley | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI095690-06-10 | 4/15/11 | 3/31/21 | Micro-RNA 122 and Chronic Hepatitis C | $380,000.00 |
| Recruitment | Lemon | Stanley | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI131685-01-04 | 3/6/17 | 2/28/22 | Murine Model of Human Hepatitis A | $388,750.00 |
| Recruitment | Lemon | Stanley | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI103083-06-09 | 9/24/12 | 8/31/22 | Membrane Hijacking: Biogenesis and Fate of Quasi-Enveloped Hepatovirus | $388,750.00 |
| Recruitment | Lemon | Stanley | NIH National Institute of Allergy and Infectious Diseases | 1-R01-AI150095-01 | 12/12/19 | 11/30/24 | Critical Lipid Species in the Hepatovirus Lifecycle | $528,265.00 |
| Recruitment | Li | Zibo | NIH Office of the Director | 1-S10-OD023611-01 | 3/17/17 | 3/16/20 | Small Animal PET/CT for Preclinical Imaging Research | $834,500.00 |
| Recruitment | Li | Zibo | University of Georgia (UGA) | SUB00001509 | 3/15/17 | 1/31/21 | Nanoscintillator-based X-ray sensitizers to enable efficient non-small cell lung cancer treatment with X-ray irradiation | $182,000.00 |
| Recruitment | Li | Zibo | NIH National Cancer Institute | 5-R01-CA233904-01-02 | 12/7/18 | 11/30/23 | Development of IDO PET agents for immunotherapy | $404,087.00 |
| Recruitment | Li | Zibo | Zymeron Corporation | Z110 | 12/1/19 | 5/31/21 | SBIR: Combinatory Treatment Modalities Utilizing Radiation to Locally Activate Systemically Delivered Therapeutics | $93,500.00 |
| Recruitment | Li | Zibo | NIH National Institute of Biomedical Imaging and Bioengineering | 1-R01-EB029451-01 | 5/1/20 | 1/31/24 | Novel Catalytic Methods for Efficient Radiolabeling of Un-activated Arene Compounds | $467,297.00 |
| Recruitment | Li | Zibo | NIH National Cancer Institute | 1-R01-CA247769-01A1 | 7/15/20 | 6/30/25 | The development of novel radiation-sensitizer based on ultra-small carbon dots | $526,148.00 |
| Theme Investment (BRIC) | Lin | Weili | NIH National Institute of Mental Health | 5-U01-MH110274-04 | 9/1/16 | 5/31/21 | UNC/UMN Baby Connectome Project | $1,155,144.00 |
| Theme Investment (BRIC) | Lin | Weili | Societe des Produits Nestle, S.A. | RDNN201704/ 4520562240 | 2/27/17 | 9/30/20 | Interrelationships of Nutrition, Gut Microbiota, as well as Brain & Cognitive Development in Early Life | $250,109.17 |
| Recruitment | Liu | Pengda | V Foundation for Cancer Research | V2018-009 | 11/1/18 | 11/1/20 | Novel Functions for cGAS in Cancer | $100,000.00 |

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|---|---|---|---|---|---|---|---|---|
| Recruitment | Liu | Pengda | NIH National Cancer Institute | 5-R21-CA234979-01-02 | 6/1/19 | 5/31/21 | Targeting EWS-FLI1 protein stability as therapeutic strategy for Ewing sarcoma | $202,928.00 |
| Recruitment | Liu | Pengda | Breast Cancer Alliance | 2020BCA | 2/1/20 | 1/31/22 | Targeting the deubiquitinase OTUD6B in Basal-Like Breast Cancer | $125,000.00 |
| Recruitment | Liu | Pengda | Gabrielle's Angel Foundation for Cancer Research | 124 | 9/1/20 | 8/31/23 | Targeting the Innate Immunity-Independent Function of STING in treating AML | $75,000.00 |
| Recruitment | Liu | Pengda | NIH National Cancer Institute | 1-R01-CA244825-01A1 | 7/7/20 | 6/30/25 | Elucidating novel functions of cGAS in breast cancer | $355,706.00 |
| Recruitment | Lund | Jennifer | Patient-Centered Outcomes Research Institute | ME-2017C3_9337 | 12/1/18 | 6/1/22 | Enhancing Hybrid Study Designs for Comparative Effectiveness Research | $243,986.00 |
| Recruitment | Lund | Jennifer | Westat, Inc. | 6473-S07 | 6/1/19 | 9/15/20 | Constructing Real World Evidence in Cancer Surveillance through Data Linkage and Advanced Methods | $28,847.00 |
| Recruitment | Lund | Jennifer | AbbVie, Inc. | 116685 | 11/27/19 | 11/26/20 | Patient Comorbidities and Mortality Outcomes in CLL Patients in SEER-Medicare | $95,984.00 |
| Investment (CC) | Magnuson | Terry | NIH Office of the Director | 2-U42-OD010924-21 | 9/30/99 | 2/28/25 | A Carolina Center to Characterize and Maintain Mutant Mice | $1,469,749.00 |
| Investment (CC) | Magnuson | Terry | NIH National Institute of General Medical Sciences | 2-R01-GM101974-32 | 12/1/89 | 3/31/24 | Albino Deletion Complex and Early Mouse Development | $431,645.00 |
| Investment (Bios/HTS) | Marron | James | National Science Foundation | IIS-1633074 | 9/1/16 | 8/31/20 | BIGDATA: F: Statistical Approaches to Big Data Analytics | $125,000.00 |
| Innovation Award | Matera | Greg | NIH National Institute of General Medical Sciences | 1-R35-GM136435-01 | 4/1/20 | 3/31/25 | Ribonucleoprotein Biogenesis and Epigenetic Gene Regulation | $652,834.00 |
| Investment (HTSF) | Matute | Daniel | NIH National Institute of General Medica | 5-R01-GM121750-01-04 | 9/1/17 | 7/31/2022 | The prevalence of genetic introgression in speciation | $341,220.64 |
| Retention | Mayer | Deborah | Duke Endowment | 6650-SP | 5/2/17 | 12/31/20 | Improving Cancer Outcomes in North Carolina with Lay Patient Navigation | $300,000.00 |
| Recruitment | McGinty | Robert | Searle Scholars Program | SSP-2017-2016 | 7/1/17 | 6/30/20 | Deciphering the nucleosome interactome | $100,000.00 |
| Recruitment | McGinty | Robert | Pew Charitable Trusts | 30551 | 8/1/17 | 7/31/22 | Deciphering the nucleosome interactome | $60,000.00 |
| Recruitment | McGinty | Robert | American Cancer Society | 132609-PF-18-153-01-DMC | 4/1/19 | 3/31/22 | FELLOW: A SKRAJNA Deciphering the nucleosome interactome | $54,500.00 |
| Recruitment | McGinty | Robert | NIH National Institute of General Medical Sciences | 5-R35-GM133498-01-02 | 8/1/19 | 7/31/24 | Molecular Mechanisms of Chromatin Recognition | $382,895.00 |
| Retention | McRee | Autumn | GlaxoSmithKline (GSK), 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 w | $11,716.92 |
| 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 | $144,732.01 |
| 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 | $29,959.00 |
| 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 | $103,441.19 |
| Retention | McRee | Autumn | Academic and Community Cancer Research United | | 2/23/18 | 3/18/28 | A Phase III Study of BBI-608 plus nab-Paclitaxel with Gemcitabine in Adult Patients with Metastatic Pancreatic Adenocarcinoma | $35,392.26 |

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|---|---|---|---|---|---|---|---|---|
| Retention | McRee | Autumn | Rgenix, Inc. | | 10/25/18 | 11/20/28 | A Phase 1 Study of RGX-202-01, a Small Molecule Inhibitor of the Creatine Transporter, SLC6a8, with or without FOLFIRI in Patients with Advanced Gastrointestinal Malignancies with Select Expansion Cohorts | $104,728.54 |
| Retention | McRee | Autumn | Biocompatibles UK Ltd. | | 11/21/18 | 5/31/29 | A pilot study of pembrolizumab in combination with Y90 radioembolization in patients with high risk hepatocellular carcinoma with preserved liver function | $6,222.40 |
| Recruitment | Mills | Sarah | NIH National Cancer Institute | 5-K01-CA242530-02 | 8/7/19 | 7/31/24 | Modeling the public health impact of a national menthol cigarette ban. | $169,370.00 |
| Recruitment | Milowsky | Matthew | Pfizer International, LLC (Corporate Office New York) | | 1/5/15 | 6/4/20 | Phase II Trial of Palbociclib (PD-0332991) in Patients with Metastatic Urothelial Cancer (UC) after Failure of First-Line Chemotherapy | $150,655.12 |
| Recruitment | Milowsky | Matthew | Genentech, Inc. | | 7/12/16 | 6/30/21 | 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 U | $30,828.14 |
| Recruitment | Milowsky | Matthew | Bristol-Myers Squibb Company | | 12/22/16 | 1/17/21 | A Phase 3 Randomized, Double-blind, Multi-center Study of Adjuvant Nivolumab versus Placebo in Subjects with High Risk Invasive Urothelial Carcinoma | $63,274.31 |
| Recruitment | Milowsky | Matthew | Incyte Corporation | | 1/31/17 | 11/30/21 | 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 | $78,454.80 |
| Recruitment | Milowsky | Matthew | Hoosier Cancer Research Network | | 10/25/16 | 2/28/21 | Randomized, Double-Blinded, Phase II Study of Maintenance Pembrolizumab versus Placebo after First-line Chemotherapy in Patients with Metastatic Urothelial Cancer | $33,153.83 |
| Recruitment | Milowsky | Matthew | New York University School of Medicine | NYU S15-00220 | 12/4/17 | 11/30/22 | A Phase II Trial of MK3475 in Combination with Gemcitabine and Concurrent Hypofractionated Radiation Therapy as Bladder Sparing Treatment for Muscle-Invasive Urothelial Cancer of the Bladder | $72,000.00 |
| Recruitment | Milowsky | Matthew | Seattle Genetics, Inc | | 4/20/18 | 4/30/28 | A phase 1b dose-escalation and dose-expansion study of enfortumab vedotin (ASG-22CE) in combination with immune checkpoint inhibitor (CPI) therapy for treatment of patients with locally advanced or metastatic urothelial cancer | $344,830.34 |
| Recruitment | Milowsky | Matthew | Inovio Pharmaceuticals, Inc. | | 9/18/18 | 10/4/28 | An Open-Label, Multi-Center Trial of INO-5401 + INO-9012 in Combination with Atezolizumab in Subjects with Locally Advanced Unresectable or Metastatic/Recurrent Urothelial Carcinoma | $86,985.80 |
| Recruitment | Milowsky | Matthew | Mirati Therapeutics, Inc | | 4/1/19 | 4/16/29 | A Phase 2 Study of Sitravatinib in Combination with Nivolumab in Patients with Advanced or Metastatic Urothelial Carcinoma | $178,031.67 |
| Recruitment | Milowsky | Matthew | The Leo & Anne Albert Institute for Bladder Cancer Care and Research | | 2/1/20 | 3/31/21 | Understanding anti-tumor immunity with combination chemotherapy and immune checkpoint blockade in patients with muscle-invasive bladder cancer | $75,000.00 |
| Recruitment | Mody | Gita | Thoracic Surgery Foundation for Research and Education | | 7/1/19 | 6/30/21 | Achieving Patient Priorities after Thoracic Surgery | $80,000.00 |

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|---|---|---|---|---|---|---|---|---|
| Investment (HTS) | Mohlke | Karen | University of Colorado Denver | FY18.878.005 | 8/1/17 | 4/30/21 | Sequence analysis of hematological traits in African Americans | $146,304.29 |
| Investment (HTS) | Mohlke | Karen | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 5-R01-DK093757-06-09 | 9/5/11 | 5/31/22 | Genetic epidemiology of rare and regulatory variants for metabolic traits | $627,100.00 |
| Investment (HTS) | Mohlke | Karen | Broad Institute | 5216280-5500001323 | 5/1/19 | 4/30/20 | Proposal for the AMP T2D-GENES Data Coordination Center and Web Portal | $116,625.00 |
| Recruitment | Mooberry | Micah | Duke University | | 8/1/16 | 9/27/19 | VARIABILITY OF CRYOPRECIPITATE CONTENT WITH A FOCUS ON POTENTIALLY PROCOAGULANT AND ALLOIMMUNIZING MICROPARTICLES - A GLOBAL EVALUATION. | $64,845.00 |
| Recruitment | Mooberry | Micah | Mayo Clinic | | 9/12/17 | 12/31/20 | A Phase III, Randomized, Controlled, Double-Blind Study Evaluating the Safety of Two Doses of Apixaban for Secondary Prevention of Cancer Related Venous Thrombosis in Subjects Who Have Completed at Least Six Months of Anticoagulation Therapy (EVE TRIAL) | $20,000.00 |
| Recruitment | Moody | Cary | NIH National Cancer Institute | 5-R01-CA226523-01-02 | 12/6/18 | 11/30/23 | Epigenetic Regulation During the HPV Life Cycle | $354,527.00 |
| Recruitment | Moorman | Nathaniel | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI103311-06-08 | 12/1/12 | 6/30/23 | The role of host and viral translation factors during HCMV infection | $384,607.00 |
| Recruitment | Moorman | Nathaniel | University of Arizona | 492004 | 9/24/18 | 8/31/23 | Molecular switch regulating human cytomegalovirus replicative and latent states | $195,964.00 |
| Recruitment | Moschos | Stergios | Merck Sharp and Dohme Corp. | | 2/15/13 | 2/14/20 | MK-3475-002-29 Randomized, Phase II Study of MK-3475 versus Chemotherapy in Patients with Advanced Melanoma | $51,740.22 |
| Recruitment | 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 | $33,016.28 |
| Recruitment | Moschos | Stergios | Merck Sharp and Dohme Corp. | | 6/3/16 | 6/2/21 | 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 | $183,478.78 |
| Recruitment | Moschos | Stergios | Leidos Corporation | 17X011 | 5/24/17 | 6/30/22 | 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 Clinica | $135,226.60 |
| Recruitment | Moschos | Stergios | University of California Board of Regents | 1554-S-WB088 | 10/5/18 | 10/5/20 | Genomic and Epigenomic Determinants of Pembrolizumab Resistance in Melanoma, Its Microenvironment and Organ-specific Tumor Niche in Deceased Subjects (Warm Autopsy) | $88,034.00 |
| Recruitment | Moschos | Stergios | Syndax Pharmaceuticals, Inc. | | 12/18/18 | 10/21/28 | Breaking Innate PD-1 Inhibitor (PD1i) Resistance Using Epigenetic Modifiers; Antitumor Efficacy and Correlative Analyses of Entinostat plus Pembrolizumab in Non-Inflamed Metastatic Melanoma (MM) | $45,343.00 |
| Recruitment | Moschos | Stergios | University of California at Los Angeles | 1554 G XB980 | 5/1/20 | 4/30/25 | Metastatic Clonal Heterogeneity and its Impact on Melanoma Therapeutic Resistance | $103,865.00 |
| Investment (CC) | Mosedale | Merrie | Alnylam Pharmaceuticals | 4510008959 | 2/21/19 | 2/20/20 | Evaluation of 2D And 3D Heparg Models For Predicting Clinical Transaminase Elevations Associated With Trivalent N-Acetylgalactosamine-Conjugated Small Interfering RNAS | $48,271.00 |

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|---|---|---|---|---|---|---|---|---|
| Investment (CC) | Mosedale | Merrie | NIH Office of the Director | 5-R21-OD028216-01-02 | 8/15/19 | 7/31/21 | Development of an in vitro mouse genetic reference platform to improve preclinical drug safety assessment | $178,992.00 |
| Investment (CC) | Mosedale | Merrie | Society of Toxicology (SOT) | | 4/1/20 | 3/31/21 | A quantitative, in vitro approach to assess the impact of human hepatocyte-derived exosomes on immune response in idiosyncratic drug-induced liver injury | $44,000.00 |
| Recruitment | Muscatell | Keely | Robert Wood Johnson Foundation | 75668 | 9/1/18 | 8/31/23 | Health Policy Research Scholars Cohort Three 2018 - Gabriella Alvarez | $120,000.00 |
| Recruitment | Muss | Hy | NIH National Cancer Institute | 5-R01-CA203023-01-05 | 1/12/16 | 12/31/20 | Biomarkers of Molecular Age to Predict the Toxicity of Cancer Chemotherapy | $423,670.00 |
| Recruitment | Muss | Hy | Breast Cancer Research Foundation | | 10/1/17 | 9/30/20 | p16INK4a Gene Expression, Chemotherapy Toxicity, and Age in Women with Breast Cancer | $250,000.00 |
| Recruitment | Muss | Hy | NIH National Cancer Institute | 5-T32-CA233419-02 | 1/1/19 | 12/31/23 | UNC Geriatric Oncology Training Grant (UNC-GO) | $167,021.00 |
| Recruitment | Nichols | Hazel | NIH National Cancer Institute | 5-R01-CA204258-01-04 | 7/1/17 | 6/30/22 | Clinical Pregnancy Outcomes in Adolescent and Young Adult Female Cancer Survivors | $638,760.00 |
| Recruitment | Nichols | Hazel | St Baldricks Foundation | 523803 | 7/1/17 | 6/30/20 | Reproductive Health after Adolescent and Young Adult Cancer | $50,000.00 |
| Recruitment | Nichols | Hazel | NIH National Cancer Institute | 1-R01-CA211093-01A1 | 8/5/19 | 7/31/23 | In vitro fertilization outcomes after cancer | $497,540.00 |
| Recruitment | Nicholson | Wanda | Duke University | A032552 | 9/30/19 | 9/29/20 | Comparing Options for Management: Patient-Centered Results in Uterine Fibroids (COMPARE-UF) | $179,260.00 |
| Recruitment | Nielsen | Matthew | UroGen Pharma Ltd. | | 11/7/18 | 12/1/22 | A Phase 2b, Single-Arm, Multicenter Trial to Evaluate the Efficacy and Safety of UGN-102 as Primary Chemoablative Therapy in Patients with Low Grade (LG) Non-Muscle-Invasive Bladder Cancer (NMIBC) at Intermediate Risk of Recurrence | $18,251.12 |
| Recruitment | Nielsen | Matthew | University of Pennsylvania | 576656 | 4/1/19 | 3/31/21 | Ostomy Telehealth Self-management Training for Cancer Survivors | $134,694.00 |
| Recruitment | Nielsen | Matthew | University of Kansas Medical Center Research Institute, Inc. | Z3C00010 0011340322 | 11/3/19 | 7/31/22 | Long-Term Outcomes of Localized Prostate Cancer Survivors | $171,342.00 |
| Recruitment | Nielsen | Matthew | University of Kansas Medical Center Research Institute, Inc. | Q125EP20 | 11/1/19 | 10/31/20 | North Carolina Prospective Prostate Cancer Cohort Study | $92,599.00 |
| Theme Investment | Niethammer | Marc | National Science Foundation | ECCS-1610762 | 9/1/16 | 8/31/21 | Dynamic Network Analysis: Analyzing the Chronnectome | $356,420.00 |
| Theme Investment | Niethammer | Marc | NIH National Institute of Arthritis and Musculoskeletal and Skin Diseases | 5-R01-AR072013-01-03 | 8/15/17 | 7/31/23 | Large-scale automatic analysis of the OAI magnetic resonance image dataset | $397,845.00 |
| Theme Investment | Niethammer | Marc | Kitware, Inc. | K002617-00-S01 | 9/18/18 | 8/31/21 | SBIR: Enhanced Software Tools for Detecting Anatomical Differences in Image Data Sets | $115,000.00 |
| Theme Investment | Niethammer | Marc | Brigham and Womens Hospital | 122937 | 3/15/20 | 2/29/24 | Prognostic Markers of Emphysema Progression | $125,173.00 |
| Recruitment | Noar | Seth | NIH National Cancer Institute | 1-R01-CA246600-01 | 9/17/19 | 8/31/22 | Advancing Perceived Message Effectiveness: A New Measure for Youth Prevention Media Campaigns | $465,932.00 |
| Recruitment | Noar | Seth | NIH National Institute on Drug Abuse | 1-R01-DA049155-01A1 | 6/1/20 | 5/31/25 | Impact of e-cigarette prevention messages on adolescents | $637,702.00 |
| Investment (Bios/HTS) | Nobel | Andrew | National Science Foundation | DMS-1613072 | 8/1/16 | 7/31/20 | Iterative testing procedures and high-dimensional scaling limits of extremal random structures | $125,293.00 |
| Retention | North | Kari | NIH National Heart, Lung, and Blood Institute | 5-T32-HL129982-05 | 5/1/16 | 4/30/21 | The Genetic Epidemiology of Heart, Lung, and Blood Training Grant (GenHLB) | $391,699.00 |
| Retention | North | Kari | NIH National Heart, Lung, and Blood Institute | 5-R01-HL142302-01-03 | 5/1/18 | 2/28/22 | Hispanic Latino Lipid Consortium | $772,763.00 |
| Retention | North | Kari | Rutgers the State University of New Jersey | 0742 / 1203 | 6/15/19 | 3/31/21 | PAGE III: Population Architecture Using Genomics and Epidemiology | $434,335.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Retention | North | Kari | Wake Forest University Health Sciences | 100100-550024 | 4/1/19 | 1/31/24 | Genetic and Epidemiological Predictors of Glucose Homeostasis Measures | $39,652.00 |
| Retention | North | Kari | Research Triangle Institute (RTI International) | 5-312-0217030-65769L | 11/15/19 | 7/31/20 | Nutritional Omics of Pulmonary Function Decline | $44,644.00 |
| Investment (CBCS) | Nyante | Sarah | NIH National Cancer Institute | 1-R01-CA237129-01A1 | 9/1/19 | 8/31/24 | Understanding the biological basis for the association between parenchymal texture features and breast cancer risk | $611,566.00 |
| Theme Investment (CC) | Nylander-Fren | L | NIH National Institute for Occupational Safety and Health | 5R21OH011562-02 | 9/30/18 | 9/29/20 | Population-based Genetic Model for Diisocyanate-Induced Asthma | $199,067.00 |
| Innovation Award | Oldenburg | Amy | National Science Foundation | CBET-1803830 | 7/1/18 | 6/30/21 | Collaborative Research: Tools for Noninvasive Nano-Optical Imaging ofthe Role of Extracellular Matrix in Pre-Malignant Breast Cancer | $120,160.00 |
| Investment (CBCS) | Olshan | Andrew | Vanderbilt University Medical Center | VUMC58928 | 1/1/16 | 6/30/20 | Breast Cancer Genetic Study in African-Ancestry Populations | $74,336.00 |
| Investment (CBCS) | Olshan | Andrew | International Agency for Research on Cancer | GEP/17/04 | 1/10/17 | 12/31/19 | The role of germline and somatic DNA mutations in oral and oropharyngeal cancers | $19,383.00 |
| Investment (CBCS) | Olshan | Andrew | Centers for Disease Control and Prevention | 5-U01DD001231-01-02 | 9/1/18 | 8/31/23 | Component A: BD-STEPS II Core at North Carolina Center for Birth Defects Research and Prevention (NC BDSTEPS II Core) | $875,000.00 |
| Investment (CBCS) | Olshan | Andrew | University of Tennessee Health Science Center | | 7/1/19 | 6/30/20 | Carolina Head and Neck Cancer Study, Phase 2 (CHANCE 2) | $90,000.00 |
| Investment (CBCS) | Olshan | Andrew | North Carolina State University | 2018-2962-02 | 7/1/19 | 1/31/21 | RCA - Liver Cancer Project | $41,114.00 |
| Recruitment | Painschab | Matthew | NIH Fogarty International Center for Advanced Study in the Health Sciences | 5-K01-TW011470-01-02 | 9/16/19 | 6/30/24 | Safety, efficacy, and cost-effectiveness of rituximab for multicentric Castleman disease in Malawi | $143,933.00 |
| Investment (CC) | Pardo Manuel | Fernando | Neogen Corporation | | 3/24/17 | 5/19/23 | Content Selection for a New Mouse Genotyping Array | $225,000.00 |
| Investment (CC) | Pardo Manuel | Fernando | University of Massachusetts Medical School | OSP2018037 WA00899630 | 8/5/17 | 7/31/22 | Systems Genetics of Tuberculosis | $289,801.00 |
| Investment (CC) | Pardo Manuel | Fernando | NIH National Human Genome Research Institute | U24HG0101001-03 | 5/17/18 | 3/31/23 | Genomic Resources for the Collaborative Cross | $346,600.00 |
| Investment (CC) | Pardo Manuel | Fernando | NIH National Institute of Environmental Health Sciences | 5-R01-ES029925-01-02 | 2/1/19 | 1/31/24 | Genetic underpinning of diabetes associated with arsenic exposure | $675,329.00 |
| Recruitment | Park | Leeza | NIH National Cancer Institute | 5-K07-CA218167-01-04 | 8/1/17 | 7/31/22 | A Psychosocial Intervention to Improve Outcomes for Parents with Advanced Cancer | $176,839.00 |
| Recruitment | Patel | Shetal | Lung Cancer Initiative of North Carolina | | 7/1/20 | 6/30/21 | Combination strategies targeting myeloid cells in squamous lung cancer | $25,000.00 |
| Investment (HTSF) | Peat | Christine | North Dakota State University | | 9/1/17 | 8/31/20 | Mechanisms that Predict Weight Trajectory after Bariatri | $106,598.10 |
| Recruitment | Pecot | Chad | American Cancer Society | MRSG-14-222-01-RMC | 1/1/15 | 12/31/19 | Tumor Angiogenesis Regulation by the miR-200 Family | $182,250.00 |
| Recruitment | Pecot | Chad | Free to Breathe | | 2/14/17 | 12/31/20 | Targeting Lung Squamous Metastasis with CCR2 Inhibitors | $200,000.00 |
| 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 | $150,000.00 |
| Recruitment | Pecot | Chad | NIH National Cancer Institute | 5-R01-CA215075-01-03 | 9/21/17 | 8/31/22 | Immune Regulation of Lung Squamous Metastasis | $381,053.00 |
| Recruitment | Pecot | Chad | North Carolina Biotechnology Center | 2019-TRG-6704 | 8/1/19 | 1/31/21 | Development of EFTX-001 to Target KRAS Mutations in Cancer | $100,000.00 |
| Recruitment | Pecot | Chad | Lung Cancer Initiative of North Carolina | | 1/1/20 | 12/31/21 | Inhibiting the Mechanisms of Lung Cancer Metastasis | $150,000.00 |
| Recruitment | Pecot | Chad | NIH National Cancer Institute | 1-F30-CA250189-01 | 4/1/20 | 3/31/25 | The Role of SPON1 Expressing Inflammatory Monocytes in Promoting Lung Cancer Metastasis. | $37,027.00 |
| Recruitment | Pecot | Chad | Enfuego Therapeutics | | 6/1/20 | 5/31/21 | STTR: Development of EFTX-001 to Target KRAS Mutations in Cancer | $82,087.00 |

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|---|---|---|---|---|---|---|---|---|
| Theme Investment (HTS) | Peifer | Mark | NIH National Institute of General Medical Sciences | 5-R35-GM118096-01-05 | 7/1/16 | 6/30/21 | Regulating cell fate and shaping the body plan during morphogenesis and oncogenesis | $583,645.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | NIH National Cancer Institute | 5-R01-CA148761-06-10 | 3/17/10 | 8/31/21 | Therapeutic Targeting of Breast Cancer Tumor Initiating Cells | $418,717.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | Susan G Komen for the Cure | SAC160074 | 7/15/16 | 7/14/22 | Identification of the Genetic Drivers of HER2-Enriched Subtype Breast Cancers | $200,000.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | Breast Cancer Research Foundation | 2003125644 | 8/23/16 | 6/30/21 | TBCRC: AURORA GENOME CHARACTERIZATION CENTER" RELATED TO 4100452 | $93,162.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | Baylor College of Medicine Childrens Foundation-Malawi | 7000000410 | 6/7/17 | 5/31/22 | MICROSCALED PROTEOGENOMICS FOR CANCER CLINICAL TRIALS | $33,466.00 |
| Theme 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 | $60,000.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | Duke University | 3130817 | 6/15/18 | 6/14/21 | Cancer cell intrinsic and extrinsic actions of steroid hormones in breast tumors | $112,509.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | NIH National Cancer Institute | 5-P50-CA058223-25 | 8/5/97 | 8/31/23 | SPORE in Breast Cancer | $2,323,522.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | NIH National Cancer Institute | 1-F32-CA228326-01A1 | 2/1/19 | 1/31/20 | FELLOW: J. SHEPHERD Epithelial Cancer Cell-Derived Determinants of Immune Involvement in Breast Cancer | $65,340.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | NIH National Cancer Institute | 5-UG1-CA233333-02 | 3/13/19 | 2/28/25 | UNITS: The UNC / UT National Clinical Trials Network Group Integrated Translational Science Production and Consultation Center | $730,001.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | NIH National Cancer Institute | 5-U01-CA238475-02 | 6/1/19 | 5/31/24 | Predictive Modeling of the EGFR-MAPK pathway for Triple Negative Breast Cancer Patients | $572,275.00 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | Johns Hopkins University | 2004285639 AURORA PROGCC UI | 7/29/19 | 6/30/21 | AURORA US: Prospective Genomic Characterization Center in Metastatic Breast Cancer RELATED 4101005 | $87,592.20 |
| Theme Investment (HTS, CBCS, MP1U) | Perou | Charles | Breast Cancer Research Foundation | BCRF-19-127 | 10/1/19 | 9/30/20 | Molecular Therapeutic for Luminal Tumor Subtypes | $250,000.00 |
| Recruitment | Phanstiel | Douglas | NIH National Institute of General Medical Sciences | 5-R35-GM128645-01-03 | 7/19/18 | 6/30/23 | MECHANISMS OF DYNAMIC CHROMATIN LOOPING DURING DIFFERENTIATION | $383,484.00 |
| Recruitment | Phanstiel | Douglas | NIH National Institute on Aging | 1-R01-AG066871-01 | 4/15/20 | 3/31/25 | Identifying Alzheimer's Disease Causal Variants and Target Genes Using iPSC-derived Microglia | $758,870.00 |
| Recruitment | Phanstiel | Douglas | BrightFocus Foundation | A2020203F | 9/1/20 | 8/31/22 | Identifying Alzheimer's Disease Risk Genes using 3D Chromatin Structure and Genome Editing in iPSC-derived Microglia | $199,041.00 |
| 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 | $54,769.00 |
| Recruitment | Purvis | Jeremy | NIH National Cancer Institute | 5-F30-CA213876-04 | 6/1/17 | 7/31/21 | FELLOW:CHAO, HUI Defining the quantitative relationship between DNA damage and cell cycle dynamics in CUL9-deficient cells | $46,204.00 |
| Recruitment | Purvis | Jeremy | National Science Foundation | MCB-1845796 | 1/1/19 | 12/31/23 | CAREER: Predicting cell fate from cell history: Theory, experiment, and outreach | $483,632.00 |
| Recruitment | Pylayeva-Gupt | Yuliya | Concern Foundation | | 7/1/18 | 11/1/20 | Role of IL35 in Immunotherapy Resistance in Pancreatic Cancer | $60,000.00 |
| Recruitment | Pylayeva-Gupt | Yuliya | NIH National Cancer Institute | 5-R37-CA230786-01-02 | 4/1/19 | 3/31/24 | Function of IL35+ B cells in pancreatic cancer | $471,387.00 |
| Recruitment | Pylayeva-Gupt | Yuliya | DOD DA Army Medical Research Acquisition Activity | W81XWH1910597/0011349040 | 9/1/19 | 8/31/22 | Role of IL-23 in epithelial-to-mesenchymal conversion in pancreatic cancer. | $183,001.00 |
| Recruitment | Pylayeva-Gupt | Yuliya | V Foundation for Cancer Research | DVP2019-016 | 2/1/19 | 2/1/20 | Mechanisms of pancreatic cancer-driven re-programming of tumor promoting B lymphocytes | $100,000.00 |

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|---|---|---|---|---|---|---|---|---|
| Recruitment | Pylayeva-Gupt | Yuliya | NIH National Cancer Institute | 1-F31-CA239494-01A1 | 1/1/20 | 12/31/21 | FELLOW:DANIEL MICHAUD Mechanisms of B cell specific IL-35 expression in cancer. | $33,356.00 |
| Recruitment | Raab | Jesse | Department of Defense | W81XWH1910423 | 8/15/19 | 8/14/22 | Mechanistic analysis of ARID mutations in hepatocellular carcinoma | $186,298.33 |
| Recruitment | Raab | Jesse | Department of Defense | W81XWH2010636 | 8/1/20 | 7/31/22 | Identification of new therapeutic strategies for targeting liver fibrosis | $155,500.00 |
| Retention | Ramsey | J | University of Delaware | PC2.1-059 | 12/1/18 | 12/31/20 | Development of a microchip CE-HPMS Analyzer for Bioreactor Monitoring | $237,329.00 |
| Retention | Ramsey | J | Medical CBRN Defense Consortium | 1909-005 | 10/23/19 | 10/21/22 | A Highly Multiplexed Point-of-Care Digital Protein Assay Platform with Digital Molecular Capability | $3,005,196.00 |
| Recruitment | Ray | Emily | Conquer Cancer Foundation | | 8/1/19 | 1/31/21 | Developing a prognostic model for 30 day risk of death in patients with advanced breast cancer | $50,000.00 |
| Innovation Award | Redinbo | Matthew | NIH National Cancer Institute | 5-R01-CA207416-01-03 | 8/1/16 | 7/31/21 | Microbiome-Targeted Probes to Eliminate Chemotherapy-Induced GI Toxicity | $596,764.00 |
| Innovation Award | Redinbo | Matthew | Eli Lilly and Company | | 6/25/18 | 6/24/21 | Precision Gut Microbiome-Targeted Inhibitors to Explore the Etiology of Inflammatory Bowel Disease | $198,749.00 |
| Innovation Award | Redinbo | Matthew | NIH National Institute of General Medical Sciences | 5-R01-GM135218-01-02 | 9/20/19 | 6/30/23 | Structural Basis for Hormone and Neurotransmitter Processing by Gut Microbial Enzymes | $729,166.00 |
| Innovation Award | Redinbo | Matthew | NIH National Institute of General Medical Sciences | 1-R01-GM137286-01 | 5/1/20 | 4/30/24 | Understanding and Controlling Drug Metabolism by the Gut Microbiota to Improve Human Health | $318,488.00 |
| Recruitment | Reeder-Hayes | Katie | Susan G Komen for the Cure North Carolina Triangle to the Coast Affiliate | | 5/13/20 | 5/12/22 | FROM ACTION TO IMPACT: IMPROVING BREAST CANCER CARE IN NORTH CAROLINA THROUGH NAVIGATION AND COLLABORATIVE PARTNERSHIPS PROJECT. | $322,013.00 |
| 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 | $146,070.00 |
| Recruitment | Reeves | Brandi | Janssen Research & Development, LLC | 54767414SMM3001 | 9/6/18 | 6/16/26 | A Phase 3 Randomized, Multicenter Study of Subcutaneous Daratumumab Versus Active Monitoring in Subjects with High-risk Smoldering Multiple Myeloma | $113,884.83 |
| Recruitment | Reeves | Brandi | Genentech, Inc. | | 1/15/19 | 1/25/29 | A Phase 1b study of the safety and pharmacokinetics of Atezolizumab (anti-PD-L1 antibody) alone or in combination with an immunomodulatory drug and/or Daratumumab In patients with MM (relapsed/refractory and post-autologous stem cell transplantation) | $27,377.00 |
| Recruitment | Reeves | Brandi | Janssen Research & Development, LLC | | 8/29/19 | 2/28/24 | A Randomized Study of Daratumumab Plus Lenalidomide Versus Lenalidomide Alone as Maintenance Treatment in Patients with Newly Diagnosed Multiple Myeloma Who Are Minimal Residual Disease Positive After Frontline Autologous Stem Cell Transplant. | $26,760.00 |
| Retention | Reuland | Dan | NIH National Cancer Institute | 4-UH3-CA233251-02 | 9/30/18 | 8/31/23 | Scaling Colorectal Cancer Screening Through Outreach, Referral, and Engagement (SCORE): A State-Level Program to Reduce Colorectal Cancer Burden in Vulnerable Populations | $1,134,289.00 |
| Retention | Reuland | Dan | Wake Forest University | 101710-550142 | 1/1/20 | 12/31/24 | A Personalized Digital Outreach Intervention for Lung Cancer Screening | $202,699.00 |
| Retention | Ribisl | Kurt | NIH National Cancer Institute | 5-T32-CA057726-29 | 7/1/17 | 6/30/22 | Cancer Control Education Program | $423,719.00 |

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|---|---|---|---|---|---|---|---|---|
| Retention | Ribisl | Kurt | University of Virginia | GB10546.PO #2126807 | 5/1/18 | 2/28/23 | The Determinants of Tobacco Relapse and Initiation Following a Period of Forced Abstinence in the U.S. Military: A Social Ecological Approach | $17,004.00 |
| Retention | Ribisl | Kurt | NIH National Cancer Institute | 5-P01-CA225597-01-02 | 9/1/18 | 8/31/23 | ASPiRE: Advancing Science & Practice in the Retail Environment | $2,178,104.00 |
| Retention | Ribisl | Kurt | NIH National Institute on Drug Abuse | 5-F31-DA045424-02 | 7/31/18 | 7/30/20 | FELLOW:A SEIDENBERG Consumer Responses to Modified Risk Tobacco Product Claims | $36,869.00 |
| Retention | Ribisl | Kurt | NIH National Cancer Institute | 1-F31-CA239331-01A1 | 12/1/19 | 5/31/21 | Associations of Tobacco Retailer Density with Neighborhood Sociodemographics, Individual Smoking Behaviors, & COPD Hospital Admission Rates: A Spatial Health Approach | $37,546.00 |
| Investment (Protocol) | Riches | Marcie | Ohio State University | 60072005 | 7/26/17 | 6/30/20 | The Ohio State Blood and Marrow Transplant Research Consortium | $18,050.00 |
| Investment (Protocol) | Riches | Marcie | National Marrow Donor Program | | 5/24/19 | 5/31/22 | BMT CTN 1703/ 1801 - A Randomized, Multicenter, Phase III Trial of Tacrolimus/Methotrexate versus Post-Transplant Cyclophosphamide/ Tacrolimus/ Mycophenolate Mofetil in Non-Myeloablative/Reduced Intensity Conditioning Allogeneic Peripheral Blood Stem Cell | $14,671.06 |
| Recruitment | Roberts | Megan | Duke University | 3630018 | 9/1/19 | 8/31/20 | Understanding Opioid Use among Cancer Survivors in North Carolina | $39,082.00 |
| Recruitment | Robinson | Whitney | NIH National Institute on Minority Health and Health Disparities (NIMHD) | 5-R01-MD011680-01-04 | 9/26/17 | 6/30/22 | Racial Differences in Treatment with Hysterectomy: a Multilevel Investigation | $695,269.00 |
| Recruitment | Rose | Tracy | Genentech, Inc. | | 6/9/17 | 6/30/22 | A PHASE III, MULTICENTER, RANDOMIZED, PLACEBO-CONTROLLED, DOUBLE-BLIND STUDY OF ATEZOLIZUMAB (ANTI?PD-L1 ANTIBODY) AS ADJUVANT THERAPY IN PATIENTS WITH RENAL CELL CARCINOMA AT HIGH RISK OF DEVELOPING METASTASIS FOLLOWING NEPHRECTOMY | $107,709.11 |
| Recruitment | Rose | Tracy | Hoosier Cancer Research Network | | 2/28/19 | 3/10/29 | Phase 2 Trial of Tremelimumab in Patients with Metastatic Urothelial Cancer Previously Treated with PD-1/PD-L1 Blockade | $55,857.00 |
| Recruitment | Rose | Tracy | NIH National Cancer Institute | 1-K08-CA248967-01 | 4/1/20 | 3/31/23 | Selective histone deacetylase inhibition with entinostat to enhance the anti-tumor immune response to immune checkpoint inhibition in urothelial cancer | $262,296.00 |
| Recruitment | Rosenstein | Donald | Rising Tide Foundation for Clinical Cancer Research (RTFCCR) | CCR-17-300/513305 | 7/1/17 | 11/30/20 | Thiamine for the Prevention of Delirium in Hematopoietic Stem Cell Transplantation | $32,848.80 |
| Investment (HTSF) | Sancar | Aziz | NIH National Institute of General Medical Sciences | 5-R35-GM118102-01-05 | 4/1/16 | 3/31/21 | Molecular Mechanism of Mammalian DNA Excision Repair, DNA Damage Checkpoints, and the Circadian Clock | $980,142.00 |
| Investment (HTSF) | Sancar | Aziz | NIH National Institute of Environmental Health Sciences | 5-R01-ES027255-01-05 | 8/1/16 | 7/31/21 | Single Nucleotide Resolution Map of Formation and Repair of Bulky Adducts in the Human Genome | $468,393.00 |
| Investment (HTSF) | Sancar | Aziz | NIH National Institute of Environmental Health Sciences | 1-K99-ES030015-01A1 | 9/6/19 | 8/31/21 | Role of Aflatoxin-induced DNA Damage Formation and Repair in Hepatic Mutagenesis | $86,400.00 |
| Investment (HTSF) | Sandler | Robert | NIH National Institute of Diabetes, Dige | 5-R01-DK094738-05-07 | 7/1/18 | 4/30/23 | Risk Factors for Asymptomatic Diverticulosis | $391,472.56 |
| Recruitment | Savoldo | Barbara | Leukemia and Lymphoma Society (LLS) | 6536-18 | 10/1/17 | 6/14/20 | Exploiting the inducible Caspase9 to pharmacologically modulate CD19.CAR-T cell function in vivo | $200,000.00 |
| 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 | $200,000.00 |
| Recruitment | Savoldo | Barbara | Childrens Research Institute | 30004929-01 | 9/30/18 | 8/31/23 | Enhancing Cell Therapy for Brain Tumors | $219,420.00 |
| Recruitment | Savoldo | Barbara | NIH National Cancer Institute | 1-R01-CA247497-01A1 | 7/1/20 | 6/30/25 | Tailoring CAR T cell therapy for Hodgkin Lymphoma | $634,693.00 |

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|---|---|---|---|---|---|---|---|---|
| Retention | Schoenfisch | Mark | Cystic Fibrosis Foundation | SCHOEN18G0 | 11/1/18 | 10/31/20 | Duel Antimicrobial / Mucolytic Therapeutic for CF | $133,704.00 |
| Innovation Award | Sekelsky | Jeff | NIH National Institute of General Medical Sciences | 5-T32-GM007092-45 | 7/1/75 | 6/30/20 | NRSA in Genetics | $267,422.00 |
| Innovation Award | Sekelsky | Jeff | NIH National Institute of General Medical Sciences | 5-R35-GM118127-01-05 | 6/1/16 | 5/31/21 | Mechanisms of meiotic and mitotic recombination | $520,113.00 |
| Innovation Award | Sekelsky | Jeff | NIH National Institute of General Medical Sciences | 1-T32-GM135128-01 | 7/1/20 | 6/30/25 | NRSA in Genetics | $674,878.00 |
| Retention | Serody | Jonathan | GlaxoSmithKline Biologicals S.A. | 456005 | 12/1/15 | 12/31/22 | GSK Task Order 8 | $64,996.00 |
| Retention | Serody | Jonathan | Merck Sharp and Dohme Corp. | 54830 | 12/15/16 | 12/15/20 | Immune Biomarker Analysis of Pembrolizumab in Triple Negative Breast Cancer | $462,947.00 |
| Retention | Serody | Jonathan | Merck Sharp and Dohme Corp. | 54829 | 12/15/16 | 12/15/20 | 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 | $218,094.00 |
| Retention | Serody | Jonathan | NIH National Cancer Institute | 5-T32-CA211056-04 | 8/1/17 | 7/31/22 | Duke UNC-Chapel Hill Immunotherapy Training Grant | $311,363.00 |
| Retention | Serody | Jonathan | NIH National Heart, Lung, and Blood Institute | 5-R01-HL139730-01-04 | 7/15/17 | 5/31/21 | Mechanistic Evaluations of ILC2 Cells for the Treatment/Prevention of GVHD | $543,763.00 |
| Retention | Serody | Jonathan | University of Minnesota | N006335101 | 10/1/17 | 6/14/20 | Innate Lymphoid Cell Type 2 Infusion for Graft-versus-Host Disease (GVHD) Prevention and Treatment | $300,000.00 |
| Retention | Serody | Jonathan | NIH National Cancer Institute | 5-F30-CA225136-03 | 2/13/18 | 2/12/23 | FELLOW:CHRISTOF SMITH Design and Delivery of Neoantigen-based Tumor Vaccines | $42,157.00 |
| Retention | Serody | Jonathan | Merck Sharp and Dohme Corp. | 58116 | 1/30/19 | 1/30/21 | OTSP: Evaluating the Function of B cells in the Activity of Anti-PD-1 mAb Therapy in Patients with Metastatic Breast Cancer. | $320,846.61 |
| Retention | Serody | Jonathan | American Association for Cancer Research | 20-40-12-VOOR | 7/1/20 | 6/30/22 | Pilot Study of Anti-PD-1 Therapy Following CD30 Directed CAR-T Cell Therapy | $120,000.00 |
| Retention | Shaheen | Nicholas | CSA Medical, Inc. | | 12/14/12 | 12/13/20 | Prevalence of Dysplasia of the Gastric Cardia | $20,000.12 |
| Retention | Shaheen | Nicholas | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 5-T35-DK007386-40 | 5/1/80 | 2/28/21 | Short Term Research Training | $144,143.00 |
| Retention | Shaheen | Nicholas | CDx Diagnostics | | 8/8/16 | 8/7/26 | CDX 707 WATS Registry Services Agreement | $60,800.00 |
| 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 | $82,595.84 |
| Retention | Shaheen | Nicholas | CDx Diagnostics, Inc. | | 10/14/16 | 10/13/30 | The WATS3D (Wide Area Transepithelial Sample Biopsy with 3-Dimensional Computer-Assisted Analysis) U.S. Registry | $21,920.00 |
| Retention | Shaheen | Nicholas | Duke University | A03-0637 | 12/13/16 | 11/30/20 | Imaging and Biomarkers for Early Cancer Detection (R01) | $324,661.00 |
| Retention | Shaheen | Nicholas | Case Western Reserve University | RES515271 | 5/17/17 | 4/30/21 | Genetic Determinants of Barrett's Esophagus and Esophageal Adenocarcinoma | $42,560.00 |
| Retention | Shaheen | Nicholas | United States Endoscopy Group, 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 | $35,853.20 |
| Retention | Shaheen | Nicholas | University of Colorado Board of Regents | FY20.1035.001 1001346678 | 4/17/20 | 3/31/21 | A Multicenter Randomized Controlled Trial of Surveillance versus Endoscopic Therapy for Barrett's Esophagus with Low-grade Dysplasia - The SURVENT Trial | $62,383.49 |
| Theme Investment (CC) | Sheahan | T | Rockefeller U Subcontract | R01AI131688-04 | 3/15/17 | 2/28/22 | Analysis of Immunity, Viral Adaptation and Pathogenesis in a New Mouse Model of HCV-related Rodent Hepacivirus Infection | $54,202.50 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Recruitment | Shen | Colette | Nanobiotix S.A. | | 3/14/19 | 3/20/29 | A Phase I/II Study Of NBTXR3 Activated By Radiation Therapy (SABR) For Patients With Advanced HNSCC or NSCLC Treated with an Anti-PD1 Antibody | $65,153.52 |
| Recruitment | Smith | Angie | University of Washington | UWSC11055/ 38451 | 2/1/19 | 1/31/21 | Comparison of Intravesical Therapy and Surgery as Treatment Options (CISTO) for Recurrent Bladder Cancer | $131,305.00 |
| Recruitment | Smith | Angie | Bladder Cancer Advocacy Network | | 7/1/19 | 6/30/20 | Quality of Life in Bladder Cancer: a Cross-Sectional Study of the BCAN Patient Survey Network | $47,647.00 |
| Recruitment | Smith | Angie | Bladder Cancer Advocacy Network | | 6/1/20 | 5/31/21 | Patient and Provider Perception of Repeat TURBT for Bladder Cancer | $124,331.00 |
| Recruitment | Smitherman | Andrew | Hyundai Hope on Wheels | 19-3385 | 12/31/19 | 12/31/21 | Expression of aging biomarkers and frailty among adolescent and young adult (AYA) cancer survivors | $200,000.00 |
| Innovation Award | Sondek | John | NIH National Institute of General Medical Sciences | 5-R01-GM120291-01-04 | 9/15/16 | 7/31/20 | Inhibition of GTPases and G proteins to treat human disease | $358,307.00 |
| Innovation Award | Sondek | John | Leukemia and Lymphoma Society | 8018-20 | 7/1/19 | 6/30/21 | PLC-? isozymes: unexploited drug targets for the treatment of leukemia and lymphomas | $323,253.00 |
| Recruitment | Song | Lixin (Lee) | NIH National Institute of Nursing Research | 5-R01-NR016990-01-04 | 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 | $511,371.00 |
| Retention | Song | Lixin (Lee) | Mayo Clinic | NCC-259713/PO#67040568 | 10/18/19 | 7/31/25 | Feasibility Testing of Patient Reported Outcomes-informed Caregiving Education and Symptom management System (PROCESS): | $90,108.00 |
| Recruitment | Spanheimer | Philip | Society of University Surgeons | | 7/1/20 | 6/30/21 | TFAP2C Regulates Estrogen Responsive Transcriptomic States in Luminal Breast Cancer | $30,000.00 |
| Investment (CYPHR) | Stitzenberg | Karyn | Agency for Healthcare Research and Quality | 5-F32-HS026363-02 | 7/1/18 | 6/30/20 | FELLOW: S. LUMPKIN Exploring the utilization of post-discharge care in colorectal surgery patients | $75,705.00 |
| Investment (CYPHR) | Stitzenberg | Karyn | University of Texas Health Science Center at San Antonio | 166469/165608 | 12/1/19 | 6/30/20 | Harnessing the Power of CTSA-CDRN Data Networks: Using Social Determinants of Health, Frailtyand Functional Status to Identify At-Risk Patients and Improve Risk Adjustment | $72,704.00 |
| Innovation Award | Strahl | Brian | NIH National Institute of General Medical Sciences | 5-R35-GM126900-01-03 | 5/1/18 | 4/30/23 | Mechanisms of chromatin and transcriptional regulation | $561,780.00 |
| Innovation Award | Stürmer | Til | NIH National Institute on Aging | 5-R01-AG056479-01-04 | 9/15/17 | 4/30/21 | Propensity Scores and Preventive Drug Use in the Elderly | $480,295.00 |
| Innovation Award | Stürmer | Til | International Society for Pharmaceutical Engineering (ISPE) | 19-2749 | 1/1/19 | 12/31/19 | Propensity Scores in Real World Evidence | $13,000.00 |
| Innovation Award | Su | Lishan | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI127346-01-05 | 6/15/16 | 5/31/21 | HIV-1 Vpr disrupts the IFN-TET-ISG pathway to promote HIV-1 infection and persistence | $532,000.00 |
| Innovation Award | Su | Lishan | Icahn School of Medicine at Mount Sinai | 0255-A651-4609 | 6/7/18 | 5/31/21 | Harnessing Abs specific for immunogenic and conserved Env epitopes to protect against HIV | $177,262.00 |
| Innovation Award | Su | Lishan | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 5-R01-DK119937-01-02 | 9/20/18 | 8/31/23 | Immune Mechanisms of Elevated Liver Diseases During HIV Infection | $388,750.00 |
| Innovation Award | Su | Lishan | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI138797-01-02 | 9/24/18 | 8/31/23 | Modeling Immune Impairments and Pathogenesis in Novel Humanized Mice for HBV-HIV Co-Infection | $783,487.00 |
| Investment (HTS) | Sullivan | Patrick | NIH National Institute of Mental Health | 5-U01-MH109528-05 | 4/1/16 | 3/31/21 | 1/7 Psychiatric Genomics Consortium: Finding actionable variation | $530,018.00 |
| Investment (HTS) | Swanstrom | Ronald | University of California at San Francisco | 9091SC | 9/30/15 | 7/31/21 | Compartmentalized CSF Viral Escape and the CNS HIV Reservoir | $348,939.00 |
| Investment (HTS) | Swanstrom | Ronald | NIH National Institute of Allergy and Infectious Diseases | 5-P30-AI050410-19-23 | 8/20/01 | 7/31/21 | The University of North Carolina Center for AIDS Research | $2,729,963.00 |
| Investment (HTS) | Swanstrom | Ronald | University of Michigan | 3004653332\PO3005674545 | 9/15/17 | 8/31/20 | The Center for HIV RNA Studies (CRNA) | $219,255.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Investment (HTS) | Swanstrom | Ronald | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI140970-01-03 | 6/25/18 | 5/31/23 | HIV Evolution Defines Virus-Host/Drug Interactions In Viremic and Aviremic People | $658,797.00 |
| Investment (HTS) | Swanstrom | Ronald | NIH National Institute of Allergy and Infectious Diseases | 1-R01-AI147849-01A1 | 2/13/20 | 1/31/25 | Formation of the HIV-1 Latent Reservoir | $659,300.00 |
| Investment (HTS) | Swanstrom | Ronald | NIH National Institute on Drug Abuse | 1-R01-DA051890-01 | 7/1/20 | 3/31/25 | Intersection of HIV, Opiods, and Amyloid Fibrils in a CNS Organoid Model | $325,549.00 |
| Recruitment | Tan | Ray | American Cancer Society | MRSG-18-193-01 | 1/1/19 | 12/31/23 | Designing visual tools to enhance cancer surgeon decision-making | $184,250.00 |
| Recruitment | Tan | Ray | Altor BioScience | | 12/18/18 | 12/31/22 | QUILT-3.032: A Multicenter Clinical Trial of Intravesical Bacillus Calmette-Guerin (BCG) in Combination with ALT-803 in Patients with BCG Unresponsive High Grade Non-Muscle Invasive Bladder Cancer | $59,503.88 |
| Investment (CC) | Tarantino | Lisa | Jackson Laboratory | 210247-0421-07 | 8/15/16 | 4/30/21 | Center for Systems Neurogenetics of Addiction | $177,228.00 |
| Investment (CC) | Tarantino | Lisa | Jackson Laboratory | 210247-0419 | 5/1/18 | 4/30/21 | Assessment of acute locomotor response to cocaine in 18 substrains | $50,000.00 |
| Investment (CC) | Tarantino | Lisa | NIH National Institute on Drug Abuse | 1-R21-DA052171-01 | 7/1/20 | 6/30/22 | Rapid identification of cocaine sensitivity genes using a novel reduced complexity cross | $227,394.00 |
| Investment (CHAI Core) | Tate | Deborah | Virginia Commonwealth University | PD303771-SC107091 | 2/1/15 | 8/31/20 | Low Intensity Weight Loss for Young Adults: Autonomous vs. Extrinsic Motivation | $59,654.00 |
| Investment (CHAI Core) | Tate | Deborah | The Obesity Society | | 12/14/17 | 5/31/20 | Mobile Methods for Reducing Obesity Risk in Parents and Preschool Children | $50,000.00 |
| Investment (CHAI Core) | Tate | Deborah | University of Michigan Board of Regents | 3004941494 | 12/1/17 | 1/31/20 | Adaptation of a digital weight loss intervention promoting self-regulation for use in type 2 diabetes | $49,869.00 |
| Investment (CHAI Core) | Tate | Deborah | Weight Watchers International, Inc | | 5/16/18 | 9/30/20 | Randomized Controlled Trial of and International Commercial Program on Weight Loss and Health Outcomes | $259,537.00 |
| Investment (CHAI Core) | Tate | Deborah | Westat, Inc. | 6632.01-S02 | 11/15/18 | 12/31/20 | Behavior Change Techniques Taxonomy | $71,339.00 |
| Investment (Training) | Tate | Deborah | NIH National Cancer Institute | 2-T32-CA128582-11 | 9/1/09 | 8/31/24 | Cancer Health Disparities Training Program | $210,973.00 |
| Investment (CHAI Core) | Tate | Deborah | University of Connecticut | 378777 5656810 | 9/23/19 | 6/30/24 | Using Behavioral Economics Strategies to Address Obesity in Economically Disadvantaged Adults | $96,328.00 |
| Investment (CHAI Core) | Tate | Deborah | NIH National Institute of Diabetes, Digestive, and Kidney Diseases | 1-R01-DK125779-01 | 7/10/20 | 6/30/25 | Optimization of a mHealth Behavioral Weight Loss Intervention | $674,414.00 |
| 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) | $423,679.00 |
| Retention | Thomas | Nancy | NIH National Cancer Institute | 1-R01-CA233524-01A1 | 4/1/20 | 3/31/25 | Identification of Lethal Melanomas at the Time of Diagnosis | $972,565.00 |
| Retention | Ting | Jenny | Duke University Medical Center | A031947 | 8/1/10 | 7/31/20 | Inflammation and Radiation-Induced Lung Injury | $454,310.00 |
| Retention | Ting | Jenny | National Multiple Sclerosis Society | CA1068-A-10 | 4/1/14 | 3/31/20 | Preclinical Therapeutic Development for Multiple Sclerosis | $137,500.00 |
| Retention | Ting | Jenny | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI029564-26-28 | 7/1/91 | 5/31/23 | Molecular and Functional Analysis of NLR Family Members | $502,378.00 |
| Retention | Ting | Jenny | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI141333-01-02 | 12/14/18 | 11/30/23 | Micro-Particle Delivery of a Potent Intracellular Adjuvant for a Universal Flu Vaccine | $1,135,695.00 |
| Retention | Ting | Jenny | NIH National Cancer Institute | 5-R35-CA232109-02 | 9/17/19 | 8/31/26 | Intracellular Innate Immune Receptors in Cancer Suppression and Immunotherapy | $925,890.00 |
| Retention | Troester | Melissa | NIH National Institute of Environmental Health Sciences | 5-P30-ES-010126-19 | 2/1/00 | 3/31/21 | UNC Center for Environmental Health and Susceptibility | $1,547,310.00 |
| Retention | Troester | Melissa | Leidos Corporation | X20102M | 8/17/17 | 9/25/20 | Blanket Purchase Agreement for Testing Services and Nucleic Acid Extraction | $100,000.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Retention | Troester | Melissa | American Cancer Society | 48195 | 8/23/17 | 12/31/20 | Gene Expression Profiling of Breast Tumors from Cancer Prevention Study 3 | $297,756.00 |
| Retention | Troester | Melissa | NIH National Cancer Institute | 5-F30-CA236199-02 | 12/13/18 | 10/12/21 | FELLOW:HALEI BENEFIELD The role of estrogen receptor in breast cancer outcomes and the effect of exposure history | $49,348.00 |
| Retention | Troester | Melissa | ECOG-ACRIN Medical Research Foundation | 2UG1CA189828-06-UNC1 | 8/1/18 | 7/31/20 | ECOG-ACRIN NCORP Research Base | $196,044.00 |
| Retention | Troester | Melissa | Memorial Sloan-Kettering Cancer Center | 19-1541 / BD525563 | 8/1/19 | 7/31/24 | Body Composition and the Obesity Paradox in Clear Cell Renal Cell Carcinoma | $133,368.00 |
| Recruitment | Trogdon | Justin | Agency for Healthcare Research and Quality | 5-R01-HS025723-01-03 | 8/1/18 | 5/31/22 | Affordability and Efficiency of the COMprehensive Post-Acute Stroke Services (COMPASS) | $397,472.00 |
| Recruitment | Trogdon | Justin | NIH National Cancer Institute | 1-F30-CA254064-01 | 7/9/20 | 7/8/24 | FELLOW:NUL L OH Cancer detection and care for dual-eligible beneficiaries in Medicare Shared Savings Program | $37,546.00 |
| Recruitment | Tsagaratou | Ageliki | NIH National Institute of General Medical Sciences | 1-R35-GM138289-01 | 7/1/20 | 6/30/25 | Epigenetic Regulation of Lineage Specification | $378,288.00 |
| 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 Treatm | $21,818.86 |
| Recruitment | Tuchman | Sascha | Karyopharm Therapeutics Inc | | 7/25/18 | 8/17/28 | A Phase 1b/2 Study of Selinexor (KPT-330) in Combination with Backbone Treatments for Relapsed/Refractory Multiple Myeloma | $207,770.13 |
| Recruitment | Tuchman | Sascha | Sanofi US Services, Inc. (formerly Sanofi-Aventis) | | 8/24/18 | 9/9/28 | SAR650984 TCD14079 isatuximab A Phase 1b Study of SAR650984 (isatuximab) in Combination with Pomalidomide and Dexamethasone for the Treatment of Relapsed/Refractory Multiple Myeloma | $66,022.00 |
| Recruitment | Tuchman | Sascha | Incyte Corporation | INCB 01158-206 | 4/17/19 | 12/31/21 | A Randomized Open-Label Phase 1/2 Study of INCB001158 Combined With Subcutaneous (SC) Daratumumab, Compared to Daratumumab SC, in Participants With Relapsed or Refractory Multiple Myeloma | $45,601.00 |
| Recruitment | Valdar | William | Wake Forest University School of Medicine | 101810-113519 | 8/1/17 | 6/30/20 | Systems genetics of adiposity traits in outbred rats | $99,820.00 |
| Recruitment | Valdar | William | NIH National Institute of General Medical Sciences | 5-R35-GM127000-01-03 | 4/1/18 | 3/31/23 | Statistical Modeling of Multiparental and Genetic Reference Populations | $336,445.00 |
| Recruitment | Valle | Carmina | NIH National Cancer Institute | 5-R01-CA204965-01-04 | 2/7/17 | 1/31/21 | Promoting Physical Activity in Young Adult Cancer Survivors Using mHealth and Adaptive Tailored Feedback Strategies | $453,158.00 |
| Recruitment | Van Duin | David | University of Pittsburgh | CNVA00060724(131270-2) | 6/1/18 | 5/31/20 | Study Network of Acinetobacter as a Carbapenem-Resistant Pathogen (SNAP) | $19,049.00 |
| Recruitment | Van Duin | David | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI143910-01-02 | 2/13/19 | 1/31/24 | Bacterial Characteristics of Community-associated Carbapenem-Resistant Enterobacteriaceae | $386,436.00 |
| Recruitment | Van Duin | David | Hackensack Meridian Health | G10063-19030 0000221275 | 3/1/19 | 11/30/20 | The molecular basis of the carbapenem resistance epidemic | $37,758.00 |
| Recruitment | Van Duin | David | Duke University | A032999 | 12/2/19 | 11/30/20 | Antibacterial Resistance Leadership Group | $135,254.00 |
| Recruitment | Vaziri | Cyrus | NIH National Cancer Institute | 5-R01-CA215347-01-03 | 2/1/18 | 1/31/23 | Defining Mechanisms of Pathological Trans-Lesion Synthesis during Carcinogenesis | $518,457.00 |
| Recruitment | Vaziri | Cyrus | NIH National Institute of Environmental Health Sciences | 5-R01-ES029079-01-02 | 2/1/19 | 11/30/23 | Pathological Reprogramming of DNA Damage Signaling in Neoplastic Cells | $467,927.00 |
| Recruitment | Vaziri | Cyrus | NIH National Cancer Institute | 5-R01-CA229530-01-02 | 4/2/19 | 3/31/24 | Establishing MAGE-A4/RAD18 as a novel cancer-specific chemotherapeutic target | $403,864.00 |

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|---|---|---|---|---|---|---|---|---|
| Recruitment | Vincent | Benjamin | Pharmacyclics, Inc. | | 6/1/16 | 5/31/20 | Prediction of Response and Rapid Development of Ibrutinib-based Combination in Genetically Engineered Mouse Models of Bladder, Breast and Melanoma | $169,858.00 |
| Recruitment | Vincent | Benjamin | Susan G Komen for the Cure | CCR17483467 | 8/15/17 | 8/14/20 | Improving Immunotherapy in Triple-Negative Breast Cancer | $149,999.60 |
| Recruitment | Vincent | Benjamin | Vanderbilt University Medical Center | VUMC65676 | 4/1/18 | 3/31/21 | Metabolic Barriers to T Cell Activation in Clear Cell Renal Cell Carcinoma | $30,938.00 |
| Recruitment | Vincent | Benjamin | V Foundation for Cancer Research | T2018-009 | 11/1/18 | 11/1/21 | Immunotherapy to treat Triple Negative Breast Cancer Brain Metastases | $200,000.00 |
| Recruitment | Vincent | Benjamin | Conquer Cancer Foundation | 15041 | 7/1/19 | 12/31/20 | Antigenic and Immunogenic Evaluation of Afro-Caribbean Adult T-Cell Leukemia/Lymphoma for the Optimization of Interferon-Based Therapy | $50,000.00 |
| Recruitment | Vincent | Benjamin | Lung Cancer Initiative of North Carolina | | 7/1/19 | 6/30/20 | Determinants of Immunotherapy Response in Lung Cancer | $25,000.00 |
| Recruitment | Vincent | Benjamin | Society for Immunotherapy of Cancer | | 12/13/19 | 12/12/20 | Immunogenomics meta-analysis of IO response data. | $50,000.00 |
| Recruitment | Vincent | Benjamin | NIH National Cancer Institute | 1-R37-CA247676-01A1 | 7/1/20 | 6/30/25 | Gvl mHA Specific T Cell Responses Prevent AML Relapse Following Allogeneic Stem Cell Transplantation. | $525,246.00 |
| Recruitment | Wan | Yisong | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI123193-01-04 | 12/12/16 | 11/30/21 | Functional protein networks underlying T cell growth, proliferation and differentiation | $377,975.00 |
| Recruitment | Wan | Yisong | National Multiple Sclerosis Society | RG-1802-30483 | 10/1/18 | 9/30/21 | Targeting T Cell Function to Halt MS/EAE Development | $207,117.17 |
| Recruitment | Wang | Andrew | Capio Biosciences, Inc. | SBIRSub1 | 8/1/18 | 1/31/20 | SBIR-CapioCyte Circulating Tumor Cell Assay as a Biomarker for Cancer Immunotherapy Response | $25,000.00 |
| Recruitment | Wang | Andrew | University of Illinois Board of Trustees | 092585-17169 | 8/15/18 | 4/30/22 | Targeting through Selective Cell Labeling | $187,458.00 |
| Recruitment | Wang | Andrew | NIH National Institute of General Medical Sciences | 5-R01-GM130590-01-02 | 2/1/19 | 11/30/22 | Basement Membrane Targeted Nanoparticles for Post-Surgical Adhesion Prevention | $373,205.00 |
| Recruitment | Wang | Andrew | Archimmune Therapeutics | | 3/1/20 | 2/28/22 | Identification of Novel Nanoparticle-Based Therapeutics for Immunotherapy of Cancer | $127,804.00 |
| Retention | Wang | Greg | American Cancer Society | RSG-16-039-01-DMC | 7/1/16 | 6/30/20 | Decipher PRC2 Dysregulation Mechanisms in Multiple Myeloma | $198,000.00 |
| Retention | Wang | Greg | NIH National Cancer Institute | 5-R01-CA211336-01-04 | 2/1/17 | 1/31/22 | Cancer Epigenetics: A Novel PRC2 Dysregulation Mechanism in Multiple Myeloma | $390,643.00 |
| Retention | Wang | Greg | NIH National Cancer Institute | 5-R01-CA215284-01-04 | 4/1/17 | 3/31/22 | Determining the Role of DNA Methylation Deregulation in Oncogenesis | $348,584.00 |
| Retention | Wang | Greg | Icahn School of Medicine at Mount Sinai | 0255-3281-4609 | 6/8/17 | 5/31/21 | Targeting Lysine Methyltransferases EZH2 and EZH1 for Treating MLL-rearranged Leukemias | $249,644.00 |
| Retention | Wang | Greg | Leukemia and Lymphoma Society | 1363-19 | 7/1/18 | 6/30/23 | Decipher and Target AML Cell Dependency on Epigenetic Mutations | $110,000.00 |
| Innovation Award | Waters | Marcey | NIH National Institute of General Medical Sciences | 5-R01-GM118499-01-03 | 9/1/17 | 8/31/21 | Origins of Ligand Binding and Selectivity in Methyllysine Reader and Writer Proteins | $286,878.00 |
| Innovation Award | Weiner | Ashley | H Lee Moffitt Cancer and Research Institute | | 5/17/19 | 7/10/29 | Radiation and Chemotherapy with Ipilimumab followed by Nivolumab for Patients with Stage III Unresectable NSCLC | $11,452.00 |
| Retention | Weiss | Jared | Pfizer International, LLC (Corporate Office New York) | | 8/27/13 | 8/26/21 | 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 | $51,021.03 |
| Retention | Weiss | Jared | Pharmaceutical Research Associates, Inc. | | 3/17/14 | 3/16/20 | A Phase 1 Study to Evaluate the Safety, Tolerability, and Pharmacokinetics of MEDI4736 in Subjects with Advanced Solid Tumors | $58,002.79 |

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|---|---|---|---|---|---|---|---|---|
| Retention | Weiss | Jared | AstraZeneca Pharmaceuticals LP | | 1/14/16 | 1/13/21 | 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 | $11,880.02 |
| Retention | Weiss | Jared | Merck Sharp and Dohme Corp. | | 12/7/15 | 12/2/20 | Pembrolizumab and Radiation for Locally Advanced Squamous Cell Carcinoma of the Head and Neck (SCCHN) not Eligible for Cisplatin Therapy | $191,847.61 |
| Retention | Weiss | Jared | Loxo Oncology, Inc. | | 5/29/18 | 6/14/28 | A Phase 1 Study of Oral LOXO-292 in Patients with Advanced Solid Tumors, Including RET-Fusion Non-Small Cell Lung Cancer, Medullary Thyroid Cancer and Other Tumors with Increased RET Activity | $419,103.75 |
| Retention | Weiss | Jared | V Foundation for Cancer Research | D2018-034 | 9/15/18 | 9/15/21 | Targeting GD2 Ganglioside in Small Cell Lung Cancer | $100,000.00 |
| Retention | Weiss | Jared | Amgen, Inc. | | 12/20/18 | 12/31/28 | Phase Ib/II Study Of IV Nivolumab And Intrapleural Talmogene Laherparepvec For Patients With Malignant Pleural Effusion | $139,591.49 |
| Retention | Weiss | Jared | Boston Biomedical, Inc. | | 2/6/19 | 2/10/29 | A First-in-Human Phase I Trial to Determine the Safety and the Pharmacokinetic Profile of DSP-0509, a Synthetic Toll-Like Receptor 7 (TLR-7) Agonist, in Adult Patients with Advanced Solid Tumors | $290,042.47 |
| Retention | Weiss | Jared | Criterium Inc. | | 9/9/19 | 8/31/20 | Treatment Patterns, Mechanisms of Resistance and Outcomes among patients with EGFR, ALK and ROS1 Translocated Non-Small Cell Lung Cancer: An ATOMIC Consortium Analysis | $19,800.00 |
| Retention | Weiss | Jared | Mirati Therapeutics, Inc | | 7/12/19 | 8/31/29 | A Phase 1/2 Multiple Expansion Cohort Trial of MRTX849 in Patients with Advanced Solid Tumors with KRAS G12C Mutation | $47,856.00 |
| Recruitment | Wheeler | Stephanie | Duke University | A031031 | 1/1/19 | 12/31/23 | Disparities in the Use of Oral Anticancer Agents in Kidney Cancer | $117,916.00 |
| Recruitment | Wheeler | Stephanie | American Cancer Society | 60241 | 2/9/19 | 8/31/20 | Developing and validating a risk stratification framework for breast cancer survivors | $110,000.00 |
| Recruitment | Wheeler | Stephanie | NIH National Cancer Institute | 1-R01-CA237357-01 | 9/1/19 | 8/31/24 | Optimizing Endocrine Therapy Adherence through Motivational Interviewing and Text Interventions | $636,094.00 |
| Recruitment | Wheeler | Stephanie | NIH National Cancer Institute | 1-R01-CA240092-01 | 8/15/19 | 7/31/23 | Addressing Cancer-Related Financial Toxicity In Rural Oncology Care Settings | $491,967.00 |
| Investment (HTSF) | Whitmire | Jason | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI138337-01-03 | 9/1/18 | 8/31/23 | Obesity associated viral pathogenesis | $388,750.00 |
| Investment (HTSF) | Whitmire | Jason | NIH National Institute of Allergy and Infectious Diseases | 5-R01-AI143894-01-02 | 2/1/19 | 1/31/24 | Regulation of CD8+ T cell responses to chronic virus infection | $500,892.00 |
| Recruitment | Williams | David | Virginia Commonwealth University | FP00007299_SA001 | 8/1/18 | 6/30/23 | The role of the MBD2-NuRD complex in globin gene silencing | $328,069.00 |
| Recruitment | Willson | Tim | Duke University | 3130816 | 6/15/18 | 6/14/21 | Cancer cell intrinsic and extrinsic actions of steroid hormones in breast tumors | $137,787.00 |
| Recruitment | Willson | Tim | Structural Genomics Consortium | | 9/30/18 | 9/30/20 | Structural Genomics Consortium Grant Funding | $250,000.00 |
| Recruitment | Willson | Tim | North Carolina Biotechnology Center | 2020-BMG-3003 | 2/1/20 | 3/31/20 | PharmSci 2020: Open Science and Drug Discovery: basic research to new medicines. | $8,784.00 |
| Recruitment | Willson | Tim | Agora Open Science Foundation | AOST-M4ND-002A | 7/1/20 | 12/30/20 | Chemical Probes of the WDR41-C9ORF72-SMARC8 complex to enable discovery of therapies for Frontotemporal Dementia | $51,137.00 |
| Recruitment | Willson | Tim | University of Cape Town | UCT00028866 | 4/3/20 | 3/31/25 | Repurposing kinase inhibitor chemotypes as antimalarials | $76,918.00 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Recruitment | Willson | Tim | Millennium Pharmaceuticals, Inc. | 20-4838 8000260829 | 5/1/20 | 4/30/22 | Identification of kinase inhibitors as therapies for SARS-CoV-2 and future pandemic viruses | $500,000.00 |
| Investment (CC) | Wiltshire | Tim | North Carolina State University | 2015-3275-02 | 6/1/16 | 4/30/21 | Systems Toxicogenomics of Endocrine Disrupting Chemicals in Brain | $99,490.00 |
| Theme Investment | Wiltshire | Tim | North Carolina State University | 2011-2427-05 | 4/1/17 | 3/31/21 | Genetic Etiology of Cancer Drug Response | $307,804.00 |
| Recruitment | Wood | William | Pfizer International, LLC (Corporate Office New York) | CP206145 / WI244321 | 12/18/18 | 12/31/20 | LCCC 1851: Digital Assessment of Functional Endpoints in Adults with Cancer: an Observational Study | $119,276.00 |
| Recruitment | Wood | William | Vanderbilt University Medical Center | VUMC 71409 | 1/15/19 | 8/31/21 | Identifying Cost and Coverage to Medicare Beneficiary Access to Specialty Drugs | $10,000.00 |
| Recruitment | Wood | William | Conquer Cancer Foundation | | 7/1/20 | 6/30/21 | Patient Preferences for Treatment Outcomes in Older Patients with Acute Myeloid Lukemia | $50,000.00 |
| Recruitment | Yarbrough | Wendell | NIH National Institute of Dental and Craniofacial Research | 5-R01-DE027942-01-02 | 6/1/19 | 7/31/24 | Exploring mechanisms of therapeutic demethylation effects in HPV-associated head and neck cancer | $404,678.00 |
| Retention | Yeh | Jen Jen | NIH National Cancer Institute | 5-R01-CA193650-01-05 | 5/1/15 | 7/31/21 | The adaptive kinome in pancreatic cancer | $575,301.00 |
| Retention | Yeh | Jen Jen | NIH National Cancer Institute | 5-R01-CA199064-01-04 | 8/1/16 | 7/31/21 | Tumor subtypes and therapy response in pancreatic cancer | $799,917.00 |
| Retention | Yeh | Jen Jen | Princeton University | SUB0000166 | 9/15/16 | 8/31/20 | Pathway and Network Integration of Cancer Genomics and Clinical Data | $88,000.00 |
| Retention | Yeh | Jen Jen | NIH National Cancer Institute | 5-F30-CA213916-03 | 7/1/17 | 6/30/20 | FELLOW:M LIPNER FOLFOX-induced kinome reprogramming in pancreatic cancer tumor xenografts | $31,050.00 |
| Retention | Yeh | Jen Jen | NIH National Cancer Institute | 5-T32-CA244125-02 | 9/20/19 | 8/31/24 | UNC Integrated Translational Oncology Program (UNC-iTOP) | $579,408.00 |
| Retention | Yeh | Jen Jen | University of Rochester | 417653-G/GR URFAO GR510987 | 9/1/19 | 8/31/20 | Targeting Macrophages to Improve Chemotherapy in Metastatic Pancreas Cancer | $400,912.00 |
| 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 | $42,310.00 |
| Recruitment | Zamboni | William | Meryx, Inc. | | 2/1/18 | 2/1/21 | QUANTITATION OF MRX-2843 AND METABOLITE M40 IN PLASMA IN A PHASE I DOSE-ESCALATION STUDY OF THE SAFETY, PHARMACOKINETICS, AND PHARMACODYNAMICS OF MRX-2843 IN ADULT SUBJECTS WITH RELAPSED/REFRACTORY ADVANCED AND/OR METASTATIC SOLID TUMORS | $120,530.00 |
| Recruitment | Zamboni | William | Apollomics, Inc. | | 9/20/18 | 2/29/20 | SBIR: Phase I Proposal: Combination of checkpoint inhibitors UNC: EVALUATION OF THE INTERACTION BETWEEN CBT-501 & CBT-502 AND THE MONONUCLEAR PHAGOCYTE SYSTEM (MPS) IN AN EX VIVO SCREENING PLATFORM OF WHOLE BLOOD | $49,500.00 |
| Recruitment | Zamboni | William | ChemoGLO, LLC | | 2/1/19 | 1/31/22 | TASK 4_COMPARISON OF DOXORUBICIN MEASUREMENTS ON SURFACES BY HDCHECK COMPARED WITH LC-MS/MS | $12,874.00 |
| Recruitment | Zamboni | William | Emory University (EU) | | 4/1/19 | 4/1/20 | QUANTITATION OF SN38 AFTER ADMINISTRATION OF HA-SN38 NANOPARTICLE IN MICE-ANALYSIS OF PLASMA, TUMOR AND LIVER PK SAMPLES | $6,000.00 |
| Recruitment | Zamboni | William | ChemoGLO, LLC | | 9/1/19 | 5/1/21 | TASK #5_COMPARISON OF METHOTREXATE MEASUREMENTS ON SURFACES BY HDCHECK COMPARED WITH LC-MS/MS | $12,874.00 |
| Recruitment | Zeidner | Joshua | Merck Sharp and Dohme Corp. | | 12/18/15 | 9/30/21 | Phase 2 Study of High Dose Cytarabine Followed by Pembrolizumab in Relapsed and Refractory Acute Myeloid Leukemia | $141,325.46 |

| UCRF Category | PI Last Name | PI First Name | Sponsor | Award Number | Begin | End | Title | Total Cost |
|---|---|---|---|---|---|---|---|---|
| Recruitment | Zeidner | Joshua | Millennium Pharmaceuticals, Inc. | 218558 | 8/22/16 | 8/21/29 | 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 Myelogeno | $38,259.96 |
| Recruitment | Zeidner | Joshua | Johns Hopkins University | | 8/3/16 | 8/2/21 | Phase 2 Study of Azacitidine in Combination with Pembrolizumab in Relapsed/Refractory Acute Myeloid Leukemia (AML) Patients and in Newly Diagnosed Older (?65 Years) AML Patients | $141,780.00 |
| 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) | $367,991.72 |
| Recruitment | Zeidner | Joshua | Millennium Pharmaceuticals, Inc. | | 8/22/18 | 9/11/28 | Pevonedistat-3001 A Phase 3, Randomized, Controlled, Open-label, Clinical Study of Pevonedistat Plus Azacitidine versus Single-Agent Azacitidine as First-Line Treatment for Patients With Higher-Risk Myelodysplastic Syndromes, Chronic Myelomonocytic Leukem | $119,831.65 |
| Recruitment | Zeidner | Joshua | Arog Pharmaceuticals, Inc. | | 2/27/19 | 1/31/29 | ARO-021- Phase III Randomized Study of Crenolanib versus Midostaurin Administered Following Inducation Chemotherapy and Consolidation Therapy in Newly Diagnosed Subjects with FLT3 Mutated Acute Myeloid Leukemia | $26,808.00 |
| Recruitment | Zeidner | Joshua | Millennium Pharmaceuticals, Inc. | | 10/1/19 | 10/31/31 | A Phase 1 Study of Pevonedistat in Combination With Azacitidine in Patients With Higher-Risk Myelodysplastic Syndromes, Chronic Myelomonocytic Leukemia, or Relapsed/Refractory Acute Myelogenous Leukemia With Severe Renal Impairment or Mild Hepatic Impairm | $34,184.00 |
| Recruitment | Zeidner | Joshua | Tolero Pharmaceuticals, Inc. | | 12/11/19 | 11/20/29 | A Phase 2, Open-label, Randomized, Two-stage Clinical Study of Alvocidib in Patients with Relapsed/Refractory Acute Myeloid Leukemia Following Treatment with Venetoclax Combination Therapy. | $64,063.00 |
| Recruitment | Zhang | Qi | University of California at Irvine (UCI) | 2017-3475 | 8/1/17 | 7/31/21 | Molecular Mechanisms of Telomere Length Homeostasis | $22,735.00 |
| Recruitment | Zhang | Qi | National Science Foundation | MCB-1652676 | 2/15/17 | 1/31/22 | CAREER: RNA conformational dynamics in the regulation of microRNA biogenesis | $197,487.00 |
| Theme Investment | Zhou | Otto | Xintek, Inc. | | 6/15/16 | 6/30/20 | Evaluation of a CNT x-ray based intraoral tomosynthesis device | $155,317.00 |
| Theme Investment | Zhou | Otto | NIH National Cancer Institute | 5-F30-CA235892-02 | 1/1/19 | 12/31/22 | FELLOW:A PUETT Improved cancer screening with synthetic and stationary 3D mammography | $36,694.00 |
| Investment (HTSF) | Zylka | Mark | NIH National Institute of Mental Health | | 9/1/19 | 6/30/24 | UBE3A gain-of-function and parent-of-origin influence on | $458,775.06 |
| Investment (HTSF) | Zylka | Mark | NIH National Institute on Aging | | 9/30/18 | 12/31/19 | Transcription-associated DNA damage and neurodegeneratio | $304,683.37 |

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