New Jersey Commission on Cancer Research

Annual Report 2022–2023

Dedicated to conquering cancer through scientific research

NJCCR NEW JERSEY COMMISSION ON CANCER RESEARCH

NJHealth New Jersey Department of Health

Annual Report 2022–2023

NJCCR
NEW JERSEY COMMISSION ON CANCER RESEARCH

The New Jersey Commission on Cancer Research was ushered in by the Cancer Research Act in 1983, to support its activities. This Act resulted from the collaborative efforts of people with cancer and their families, clinicians, academicians, scientists, public officials, and representatives of research, pharmaceutical industry, and non-profit organizations.

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A Message From the Chair

The New Jersey Commission on Cancer Research (NJCCR) is pleased to announce the release of the 2022-2023 Annual Report on the status of cancer research grants in New Jersey. The purpose of this report is to highlight the activities of the Commission and the most up-to-date cancer research grants in New Jersey.

For 40 years, NJCCR has been awarding cancer research grants. Since its inception in 1983, we have awarded more than $52 million for 915 peer-reviewed cancer research grants and student fellowships. Our grantees have leveraged a return of over $10 in federal research funding for every NJCCR dollar awarded for a total of $455 million. These grants have been awarded to the Cancer Institute of New Jersey, Rutgers University both in Newark and Piscataway, Princeton University, Rowan University, and many others.

Although the NJCCR receives a $1 million state appropriation, the Legislature has generously provided $4 million to fund basic cancer science research, including research for breast, lung, colon, and prostate. In addition, this year, the NJCCR announced a new research grant opportunity on the impact of cancer and health disparities. We are confident that this new opportunity will provide insight into the reasons for these glaring disparities in New Jersey.

The Commission has an amazing group of dedicated volunteers who serve on the NJCCR. The Commission members represent academia, non-profits, and health care institutions. We also note and thank the many scientists and their affiliated organizations for their outstanding cancer research projects highlighted in this report.

It is an honor to serve the citizens of New Jersey by being both a member of the NJCCR and the Chair. As one of 10 members volunteering their time to serve on the Commission, I wish to thank you for your support of our cancer research work. Lastly, we wish to thank the legislators for their continued support of this public health challenge.

Sincerely,

Kenneth Adler

Kenneth Adler, MD, FACP
Morristown Medical Center
Chairperson, New Jersey Commission on Cancer Research

Executive Summary

Cancer is the second leading cause of death in New Jersey, exceeded only by heart disease. More than 57,000 New Jerseyans are diagnosed every year. One in four deaths in the United States is attributable to cancer, and one in three Americans will eventually develop some form of cancer. Furthermore, the National Cancer Institute has ranked New Jersey as 4th in the nation for the incidence of cancer. With continued research efforts by the New Jersey Commission on Cancer Research (NJCCR), the scientific understanding of the causes of cancer prevention, detection, and treatment has improved.

NJCCR was created by enabling legislation §52:9U-1 in 1983 as a semi-independent public body, the Commission is ". . . allocated in, but not of" the New Jersey Department of Health (NJDOH). The Commission is subject to all the administrative rules and procedures of the NJDOH but is not part of the Department's budget. The legislation dictates that the NJCCR receive no less than $1 million annually for research into the causes, prevention, and treatment of cancer. In more recent years, the NJCCR received $4 million from the Legislature for cancer research. In fiscal year 2022, the NJCCR received for the first time a $5 million state appropriation for pediatric cancer research.

Research is critical to reducing the burden of cancer in New Jersey. This 2022-2023 annual report highlights the remarkable progress that has been made against cancer by scientists in New Jersey. In 2022 and 2023, NJCCR awarded predoctoral, postdoctoral, bridge, and pilot grants ranging from $50,000 to $500,000. Using a rigorous peer review process, awards are given to qualified research institutions such as academic centers of excellence and non-profit entities. A snapshot of each type of grant award is highlighted in this report. In addition, it also underscores the impact of the various types of cancer and the need for predictable and stable funding to advance cancer research.

Finally, the report addresses NJCCR activities surrounding funding, The Drive Hope Forward campaign, the formation of a pediatric advisory, and the grant application and review process. Questions about the report can be sent by email to: njccr@doh.nj.gov.

Introduction

This report is written in accordance with the enabling statute §52:9U-1 known as the *Cancer Research Act,* which stipulates that NJCCR shall provide a report to the Governor and the Legislature on the status of the Commission's activities and the results of its funded research efforts. A copy of the statute is attached hereto as Appendix 1. Although the Act dictates that the NJCCR receives no less than $1 million annually for research into the causes, prevention, and treatment of cancer, the Legislature has been generous by granting $4 million over the past few years.

NJCCR was established in 1983 to promote and fund cancer research projects to scientists at qualified research institutions in New Jersey. Throughout its 40-year history, NJCCR has awarded over $52 million for 915 peer-reviewed cancer research grants and student fellowships. NJCCR is the only statewide commission that provides peer-reviewed scientific cancer research to eligible scientists in New Jersey. This merit-based system has a strong track record of funding scientific fellowships and principal investigators who conduct cutting-edge research. The merits of cancer research are undeniable, and the benefits are huge for New Jersey. An independent study of NJCCR grant recipients revealed that these researchers leverage $10 in federal funding for each $1 of the NJCCR funding.

In 2022-2023, NJCCR announced a new grant opportunity to identify translational research projects that examine the impact of social determinants of health as applied to the field of cancer including, but not limited to, health disparities, underserved, uninsured, and vulnerable populations.

NJCCR recognizes the importance and need for future funding to advance cancer research in New Jersey. In fiscal year 2022, the NJCCR received a one-time state appropriation of $5 million for pediatric cancer research. With this additional funding, the NJCCR received 11 pediatric cancer research grant applications from qualified research institutions in New Jersey. Despite these advances, cancer remains an enormous public health challenge. The NJCCR remains hopeful about obtaining predictable and stable funding since tremendous progress has been made in the fields of genomics and immunology, resulting in the newest treatments in cancer care.

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Mission and Goals

The mission of the New Jersey Commission on Cancer Research is to: ***Ensure that the citizens of New Jersey receive the fullest benefit of our nation's fight against cancer through the promotion and funding of research into the causes, prevention, survival, and treatment of cancer.***

Simply stated, the Commission's goals are:

- To support meritorious research projects that advance the understanding of prevention, diagnosis, treatment, and survivorship of cancer.
- To support the progression of research from bench to bedside.
- To enhance the reputation of New Jersey as a leader in funding cancer research.
- To facilitate the initiatives of New Jersey scientists to obtain grants from sources such as the National Institutes of Health.
- To support promising investigators experiencing a short-term interruption in funding for research focused on cancer prevention, diagnosis, treatment, and survivorship.

More specifically, the NJCCR works to:

- Advance the field of scientific cancer research in New Jersey by encouraging established scientists to apply their expertise to cancer research.
- Foster collaborative, interdisciplinary approaches to cancer research.
- Nurture future generations of cancer researchers by supporting scientists and pre-doctoral and post-doctoral fellows.
- Disseminate the research findings at the Commission's annual cancer research symposium.
- Compile and update the NJCCR directory of all cancer research projects in the State.

Membership and Organization

Created as a semi-independent public body, NJCCR is " . . . *allocated in, but not* . . ." the New Jersey Department of Health. It is subject to all the administrative rules and procedures of the Department, but is not part of the Department's budget.

The Commission establishes and oversees the administrative operations of the grant-making process as well as other programmatic activities that are implemented by its administrative staff. The Governor appoints 11 uncompensated members to serve on this committee. These members include the Commissioners of the New Jersey Department of Health, the Department of Environmental Protection (or their appointed designees), and nine citizens of New Jersey. Their term of service is three years, and their appointments are made with the advice and consent of the Senate.

New Jersey residents wishing to be considered for an appointment may submit their name to the Governor's Office of Appointments.[1]

Administrative Functions

The Commission's leadership and staff provide vital linkages to implement its programs and ensure day-to-day operations. The office staff manages the operations including program administration, interaction with applicants and grantees, contract administration, budgeting, and financial matters, record-keeping, reporting, and managing outside contracts such as advisory consultants. The administrative staff is also responsible for coordinating and overseeing all activities, overseeing the scientific merit review process, engaging in negotiations with external vendors, and managing the essential relationships within the state government.

Cancer is the second leading cause of death in New Jersey, exceeded only by heart disease. More than 57,000 New Jerseyans are diagnosed every year. One in four deaths in the United States is attributable to cancer, and one in three Americans will eventually develop some form of cancer.

1. *Information on how to apply can be found at:* https://www.nj.gov/governor/admin/bca.

Cancer as a Public Health Challenge in New Jersey

Cancer remains a public health challenge in New Jersey and the nation.

- Despite the COVID-19 epidemic, cancer remained a significant cause of mortality, accounting for 18.4% of deaths in 2021. It ranked second in terms of causes of death, trailing behind heart diseases.[2]
- National Cancer Institute has ranked New Jersey as fourth in the nation for the incidence of cancer (all cancer sites)[3] and is ranked 42nd among all states for cancer deaths (all cancer sites)[4] for the period of 2016-2020.
- According to the American Cancer Society, in New Jersey, approximately 57,740 individuals are projected to receive a cancer diagnosis and 15,110 people are expected to die in year 2024, which is slightly higher than 2023 projections.[5]
- According to the American Cancer Society, new cancer diagnosis for New Jersey is estimated for selected cancers for year 2024 as follows:[5]
  - Prostate: **9,860**
  - Female breast: **8,880**
  - Lung and bronchus: **5,600**
  - Colon and rectum: **4,240**
  - Melanoma of the skin: **2,330**
  - Non-Hodgkin lymphoma: **2,490**
  - Uterine corpus: **2,230**
  - Urinary bladder: **2,540**
  - Leukemia: **1,940**
  - Uterine cervix: **370**
- Similarly, according to American Cancer Society, new cancer death for New Jersey is estimated for selected cancers for year 2024 is as follows:[6]
  - Lung and bronchus: **2,700**
  - Pancreas: **1,440**
  - Colon and rectum: **1,330**
  - Female breast: **1,170**
  - Prostate: **740**

2 https://www-doh.state.nj.us/doh-shad/indicator/view/LCODall.Count10.html
3 https://statecancerprofiles.cancer.gov/incidencerates/index.php
4 https://statecancerprofiles.cancer.gov/deathrates/index.php
5 https://acsjournals.onlinelibrary.wiley.com/doi/full/10.3322/caac.21820
6 https://acsjournals.onlinelibrary.wiley.com/doi/10.3322/caac.21763

- Leukemia: **630**
- Liver and intrahepatic bile duct: **620**
- Non-Hodgkin lymphoma: **520**
- Brain and other nervous system: **500**
- Ovary: **340**

These numbers highlight the importance of continued research in the area of cancer prevention, early detection, and effective treatments. NJCCR promotes significant and original research into the causes, prevention, and treatment of cancer and serves as a resource to providers and consumers of cancer services.

The Commission establishes and oversees the administrative operations of the grant-making process as well as other programmatic activities that are implemented by its administrative staff.

Current Grant Programs

The New Jersey Commission on Cancer Research grant programs are designed to provide scientific opportunities to attract research scientists. Awards are intended to promote collaboration among cancer researchers in New Jersey as well as spark innovative research. The purpose of the NJCCR grants is to advance research as opposed to providing long-term support. NJCCR anticipates that this support will lead investigators to advance cancer research and provide opportunities for securing larger federal grants, such as the National Institutes of Health (NIH). The types of grants funded by the NJCCR include the following:

1) **NJCCR Predoctoral Fellowship Grant:** Provides two-year fellowship awards, to attract and retain talented scientists who wish to pursue a career in cancer research in New Jersey.

2) **NJCCR Postdoctoral Fellowship Grant:** Provides two-year fellowship awards, to retain postdoctoral scientists who have devoted their careers to cancer research in New Jersey.

3) **NJCCR Research Bridge Grant:** Designed to enhance cancer-related research at New Jersey institutions by providing funding to motivated and productive investigators who anticipate a short-term interruption in funding for research projects focused on cancer prevention, diagnosis, treatment, and survivorship. This two-year funding helps to position New Jersey investigators to compete for NIH grant awards and/or other federal grants.

4) **NJCCR Pediatric Research Grant:** Intended to encourage and support projects that address causes, prevention, education, treatment, or cure of pediatric cancer as well as address the symptoms or effects that pediatric populations encounter after completing cancer treatment.

5) **NJCCR Pilot Program Research Grant:** Supports cancer research projects that address priority areas such as: Cancer Health Disparities; the Impact of COVID-19 on access, disease progression, treatment, and outcomes of persons with cancer; Palliative Care, Pain Management; Psychosocial effects of cancer, etc.

Grants Application and Review Process

The NJCCR grant application and review process is designed to follow the similar standards as the NIH.[7] This ensures a fair and thorough evaluation of research proposals. Over time, this approach has gained respect from both grant recipients and applicants.

Application Process

NJCCR Grant applications are submitted electronically by applicants using the System for Administering Grants Electronically (SAGE).[8] This online system ensures easy access, convenience, and flexibility, while reducing administrative workloads for applicants, the Commission office, and the Scientific Merit Review Panel.

Grant Review Process

The grant evaluation process consists of a two-step review.

1) **Administrative Review:** Upon receipt, all grant applications will be reviewed by the NJCCR staff for compliance with all applicable New Jersey State statutes and regulations to ensure completeness and accuracy.

2) **Scientific Merit Review:** An independent expert panel of scientific merit reviewers who use NIH scoring guidelines to evaluate grant applications, provide assign scores. While their feedback and scores will be considered for funding decisions, the final authority to review and approve grants rests with the NJCCR, in accordance with N.J.S.A. 52:9U-1.[9]

NJCCR anticipates that this support will lead investigators to advance cancer research and provide opportunities for securing larger federal grants.

7 https://www.niaid.nih.gov/grants-contracts/review-process

8 https://dohsage.intelligrants.com/

9 https://www.nj.gov/health/ces/documents/njccr/cancer-commission-on-research-legislation-NJSA-529U.pdf

Drive Hope Forward Campaign

Cancer remains the second leading cause of death in New Jersey. To raise awareness about cancer and highlight the need for cancer research as well as stimulate donations, NJCCR embarked on a campaign, entitled, *Drive Hope Forward*. In 2022, NJCCR solicited the help of a multicultural marketing firm to plan and implement the campaign.

Since its inception, the campaign has focused on the planning and implementation of digital marketing ads for use on the various NJDOH platforms. In addition, short video clips have been produced to inform communities and key stakeholders about cancer research. On the next page, you can find QR codes to view the video clips for the *Drive Hope Forward* campaign.

Research is the backbone of scientific progress against cancer. It spurs the development of innovation, medical breakthroughs, and better approaches to preventing, detecting, diagnosing, treating, and curing some of the many diseases known as cancer.

NJCCR *Drive Hope Forward* Campaign

For example, funding by NJCCR has resulted in the discovery of life-saving scientific breakthroughs, including the recent discovery of a unique gene by scientists at Princeton University and the Cancer Institute of New Jersey. Specifically, this discovery resulted in the finding of the gene (Metadherin) critical to breast cancer metastasis. Most recently, another discovery by Dr. Sharon Pine, formerly of Rutgers Robert Wood Johnson Medical School and currently at the University of Colorado, has helped pave the way for the discovery of liquid biopsies that have the potential to impact the early detection, diagnosis, and treatment of breast cancer.

Research continues to be our best defense against cancer because it is the driving force behind all clinical and policy advances that can improve cancer prevention, detection, diagnosis, treatment and, increasingly cures for cancer.

Despite 40 years of funding lifesaving research and progress, its impact is limited by a lack of stable and predictable funding. Although the NJCCR receives no less than $1 million annually for cancer research, the Commission has not had a significant increase in funding since 1983. To advance cancer research and facilitate robust innovation and new therapies aimed at treating cancer, a dedicated non-lapsing fund would provide the stability and predictability in funding needed.

Since its inception, the Drive Hope Forward Campaign has focused on the planning and implementation of digital marking ads for use on the various NJDOH platforms.

Drive Hope Forward Video Clip #1

Drive Hope Forward Video Clip #2

NJCCR Funding

Aside from the annual State budget appropriation, NJCCR receives funding from other sources such as state income-tax check-offs and the purchase of a Conquer Cancer License Plate by New Jersey residents. This specialty license plate is making good on its promise to "Drive Hope Forward" and advance cancer research. Since its inception in 1998, over 100,000 license plates have been sold and more than $5.7 million have been raised for cancer research in New Jersey.

Other sources of funding for cancer research include the following:

New Jersey Breast, Prostate, Lung and Childhood Cancer Research Funds

- NJCCR administers targeted funds for cancer research. The New Jersey Breast Cancer Research Fund was created in 1995 as a result of legislation §54A:9-25.7. This fund provides taxpayers with the opportunity to indicate on a New Jersey gross income tax return a portion of their tax refund or alternatively make a contribution to be deposited in this special fund. For example, New Jersey Breast Cancer Research Fund: I wish to contribute $20, other dollar amount to this Fund.
- Created by statute §54A:9-25.21, this law established the New Jersey Prostate Cancer Research Fund. This fund allows taxpayers the opportunity to dedicate a portion of their tax refund or make a contribution to be deposited in this special fund.
- Similarly, §52:9U-6.3 ushered in the New Jersey Lung Cancer Research Fund to allow NJCCR to solicit, receive, evaluate, and approve applications from qualified research institutions for grants from the New Jersey Lung Cancer Research Fund. Under this statute, a "qualified research institution" shall mean an academic medical institution, State or local government agencies, public or private organizations within New Jersey, and any other institution approved by the commission, which is conducting a lung cancer research project.
- NJCCR administers a special fund known as the New Jersey Pediatric Cancer Research Fund §54A:9-25.47 (C.52:9U-4). This fund allows taxpayers the opportunity to indicate on a New Jersey gross income tax return a portion of their refund or an enclosed contribution to the fund.

New Jersey Pediatric Cancer Research Fund & New Jersey Pediatric Cancer Research Advisory Group

According to the State Cancer Profiles, the incidence rate for childhood (<15 y/o) cancer in New Jersey was 17.5% for the period between 2014-2018 with the rate stable. Although mortality rates for cancer within this group have declined (due to major advances in treatment modalities), it is still the second leading cause of death in children under the age of 15 years, behind accidents.

In 2021, Senate bill 1431 ushered in the Pediatric Cancer Research Fund, which resulted in a one-time State appropriation of $5 million for pediatric cancer research. Subsequently, the New Jersey Commission on Cancer Research established a Pediatric Cancer Research Advisory Group (Advisory Group) to consult with the NJCCR on how the money from the fund should be utilized to support pediatric cancer research projects to qualified research institutions in New Jersey.

The Advisory Group held its first meeting in April 2022. This group consists of seven members who either treat patients with pediatric cancer, conduct research into pediatric cancer, advocate to advance pediatric cancer research or treatment, or have been affected by their own or a family member's diagnosis of pediatric cancer. Since this time, NJCCR continues to stay engaged with the Advisory Group to assist with the identification and funding of scientific research projects that focus on translational research (from laboratory to the bedside) and pediatric cancer research projects surrounding the causes, prevention, education, treatment, or cure of pediatric cancer, or the symptoms or effects experienced by patients following completion of a course of treatment for pediatric cancer. Currently, the Advisory Group Members include the following:

- Aubrey Reichard-Eline, Chair
- Dr. Peter Cole, Co-Chair
- Dr. Steven Halpern
- Dr. Daniel Notterman
- Paulette Forbes
- Dr. Rafat Ahmed
- Dr. Alfred Gillio

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2022 Grant Recipients

Predoctoral Research Fellowship Recipient:
Maria Ibrahim
mi249@gsbs.rutgers.edu, COCR22PRF005
Rutgers Biomedical and Health Sciences
$50,000

Project Title & Summary:
Investigating the impact of autophagy deficiency on the tumor microenvironment

Lung cancer is a deadly disease and one of the leading causes of death worldwide, and thus is in need of new therapeutic approaches. Autophagy is the mechanism by which cells recycle proteins and organelles to maintain cellular homeostasis during stress and starvation. Under normal conditions, autophagy functions at a low basal level to remove damaged cellular components, thus preventing the gradual accumulation of toxic, intracellular waste material. Cancer cells rely on autophagy -- in many cases, they are more autophagy dependent than normal cells and tissues. This is due to the inherent deficiencies in the surrounding microenvironment caused by increased metabolic and biosynthetic demands imposed by deregulated cell proliferation. A major limitation is that most cancer models have addressed the role of autophagy only in tumors without drawing a direct comparison to autophagy deficiency in normal tissues. We propose to use a GEMM of systemic ablation of essential autophagy gene 7 (Atg7) to explore the underlying metabolic phenotype associated with autophagy deficiency and the tumor microenvironment. Acute, whole body deletion of Atg7 in adult mice causes a systemic metabolic defect manifested by gradual loss of white adipose tissue, liver glycogen, and muscle mass. Hence, we propose that the overall alterations in energy balance, consumption, and macro-fuel combustion contribute to the metabolic phenotype underlying autophagy deficiency.

Predoctoral Research Fellowship Recipient
Paul Kraycer
paul.m.kraycer@rutgers.edu, COCR22PRF006
Rutgers Biomedical and Health Sciences
$50,000

Project Title & Summary:
The Role of Sliding in Cohesin Accumulation and Function on Chromosomes

Dysfunction of cohesin, a protein complex that controls chromosome structure and function, has been linked to some forms of cancer. To appreciate cohesin's role in cancers, it is necessary to first understand its normal roles in chromosome biology. This grant proposal aims to reveal how cohesion accumulates and functions at key chromosomal sites.

Predoctoral Research Fellowship Recipient

Rukia Henry
rukia.henry@rutgers.edu, COCR22PRF011
Rutgers Biomedical and Health Sciences
$50,000

Project Title & Summary:

Elucidating the Role of LYN Src Kinase in DNA Repair

Our DNA is subjected to daily stressors that may induce damage in the form of single and double-stranded breaks. Should our cells not briefly and efficiently repair these damages, it can lead to the growth and proliferation of cells harbouring mutations potentially contributing to cancer formation. In order to conduct efficient repair of damaged DNA, our cells utilize proteins that regulate the coordination of efficient recognition and subsequent repair of damaged DNA. An important DNA repair protein, PARP [poly(ADP-ribose) polymerase] is essential in the signalling and recruitment of proteins involved in the DNA damage response. ATM (ataxia-telangiectasia mutated) is another important protein involved in the recruitment of important DNA repair factors, coordinating a cascade of signalling required to efficiently repair DNA double-strand breaks. During the DNA damage response, there is an interplay between these proteins and those in their respective repair pathway. There is evidence that suggests that the key regulator facilitating the relay of information between ATM and PARP is an enzyme called LYN. LYN may interact with the protein TRIM33 that is recruited by PARP during the DNA damage response, although LYN itself is not recruited by PARP. Lyn is instead recruited by ATM, and thus may be the key regulator between these damage response proteins. Recently, PARP inhibitors have been developed and shown to be an effective cancer therapy. Consequently, as a regulator of PARP and ATM during DNA repair, targeting LYN could prove to be beneficial.

Postdoctoral Research Fellowship Recipient

Patricia Renck Nunes
pr476@cinj.rutgers.edu, COCR22PDF002
Rutgers Biomedical and Health Sciences
$100,000

Project Title & Summary:

ACLY as a novel therapeutic target in T-cell leukemia

T-lineage acute lymphoblastic leukemia (T-ALL) is an aggressive hematologic malignancy driven by a gene called NOTCH1. Despite recent progress in clinical outcomes in this disease, 25% of children and over 50% of adult T-ALL cases show primary resistant leukemia

NJCCR grant programs are designed to provide scientific opportunities to attract research scientists. Awards are intended to promote collaboration among cancer researchers in New Jersey as well as spark innovative research.

2022 Grant Recipients

or respond only transiently to chemotherapy, and ultimately succumb to their disease, highlighting the need to discover novel and improved therapeutic targets. Our preliminary data point to the fact that ACLY (an enzyme involved in the control of both metabolism and gene expression) could play a key but previously unrecognized role in this disease. Thus, the main objective of this study is to address the role of ACLY in T-ALL in vivo using refined genetic mouse models and experimental therapeutic assays. The results from this project could directly translate into improved treatments for T-ALL patients in the short-term.

Bridge Cancer Research Grant Recipient

Dane Parker
dane.parker@rutgers.edu, COCR22RBG010
Rutgers Biomedical and Health Sciences
$336,497

Project Title & Summary:

Training the innate immune system to Staphylococcus aureus infection.

Staphylococcus aureus is an important human pathogen that causes a range of infections, including pneumonia. This project focuses on the role of an important cell type in the airway, the alveolar macrophage, gaining a better understanding of its role in infection and how prior exposure to *S. aureus* can train these cells for improved secondary responses to infection. This would benefit susceptible patients such as those undergoing cancer therapy.

Pediatric Research Grant Recipient

Rachel Riley
rileyr@rowan.edu, COCR22PRG012
Rowan University
$500,000

Project Title & Summary:

A Personalized Vaccination Approach to Treat Pediatric Acute Myelogenous Leukemia using Lipid Nanoparticles

Acute Myelogenous Leukemia (AML) is the second most common pediatric cancer with a 5-year survival rate of only 68%. Patients are typically treated with chemotherapy and bone marrow transplantation, both of which have detrimental short- and long-term effects. There is an imminent need to develop novel therapies for pediatric AML patients with fewer side effects and improved efficacy. A promising approach for effective cancer treatment with minimal adverse effects is cancer vaccination. In this approach, a patient's immune cells are engineered to

recognize and kill cancer cells expressing the antigen of interest. Thus, cancer vaccination is highly specific to cancer cells while leaving healthy cells (that do not express the antigen) intact. Here, we will develop a vaccine delivery platform to prime immune cells to attack AML cells to treat this disease. We will use lipid nanoparticles, which are already used in humans for the COVID-19 vaccines, to deliver the vaccine cargo, and we will evaluate how our vaccines elicit protection against pediatric AML. In Aim 1, we will engineer the lipid nanoparticle platform for delivery to immune cells. In Aim 2, we will evaluate the efficacy and safety of our vaccine in vivo using a mouse model of AML. This work will result in a robust vaccine delivery platform for treating pediatric AML. Moving forward, our vaccines can be adapted to deliver vaccines that recognize cancer cells based on specific patient samples for a highly specific, potent, and safe treatment for children with this disease.

Pediatric Research Grant Recipient

Alexander Valvezan
valvezan@cabm.rutgers.edu, COCR22PRG016
Rutgers Biomedical and Health Sciences
$497,307

Project Title & Summary:

Defining and Targeting Metabolic Reprogramming in Familial Adenomatous Polyposis

This project will test a new strategy for selectively killing tumor cells in the genetic tumor syndrome Familial Adenomatous Polyposis (FAP), by repurposing clinically approved drugs that are already being used safely in humans for other purposes. Children with FAP develop intestinal tumors beginning in their early teenage years, and will eventually accumulate hundreds to thousands of tumors. Regular screening typically begins at 8 to 10 years old for children known to be affected, and complete surgical removal of the colon is almost always required, which has lifelong impacts on quality of life. Our strategy exploits a molecular vulnerability that we recently discovered in tumors with abnormal activation of a critical group of proteins called mTOR complex 1 (mTORC1). mTORC1 is activated to promote cell growth and proliferation in the majority of all human tumors in children and adults. We discovered that tumor cells with active mTORC1 could be selectively killed, without affecting normal cells, in pre-clinical models of another genetic tumor syndrome called Tuberous Sclerosis Complex (TSC), in which tumor growth is driven by high mTORC1 activity. Due to key molecular similarities between cells in TSC tumors and FAP, we hypothesize that the same strategy could be effective in killing tumor cells in FAP. These studies will rigorously test this hypothesis, while also

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2022 Grant Recipients

providing important new knowledge about the effects of the genetic mutations that cause FAP, which could further aid in the development of new treatment strategies. Our use of clinically approved therapeutics means that efficacy in these studies could lead to rapid repurposing of these drugs for children and adults with FAP.

Pilot Research Grant Recipient

Angela Fong
af874@cinj.rutgers.edu, COCR22PPR005
Rutgers Biomedical and Health Sciences
$50,000

Project Title & Summary:

A Pilot study of a home-based physical activity program in female lung cancer patients

Lung cancer patients have significant improved survival and outcomes with new therapeutic advances especially immunotherapy. Patients with advanced lung cancer are treated with immunotherapy and may receive chemotherapy or radiation as well. Due to multiple factors such as toxicity from these treatment, reduced lung function from tumor and other medical problems such as bronchitis, patients have low exercise capacity and physical deconditioning. This in turn leads to more symptoms such as shortness of breath and fatigue as well as poor quality of life. To improve physical activity in patients who have completed therapy with immunotherapy for advanced lung cancer, we plan a pilot study of home-based physical activity program. Fifteen female patients will be enrolled and will receive home-based session with exercise trainer via videoconferencing. We will also measure changes in symptom burden and quality of life with our intervention. This goal is to test the feasibility of this intervention so that we can plan a larger study in advanced lung cancer survivors treated with immunotherapy.

Pediatric Research Grant Recipient

Shengkan Victor Jin
Victor.jin@rutgers.edu, COCR23PRG007
Rutgers Biomedical and Health Sciences
$500,000

Project Title & Summary:

Developing Off-the-Shelf CAR-T Cells for Treating Pediatric Leukemia with a New Base Editing Technology

In recent years, chimeric antigen receptor T cells (CAR-T cells) have emerged as an effective immunotherapy to treat advanced B-ALL cancers. The CAR-T cells are engineered from a patient's own T cells

to produce an artificial T cell receptor that can recognize the patient's cancer cells and act as a "living drug" to attack these tumor cells. CAR-T cell therapy has achieved outstanding clinical outcomes, with complete response (CR) rates of 65–90% across clinical trials spanning institutions. However, the process of engineering these cells is currently highly complex, lengthy, and very costly.

The root cause of these issues is that the current CAR-Ts are engineered from the patient's own T cells in a laboratory setting. This "autologous" manufacturing approach has intrinsic shortcomings, including (1) the quality of a cancer patient's T cells might be compromised by the disease and by previous treatments, thereby jeopardizing effectiveness; (2) the time required for manufacturing (at least three weeks) is often too long for critically ill patients; (3) logistics for manufacturing is complex; and (4) the costs per patient are extremely high ($350k to $500k).

It is highly desirable to develop off-the-shelf CAR-T therapies, where T cells from healthy donors are engineered to create a bank of cells that are available for treating patients on demand. The "allogeneic" engineering approach would ensure the quality of CAR-Ts, eliminate patient waiting time, simplify manufacturing logistics, and drastically reduce costs. The barriers to generating CAR-Ts from healthy donors are the risk of the foreign T-cells attacking normal tissues of the patients and the patient's immune system rejecting the foreign T-cells. These barriers can be circumvented by simultaneously inactivating the genes in the healthy donor T cells involved in the self-non-self-recognition, making the T-cells from healthy donors only kill cancer cells but not the normal cells in patients, while also avoiding being attacked by the patient's own immune cells.

Dr. Jin's Lab developed a novel "RNA-aptamer mediated base editing" technology, providing a safe way to do a "surgical operation" on DNA by avoiding the oncogenic damage to DNA. The base editing technology is ideal for simultaneous inactivating multiple genes in human primary T cells to generate off-the-shelf CAR-Ts. The current proposal capitalizes on the novel "RNA aptamer-mediated base editing technology" to generate CAR-Ts for pediatric ALL treatment. We proposed two specific aims. The first aim will create a new approach to engineering and manufacturing the off-the-shelf CAR-Ts; the second aim will generate more potent, off-the-shelf CAR-Ts to further improve the CAR-T therapeutic paradigm. In essence, our proposal will produce the near-term outcomes of developing off-the-shelf CAR-Ts and more potent CAR-Ts. These outcomes will improve CAR-T quality, simplify production, eliminate patient waiting time, drastically reduce costs (from $350k-$500k to $10k-$30k), and broaden accessibility. The proposal can have a sustained impact on pediatric leukemia cancer treatment.

In 2022 and 2023, the NJCCR awarded predoctoral, postdoctoral, bridge, and pilot grants ranging from $50,000 to $500,000.

2023 Grant Recipients

Predoctoral Research Grant Recipient

Samuel Hofbauer
Hofbau17@rowan.edu, COCR23PRF008
Rowan University
$200,000

Project Title & Summary:

Lipid Nanoparticles (LNPs) for the targeted delivery of immunotherapeutic agents to treat endometrial cancer.

Uterine cancers are the 5th leading cause of cancer death in women in the United States. This disease is commonly diagnosed in the early stages of its progression and treated surgically with a complete hysterectomy. While this is an effective treatment option in cancers diagnosed early, it is highly invasive and requires women to take hormone replacement medications throughout their lives. Further, 14% of endometrial cancer cases are in premenopausal women, and undergoing a total hysterectomy renders these patients completely infertile. Thus, there is an immense need to develop nonsurgical and noninvasive therapies for endometrial cancer in premenopausal women. As alternatives to chemotherapies, immunotherapies have emerged as promising therapeutics to treat many types of cancer. Immunotherapies harness the power of the patient's immune system to recognize and fight the cancer cells. However, many immunotherapies result in severe side effects that limit their use. Here, we will develop lipid nanoparticles (LNPs) to deliver immunotherapies specifically to uterine cancer cells. Importantly, LNPs are already used in humans as the delivery system in the Pfizer and Moderna vaccines against COVID-19, and they are approved by the FDA for other diseases as well. Thus, LNPs are proven to be safe in humans, making them a robust and highly translatable delivery system. We hypothesize that LNPs will deliver the immunotherapies to uterine cancer cells to inhibit their growth, ultimately halting disease progression. We expect that our drug delivery platforms will increase the therapeutic efficacy and decrease the side effects associated with conventional forms of immunotherapies. Ultimately, this treatment will provide a nonsurgical and noninvasive approach to treat endometrial cancer.

Predoctoral Research Grant Recipient

Samuel Desind
Szd4@gsbs.rutgers.edu, COCR23PRF030
Rutgers Biomedical and Health Sciences
$90,000

Project Title & Summary:

Understanding the Role and Functions of lncRNA PACER in Lung Cancer Cells and Beyond.

Long noncoding RNAs regulate gene expression; however, in many cases, the mechanism of this regulation is unknown. One novel lncRNA relevant to inflammation and arachidonic acid (AA) metabolism is the p50-associated COX-2 extragenic RNA (PACER). PACER is a key regulator of COX-2. COX-2 is a major enzyme in the AA pathway, an important inflammatory signaling network. PACER is known to play a role in inflammation-associated conditions, yet the mechanisms responsible for the regulation of PACER are not understood. Our recent research focuses on the regulation of PACER in lung cancer. Our data suggest PACER is a key regulator of COX-2 expression and dysregulated expression in lung cancer cells. Bioinformatic analysis of TCGA data has identified that PACER is overexpressed in lung cancer patients. Our experimental results identified previously undescribed transcription factors that may play a role in PACER regulation in lung cancer cells. We hypothesize that Inhibition of PACER expression decreases lung cancer cell proliferation and migration and has regulatory effects on the arachidonic acid metabolic pathway and beyond.

Predoctoral Research Grant Recipient

Youssef Sabha
Yas40@gsbs.rutgers.edu, COCR23PRF033
Rutgers Biomedical and Health Sciences
$65,000

Project Title & Summary:

Elucidating the role of Heat Shock Protein 90 in NK cell immunosurveillance of drug-resistant liver cancer to improve NK cell-based therapies for solid tumors.

Treatments for liver and pancreatic cancers are limited because tumors evolve resistance to traditional therapies. Chimeric Antigen Receptor-Natural Killer (CAR-NK) cell-based therapies are shown to successfully treat refractory blood cancers. CAR-NK cells are armored immune cells that precisely kill a tumor that expresses a biomarker surface protein. These armored cells have shown strong efficacy in treating lymphomas/leukemias but not solid tumors. We require synergistic

Research is the backbone of scientific progress against cancer. It spurs the development of innovation, medical breakthroughs, and better approaches to preventing, detecting, diagnosing, treating, and curing some of the many diseases known as cancer.

approaches that demolish the tumor architecture while precisely killing the tumor cells. Recent studies have suggested combination chemotherapy-immunotherapy improves anti-tumor immunity compared to monotherapy strategies. Heat Shock Proteins (HSPs) have essential roles in cancer cell survival and immune evasion. HSPs stabilize the chaos of a tumor microenvironment whereby targeting HSPs destabilizes the tumor architecture. We find targeting Heat Shock Protein 90 (HSP90) induces the expression of surface HSPs that can be targeted with a CAR-NK. This study proposes a unique approach to enhance precise CAR-NK immunotherapy with a combination of HSP90 inhibitor chemotherapy to target the survival of solid tumors.

Predoctoral Research Grant Recipient

Agata Krzyzanowska
Agata.krzyzanowska@rutgers.edu, COCR23PRF036
Rutgers Biomedical and Health Sciences
$186,000

Project Title & Summary:

Immunotherapy checkpoint inhibitor efficacy is dependent upon a functionally unique T cell subset

The expression of BTB-ZF transcription factors such as ThPOK in CD4+ T cells or PLZF in NKT cells defines the fundamental nature and characteristics of these cells. Screening for potential new lineage-defining BTB-ZF genes led to the discovery of a subset of T cells that express Zbtb20. Approximately half of Zbtb20+ T cells expressed FoxP3, the lineage-defining transcription factor for regulatory T cells (Tregs). Zbtb20+ Tregs were phenotypically and genetically distinct from the larger conventional Treg population, for example, they constitutively expressed mRNA for IL-10 and produced high levels of the cytokine upon primary activation. The deletion of Zbtb20 in T cells resulted in accelerated tumor growth in mice (cKO). Interestingly, when cKO mice were treated with the immune checkpoint inhibitor, anti-PD1 antibody, tumor growth remained accelerated, indicating that the targeted deletion of Zbtb20 in T cells made mice resistant to the immunotherapy. Thus, we hypothesize that Zbtb20+ T cells are important for checkpoint inhibitor-induced immune responses to cancer.

Predoctoral Research Grant Recipient

Giuseppina Marchesini Tovar
gm636@gsbs.rutgers.edu, COCR23PRF034
Rutgers Biomedical and Health Sciences
$98,050

Project Title & Summary:

The role of GPR132 in regulating T cell function during infection and anti-tumor immunity.

T lymphocytes are immune cells that play a vital role in controlling infection and growth of malignant cells and represent the basis of current successful cancer immunotherapies. CD8+ T cells in particular are very powerful in responding to foreign antigens, as they can directly kill infected or tumor cells and amplify the immune response by releasing pro-inflammatory cytokines. After initial encounters with their target antigen, these cells persist throughout our lives as memory T cells, which facilitate stronger and faster responses that protect the body from illnesses and recurring tumoral events. We work with tissue-resident memory cells (Trm), a subset of memory T cells that are maintained in mucosal and barrier tissues, such as the skin, lungs, and reproductive tract, and have been shown to be critical in the control of infections and solid tumors in these tissues. However, the regulation of Trm cells is crucial, as insufficient activation results in poor infection/tumor control, and excessive activation can lead to off-target effects and tissue damage. This proposal aims to investigate and determine key regulators of Trm cells within the intestine during infection and colorectal cancer. These studies will also provide insight into how vaccination strategies can be adapted to boost protective responses to both infections and cancer.

Predoctoral Research Grant Recipient

Jake N. Siebert
Jns142@rutgers.edu, COCR23PRF020
Rutgers, The State University of New Jersey
$50,000

Project Title & Summary:

Metastatic Breast Cancer Prediction and Monitoring with Short-Wave Infrared Imaging of the Pre-Metastatic Niche

Recently, scientists and doctors have developed a new therapy that uses the body's own immune system to aid in the fight against breast cancer. However, a significant portion of the population is not responsive to this new type of therapy. Additionally, all breast cancer survivors have a lifetime risk of recurrent disease that spreads to other organs,

For 40 years, the NJCCR has been awarding cancer research grants. Since the inception of the Commission in 1983, we have awarded more than $52 million for 915 peer-reviewed cancer research grants and student fellowships. Our grantees have leveraged a return of over $10 in federal research funding for every NJCCR dollar awarded for a total of $455 million.

2023 Grant Recipients

forming secondary tumors in the bone, brain, and lungs. The spread of cancer to these organs is often incurable and patients rapidly succumb to disease within a few years. A common thread between therapy resistance and cancer metastasis is the role of a subset of immune cells, myeloid-derived suppressor cells (MDSCs). These cells are responsible for inhibiting the aspects of our immune system that actively fights off cancer and is targeted by the new therapy. These cells are also known to spread to other organs before the cancer, where they promote the growth of a secondary tumor. Our goal is to use nanometer-scale particles to target and label MDSCs for imaging within the body. By targeting MDSCs with these particles, we hope to be able to visualize these cells at the site of cancer spread before the tumor cells arrive, as well as predict therapy response. The success of this research will allow doctors to identify cancerous spread earlier than is currently possible and initiate individualized treatment to the patient sooner.

Predoctoral Research Grant Recipient

Teresa Wood, PhD
Terri.wood@rutgers.edu, COCR23RBG005
Rutgers Biomedical and Health Sciences
$499,652

Project Title & Summary:

Novel IGF1R Function in Breast Tumor Metastasis

Metastasis of primary tumor cells to distant sites is the major cause of death in breast cancer patients. Metastasis rates vary between different subtypes of breast cancer; for example, triple-negative breast cancers (TNBC) have a higher likelihood of becoming metastatic compared to hormone receptor-positive breast cancers. However, a substantial percentage of patients in all breast cancer subtypes will develop metastatic breast cancer. Importantly, what causes some tumors to metastasize while others do not is unknown. The proposed project will use mouse tumor models aligned with human gene expression data to identify and define how specific cellular pathways alter the primary tumor leading to metastasis.

Predoctoral Research Grant Recipient

Robert Rosen
Rsr138@rwjms.rutgers.edu, COCR23PRF006
Rutgers, The State University of New Jersey
$148,400

Project Title & Summary:

Treatment Strategies to Reduce post-CAR T-cell Sequelae.

Access to a new, highly effective blood cancer treatment, known as Chimeric Antigen Receptor T-cell therapy, is limited due to its dangerous side effects. These side effects are driven by an overactive immune system which results in widespread and severe inflammation, particularly at the blood-brain barrier, that is uncontrollable by currently available treatment options. While one immune cell, in particular, the macrophage, has been found to cause this inflammation, it was recently found that the blood vessels themselves play an active role in the disease process, particularly in the brain. Yet, how significant of a role the blood vessels play in the development of this inflammation in the brain and the rest of the body, how they interact with the immune cells, and whether targeting the blood vessels directly can treat this condition, has to be explored. To study this toxicity, we modeled severe inflammation, looking at how the blood vessels interacted with these inflammatory immune cells. We found that the degree of inflammation was highly dependent on the state of blood vessels and conventional treatments did not protect against direct blood vessel damage. To better understand the mechanisms driving these observations, we created a computational representation of our cells, simulated this interaction, and analyzed the results. We found a particular gene, that controls blood vessel stability and inflammation, STAT3, was key in developing this disease state. Our proposed research focuses on exploring the role of STAT3 in the blood vessels, how it impacts the development of these toxicities, and testing a novel treatment strategy for controlling STAT3 activity to reduce, or even prevent, these life-threatening side effects. Ensuring the safety of this life-saving cancer therapy will enable its use in a wider patient population and increase accessibility to complete remission.

This year, NJCCR announced a new research grant opportunity on the impact of cancer and health disparities. We are confident that this new opportunity will provide insight into the scientific reasons for these glaring disparities in New Jersey.

2023 Grant Recipients

Postdoctoral Research Grant Recipient

Wenfan Ke
Wk9698@princeton.edu, COCR23PDF011
The Trustees of Princeton University
$176,040

Project Title & Summary:

Functional analysis of TAD formation and long-range regulatory interactions.

The human genome is organized into a series of looped domains in three-dimensional (3-D) space and these loop domains are delimited by boundary elements (BEs). This 3-D organization is known to play central roles in gene regulation, development, and disease. Disruptions in the normal patterns of chromosomal loops, and the accompanying changes in gene expression are some of the distinctive hallmarks of cancer cells. To understand the role of these loop domains in cancer, it is critical to elucidate the mechanisms underlying their formation and maintenance and identify the critical molecular players. BEs were first identified and characterized in the model organism fruit flies (Drosophila melanogaster), and much is already known about their chromosome architectural and genetic functions. Given the evolutionary conservation of BE functions, I will exploit the genetic, cytological, and molecular tools that are uniquely available in this model organism to elucidate the molecular mechanism determining how the precise and characteristic looping pattern of chromosomes in multicellular organisms are determined. To achieve this goal, I will utilize the expertise in Schedl lab in chromatin biology and fly model systems, combined with my expertise in molecular biology. Together, our research will shed light on understanding the cellular and molecular machinery that determines chromosome 3-D architecture in normal and cancerous cells.

Postdoctoral Research Grant Recipient

Tinghan Zhao
Tz235@cinj.rutgers.edu, COCR23PDF009
Rutgers Biomedical and Health Sciences
$163,065

Project Title & Summary:

Regulatory Mechanism of Oncogenic Chromatin Remodeling

ARID1A is a tumor suppressor whose loss results in tumor development and anticancer drug resistance. In this application, I will study new molecular details of how a major oncoprotein named mTOR regulates the breakdown of ARID1A protein, thereby enabling cancer

cells to proliferate uncontrollably and become refractory to drug therapies. A successful outcome of this project could lead to better diagnosis and treatment, improving cancer patient survival.

Bridge Research Grant Recipient

Zhaohui Feng, PhD
fengzh@cinj.rutgers.edu, COCR23RBG004
Rutgers Biomedical and Health Sciences
$500,000

Project Title & Summary:

Targeting mutant p53 in breast cancer

Tumor suppressor p53 plays a key role in preventing tumor development. p53 is the most frequently mutated gene in human cancers. p53 mutations are observed in 25-30% of breast cancers and in over 80% of triple-negative breast cancers (TNBCs). These p53 mutations often lead to the production of mutant p53 proteins in cancers that not only lose the tumor suppressive function but also gain new activities to promote cancer growth and metastasis. Currently, the role and mechanism of mutant p53 in breast cancers are poorly defined, which hinders the development of effective strategies to treat breast cancers with mutant p53. Metabolic changes are a hallmark of cancer cells and a key contributor to cancer progression. Breast cancer cells often have altered glucose and fatty acid metabolism, which promotes breast cancer progression. Currently, the mechanism of metabolic reprogramming in breast cancers is not well understood. A better understanding of its mechanism in breast cancers will help to develop more effective strategies for breast cancer therapy.

Pediatric Research Grant Recipient

Daniel Herranz Benito
Dh710@cinj.rutgers.edu, COCR23PRG006
Rutgers Biomedical and Health Sciences
$497,216

Project Title & Summary:

Investigating clonal dynamics and transcriptional remodeling during treatment in pediatric acute leukemia

Pediatric acute myeloid leukemia (AML) is an aggressive tumor of blood cells in the bone marrow that requires intensive treatment. About 15% of childhood acute leukemia are cases of AML, which because of limited therapeutic options unsatisfactory cure, and increasing incidence rates, has become a major and growing clinical problem. AML in children is a different disease from AML in adults; however, its biology and changes

Our grantees have leveraged a return of over $10 in federal research funding for every NJCCR dollar awarded for a total of $455 million. These grants have been awarded to the Cancer Institute of New Jersey, Rutgers University both in Newark and Piscataway, Princeton University, Rowan University, and many others.

under therapies are mostly unknown. We and others have shown that chemotherapy is successful in some patients with pediatric leukemias, but drugs often do not work when a small group of cancer cells have specific changes in their DNA. These mutations, which may not be found by common approaches in the clinic before the start of the treatment, change the function of the genes; the cells that have these mutations become the major tumor population when leukemia comes back. In this project, we will analyze patient samples that have been collected before and during treatment and will apply highly sensitive experimental approaches to thousands of single leukemia cells. We will study the origins of childhood AML and will investigate its evolution to relapsed disease, with the goal of finding new ways for doctors to diagnose and treat this devastating childhood disease.

Pilot Research Grant Recipient

Ramy Sedhom
Ramy.Sedhom@pennmedicine.upenn.edu, COCR23PPR006
Goals of Care Coalition of New Jersey
$361,750

Project Title & Summary:

Palliative Care in New Jersey: Gaps and Opportunities to Improve Access

Palliative care is specialized medical care that provides patients with relief from the symptoms, pain, and stress that often occur with serious medical illnesses such as cancer. Research has shown that Palliative care significantly improves the quality of life for patients living with cancer and has been proven to lower costs that are often burdensome for patients and their families. Unfortunately, despite the recent increase of inpatient palliative care programs in NJ hospitals, information about the composition of palliative care programs in our state is not well understood. The purpose of this research project is to better understand and quantify the gaps in access to palliative care for patients with cancer. Using Medicare and Medicaid claims data, this project will identify the current need for palliative care in cancer patients and determine the capacity of palliative care providers and other home-based medical services providers across NJ.

Pilot Research Grant Recipient

KiBum Lee
kblee@chem.rutgers.edu, COCR23PPR007
Rutgers, The State University of New Jersey
$200,000

Project Title & Summary:

Developing Advanced Liquid Biopsy Diagnostics Targeting Tumor-derived Exosomes Using a Liposome-mediated CRISPR/Cas13 System

Cancer care, including routine screening, diagnosis, and treatment, has been significantly disrupted due to the COVID-19 pandemic. The current gold standard for cancer diagnosis involves surgical tissue biopsy, which is invasive and time-consuming. Moreover, the complexity of tumor tissues makes it difficult to understand the entire landscape of tumors fully, hindering the progress of precision medicine. To address these challenges, we propose the development of a less invasive and more reliable cancer diagnostic and monitoring platform using liquid biopsy. This novel technique analyzes cancer-related contents in body fluids, enabling non-invasive and real-time cancer diagnosis and monitoring. Our project focuses on detecting tumor-derived exosomes, which carry abundant tumor-related genetic materials, using an innovative combination of CRISPR-based biosensing technology and a microfluidic chip. This approach will allow for more accurate and cost-effective cancer diagnostics by simultaneously detecting multiple components, such as membrane proteins and internal miRNA, at the single exosome level. The programmability of the CRISPR system makes this method a versatile diagnostic platform for various types of cancer. Our proposed on-chip cancer liquid biopsy aims to make cancer diagnosis and monitoring more reliable and accessible during and after the pandemic era.

The Commission has an amazing group of dedicated volunteers who serve on NJCCR. The commission members represent academia, non-profits, and health care institutions.

Members of the New Jersey Commission on Cancer Research

NJCCR Commission Members

Kenneth R. Adler, MD, *Chair*
Morristown Medical Center

Kathleen Scotto, PhD, *Vice-Chair*
Rutgers School of Biomedical and Health Sciences

Generosa Grana, MD, FACP
M.D. Anderson Cancer Center at Cooper

Wendy Budin, PhD, RN-BC, FAAN
Rutgers School of Nursing

Li Li, PhD, DABT
Novartis Pharmaceuticals Corporation

Shawna Hudson, PhD
Rutgers Robert Wood Johnson Medical School

Christine Schell, MPA, CPM
New Jersey Department of Environmental Protection

Loletha Johnson, RN, MS, *Commissioner's Designee*
New Jersey Department of Health

Michele L. Donato, MD, FACP, CPE
Hackensack University Medical Center

Dr. Jane Flint, PhD, *Professor Emerita*
Princeton University

NJCCR Pediatric Cancer Research Advisory Group

Aubrey Reichard-Eline, *Chair*
Rutgers Cancer Institute of New Jersey

Peter Cole, MD, *Vice-Chair*
Rutgers Cancer Institute of New Jersey

Steven Halpern, MD, MBA
Morristown Medical Center

Daniel Notterman, MA, MD
Robert Wood Johnson University Hospital

Paulette Forbes, PhD, MPH, APN-BC
Rutgers Cancer Institute of New Jersey

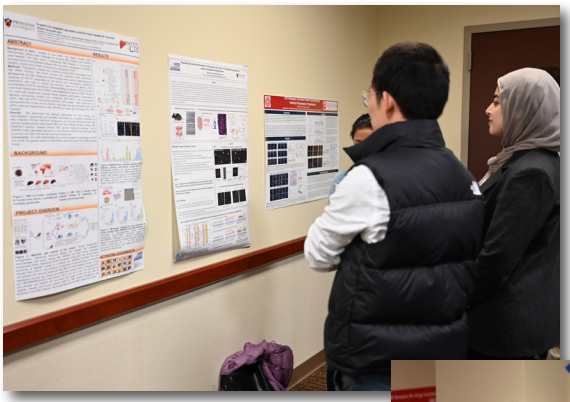
Rafat Ahmed, MD
Cooper Medical School of Rowan University

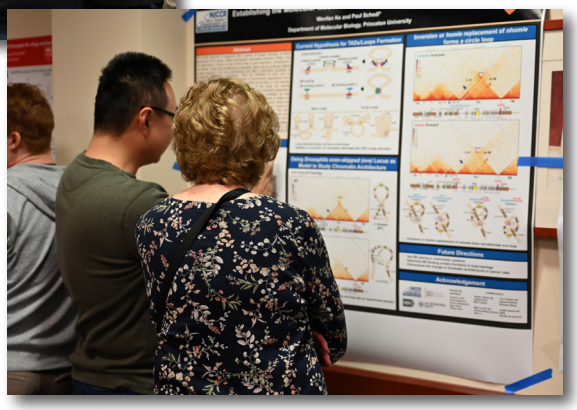
Alfred Gillio, MD
Hackensack University Medical Center

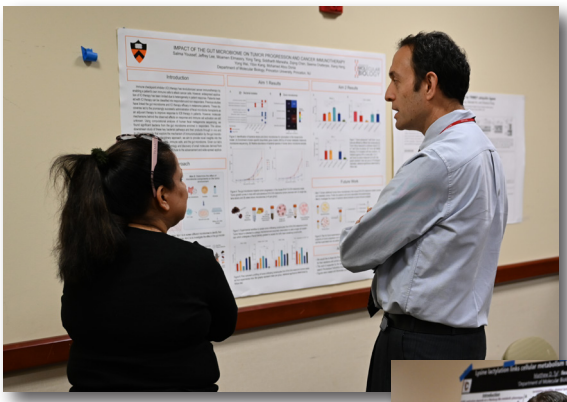
The Commission's leadership and staff provide vital linkages to implement its programs and ensure day-to-day operations.

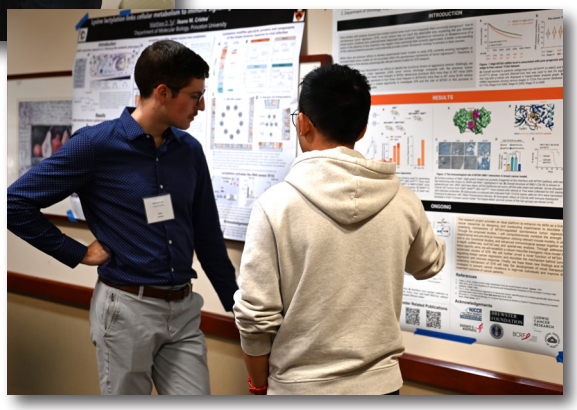
Highlights from the Cancer Commission Symposium

NJCCR 2023 Annual Symposium Poster Presentation by Grantees







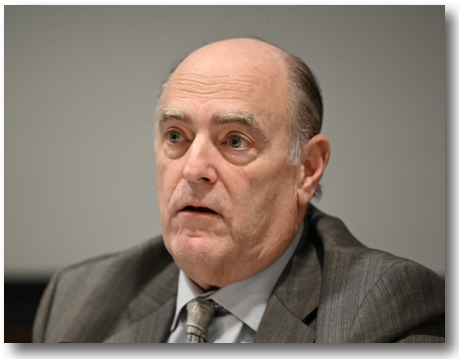


NJCCR 2023 Annual Symposium Panel Discussion

Yibin Kang, PhD

Anita Kinney, PhD

Mark Kaplan, PhD



Daniel Notterman, MD

NJCCR 40 year Celebration; Dr. Adler, *Chair* & Lisa Cummings, *Executive Director*

Proclamation issued by the Governor of New Jersey for May as Cancer Awareness Month

The New Jersey Commission on Cancer Research promotes significant and original research into the causes, prevention and treatment of cancer and serves as a resource to providers and consumers of cancer services.

Appendix I: Cancer Commission on Research Legislation (N.J. Stat § 52:9U-1 (2011))

THIS SECTION IS CURRENT THROUGH NEW JERSEY 214TH LEGISLATURE

2ND ANNUAL SESSION (P.L. 2011 CHAPTER 51 AND JR 3)

STATE CONSTITUTION CURRENT THROUGH THE NOVEMBER, 2010 ELECTION; ANNOTATIONS CURRENT THROUGH MAY 5, 2011.

TITLE 52. STATE GOVERNMENT, DEPARTMENTS AND OFFICERS SUBTITLE I. GENERAL PROVISIONS, CHAPTER 9U. CANCER RESEARCH ACT

GO TO THE NEW JERSEY ANNOTATED STATUTES ARCHIVE DIRECTORY
N.J. Stat.§ 52:9U-1 (2011)

§ 52:9U- 1 . Short title

This act shall be known and may be cited as the "Cancer Research Act."

HISTORY: L. 1983, c. 6, 1, eff. Jan. 17, 1983.

NOTES:
Cross References:
Legislative appropriations; breast cancer research project defined, see 54A: 9-25. 8.
Appropriation of monies deposited, see 54A. 9-25.8.

§ 52:9U-2. Legislative findings and declarations
The Legislature finds and declares that, although this State has the highest cancer death rate in the nation for many of the most frequently fatal types of cancer, it has provided relatively little encouragement for cancer studies at any of its local institutions involved in basic biological research; and that this failure has made New Jersey unattractive for the recruitment of highly skilled cancer investigators, has reduced the State's capacity to compete for its fair share of federal and private research dollars, and has been responsible for delaying the development of services and facilities necessary to conduct productive research. New Jersey's failure to make a concerted and intense effort in the war against cancer has deprived its citizens orthe benefits resulting from the latest advances in basic cancer research.

The Legislature further finds that the State can ill afford to continue its present policy in this regard. Corrective measures should be adopted promptly and funded adequately to make up for lost ground and to make the State competitive in the area of cancer research within the next 5 years.

HISTORY: L. 1983,c.6,2, eff.Jan. 17, 1983.

§ 52:9U-3. Definitions
As used in this act:
a. "Approved research project" means a scientific research project, which is approved by the commission and which focuses on the genetic, biochemical, viral, microbiological and environmental causes of cancer, and may include, but is not limited to, behavioral, socio-economic, demographic and

psychosocial research or research into methods of clinical treatment; or which focuses on pain management and palliative care for persons diagnosed with cancer.

b. "Commission" means the New Jersey State Commission on Cancer Research established pursuant to this act.

c. "Institutional support services" means all services, facilities, equipment, personnel and expenditures associated with the creation and maintenance of approved research projects.

d. "Qualifying research institution" means the Institute for Medical Research in Camden, New Jersey, the University of Medicine and Dentistry of New Jersey, Rutgers--The State University, Princeton University and any other institution approved by the commission, which is conducting an approved research project.

HISTORY: L. 1983, e. 6, § 3: amended 1984, c. 237, §I: 2000, c. 63, § 1, eff. July 13, 2000.

§ 52:9U-4. Commission on Cancer Research

a. There is established in the Executive Branch of the State government, the New Jersey State Commission on Cancer Research. For the purposes of complying with the provisions of Anidt! I·, Section II', paragraph I oftht! New Jersey Constitution, the commission is allocated within the Department of Health, but notwithstanding that allocation, the commission shall be independent of any supervision or control by the department or by any board or officer thereof.

b. The commission shall consist of 11 members, including the Commissioners of the Department of Health and the Depaitment of Environmental Protection or their appointed designees, and nine citizens of New Jersey or persons otherwise associated with the State, who are known for their knowledge, competence, experience or interest in medical research, appointed by the Governor with the advice and consent of the Senate.

c. The term of office of each appointed member shall be three years, but of the members first appointed, three shall be appointed for terms of one year, three for terms of two years, and one for a term of three years. The terms of office of the two additional members appointed pursuant to this amendatory act shall expire upon the expiration of the term of office of the member first appointed for a term of three years. All vacancies shall be filled for the balances of the unexpired tenns in the same manner as the original appointments. The members of the commission shall not receive any compensation for their services, but shall be reimbursed for the actual and necessary expenses incuffed in the performance of their duties as members of the commission.

§ 52:9U-5. Duties of commission

The commission shall:

a. Review and authorize approved research projects;

b. Apportion all available funds to qualifying resean;h institutions to finance approved research projects and necessary institutional support services;

Appendix I: Cancer Commission on Research Legislation (N.J. Stat § 52:9U-1 (2011)

c. Ensure that funds appropriated to approved research projects are not diverted to any other use;
d. Take steps necessary to encourage the development within the State of research projects on:
(1) the causes of cancer; and
(2) pain management and palliative care for persons diagnosed with cancer;
e. Compile a directory of all cancer research projects being conducted in the State; and
f. Provide the Governor and the Legislature with a report by January 30 of each year describing the status of the commission's activities and the results of its funded research efforts.

The commission is authorized to:
a. Adopt rules and regulations concerning the operation of the commission, the functions and responsibilities of its officers and employees and other matters as may be necessary to cany out the purposes of this act;
b. Maintain otrices at such places within the State as it may designate;
c. Employ an executive director and other personnel as may be necessary, whose employment shall be in the unclassified service of the State, except that employees performing stenographic or clerical duties shall be appointed pursuant to Title 11 (Civil Service) of the Revised Statutes;
d. Design a fair and equitable system for the solicitation, evaluation and approval of proposals for cancer research projects;
e. Apply for and accept any grant of money from the federal government, which may be available for programs relating to research on the causes of cancer;
f. Enter into contracts with individuals, organizations and institutions necessary or incidental to the performance of its duties and the execution of its powers under this act: and
g. Accept gilts, grants and bequests offunds from individuals, foundations, corporations, governmental agencies and other organizations and institutions.

§ 52:9U-6. I. Grants; qualified research institution defined
The New Jersey State Commission on Cancer Research shall solicit, receive. evaluate and approve applications of qualified research institutions for grants from the "New Jersey Breast Cancer Research Fund," established pursuant to section I of P.L.1995, c.26 (C 5-IA: 9-25.7), to conduct research relating to the causes, prevention, screening, treatment and cure of breast cancer. As used in this section. "qualified research institution" may include academic medical institutions, State or local government agencies, public or private organizations within New Jersey, and any other institution approved by the commission, which is conducting a breast cancer research project.

§ 52:9U-6.2. Applications for grants
The New Jersey State Commission on Cancer Research shall solicit, receive, evaluate and approve applications of qualified research institutions for grants from the "New Jersey Prostate Cancer Research Fund," established pursuant

to section I of P.L. 200 I, c. 30S (C 54-A: 9-25.21), to conduct research relating to the causes, prevention, screening, treatment and cure of prostate cancer. As used in this section, "qualified research institution" may include academic medical institutions, State or local government agencies, public or private organizations within New Jersey, and any other institution approved by the commission, which is conducting a prostate cancer research project.

§ 52:9U-6.3. Grants from "New Jersey Lung Cancer Research Fund"
The New Jersey State Commission on Cancer Research shall solicit, receive, evaluate and approve applications of qualified research institutions for grants from the "New Jersey Lung Cancer Research Fund," established pursuant to section I of P.L.2009, c.172 (C. 54A: 9-25.27), to conduct research relating to the causes, prevention, education, screening, treatment and cure of lung cancer. As used in this section, "qualified research institution" may include academic medical institutions, State or local government agencies, public or private organizations within New Jersey, and any other institution approved by the commission, which is conducting a lung cancer research project.

§ 52:9U-7. Chairman and vice-chairman; election; duties; duties of executive director
The members of the commission shall annually elect a chairman and a vice-chairman from among their number. The chairman shall be the chief executive officer of the commission, shall preside at all meetings of the commission and shall perform other duties that the commission may prescribe.

The executive director shall serve as secretary to the commission and shall carry out its policies under the direction of the chairman.

§ 52:9U-8. Annual appropriation
$ 1,000,000.00 shall be appropriated annually from the Cancer Research Fund established by P.L.1982. c. 40 (C 54:40A-8 et al.) to effectuate the purposes of this act, except that only $ 500,000.00 shall be appropriated from the fund in fiscal year 1982- 1983.

§ 52:9U-9. Research facilities; direct application for or receipt of funds from public or private agency
Nothing in this act shall preclude a qualifying research institution or any other research facility in the State from directly applying for or receiving funds from any public or private agency to conduct cancer research.

A dedicated non-lapsing is one approach to provide stable and predictable funding for cancer research. Additional funding will facilitate robust innovation and new therapies aimed at treating cancer.

Appendix II: New Jersey Pediatric Cancer Research Fund Statutes

CHAPTER 210 *(CORRECTED COPY)*

AN ACT concerning pediatric cancer research, supplementing chapter 9 of Title 54A of the New Jersey Statutes and supplementing and amending P.L.1983, c.6 (C.52:9U-l et seq.).

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

C.54A:9-25.47 "New Jersey Pediatric Cancer Research Fund."

1. a. There is established in the Department of the Treasury a special fund to be known as the "New Jersey Pediatric Cancer Research Fund."

b. Each taxpayer shall have the opportunity to indicate on the taxpayer's New Jersey gross income tax return that a portion of the taxpayer's refund or an enclosed contribution shall be deposited in the special fund.

c. Any costs incurred by the Division of Taxation for collection or administration attributable to this act may be deducted from receipts collected pursuant to this act, as determined by the Director of the Division of Budget and Accounting in the Department of the Treasury. The State Treasurer shall deposit net contributions collected pursuant to this section to the "New Jersey Pediatric Cancer Research Fund."

d. The Legislature shall annually appropriate all funds deposited in the "New Jersey Pediatric Cancer Research Fund" established pursuant to this section to the New Jersey State Commission on Cancer Research, established pursuant to section 4 of P .L.1983, c.6 (C.52:9U-4), for pediatric cancer research projects.

e. As used in this section, "pediatric cancer research project" means a scientific research project approved pursuant to section 2 of P.L.2021, c.210 (C.52:9U-6.4), which scientific research proj ect focuses on the causes, prevention, education, screening, treatment, or cure of pediatric cancer, or the symptoms or effects experienced by patients following completion of a course of treatment for pediatric cancer, and may include, but shall not limited to, basic, clinical, and epidemiologic research.

C.52:9U-6.4 Applications for grants.

2. The New Jersey State Commission on Cancer Research, in con~l. 1tation with theadvisory group established pursuant to section 3 of P.L.2021, c.210 (C.:t2:9U-6.5), shall solicit, receive, evaluate and approve applications of qualifying research institutions for grants from the "New Jersey Pediatric Cancer Research Fund," established pursuant to section 1 ofP.L.2021, c.210 (C.54A:9-25.47), to fund pediatric cancer research projects.

C.52:9U-6.5 Advisory group.

3. a. The New Jersey State Commission on Cancer Research shall establish an advisory group within the commission which shall be responsible for advising the commission on how moneys from the fund established pursuant to section 1 of P.L.2021, c.210 (C.54A:9-25.47) to support pediatric cancer research projects will be distributed by the commission.

4. Section 3 ofP.L.1983, c.6 (C.S2:9U-3) is amended to read as follows:
C.S2:9U-3 Definitions.

3. As used in this act:

"Approved research project" means a scientific research project, which is approved by the commission and which focuses on the genetic, biochemical, viral, microbiological and environmental causes of cancer, and may include, but is not limited to, behavioral, socioeconomic, demographic and psychosocial research or research into methods of clinical treatment; or which focuses on pain management and palliative care for persons diagnosed with cancer.

"Commission" means the New Jersey State Commission on Cancer Research established pursuant to this act.

"Institutional support services" means all services, facilities, equipment, personnel and expenditures associated with the creation and maintenance of approved research projects.

Appendix II: New Jersey Pediatric Cancer Research Fund Statutes

"Pediatric cancer research project" means a scientific research project approved pursuant to this act, which scientific research project focuses on the causes, prevention, education, screening, treatment, or cure of pediatric cancer, or the symptoms or effects experienced by patients following completion of a course of treatment for pediatric cancer, and may include, but shall not be limited to, basic, clinical, and epidemiologic research.

"Qualifying research institution" means the Coriell Institute for Medical Research in Camden, New Jersey, Rutgers--The State University, Rowan University, Princeton University and any other institution approved by the commission, which is conducting an approved research project. For the purposes of sections 2 through S of P.L.2021, c.210 (C.S2:9U-6.4 et al.), "qualifying research institution" may include academic medical institutions, State or local government agencies, public or private organizations within New Jersey, and any other institution approved by the commission, which is conducting a pediatric cancer research project.

5. Section S ofP.L.1983, c.6 (C.S2:9U-S) is amended to read as follows:
C.S2:9U-S Duties of commission.

5. The Commission shall:

a. Review ard authorize approved research projects;

b. Apportion all available funds to qualifying research institutions to finance approved research projects and necessary institutional support services;

c. Ensure that funds appropriated to approved research projects are not diverted to any other use;

d. Take steps necessary to encourage the development within the State of research projects on:
(1) the causes of cancer; and
(2) pain management and palliative care for persons diagnosed with cancer;

6. Section 8 of P.L.1983, c.6 (C.52:9U-8) is amended to read as follows:
C.52:9U-8 Annual appropriation.

8. $1,000,000.00 shall be appropriated annually from the Cancer Research Fund established by P.L.1982, c40 (C.54:40A-8 et al.) to effectuate the purposes of this act, except that only $500,000.00 shall be appropriated from the fund in fiscal year 1982-1983. The full amount of the annual appropriation from the Cancer Research Fund mandated by this section to effectuate the purposes of this act shall be made notwithstanding any monies received by taxpayer voluntary contribution through gross income tax return to any cancer research fund designated for a specific type or category of cancer by State law.

7. This act shall take effect immediately and apply to taxable years beginning on or after January 1 next following enactment.

Approved September 16, 2021.

NJCCR engaged with the Pediatric Advisory Group to assist with the identification and funding of scientific research projects that focus on translational research (from laboratory to the bedside) and pediatric cancer research projects.

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