Maine Medical Center Research Institute: 2017 Year in Review

Maine Medical Center Research Institute

Follow this and additional works at: https://knowledgeconnection.mainehealth.org/annualreports

Part of the Medical Education Commons, and the Translational Medical Research Commons

Recommended Citation
Maine Medical Center Research Institute, "Maine Medical Center Research Institute: 2017 Year in Review" (2017). Annual Reports. 1.
https://knowledgeconnection.mainehealth.org/annualreports/1

This Book is brought to you for free and open access by the Institutional History and Archives at MaineHealth Knowledge Connection. It has been accepted for inclusion in Annual Reports by an authorized administrator of MaineHealth Knowledge Connection. For more information, please contact mckeld1@mmc.org.
TABLE OF CONTENTS

Leadership & 2017 Stats 4

Biomedical Research 5

Clinical & Translational Research 8

Psychiatric Research 10

Health Outcomes Research 12

Education 14

2017 MAJOR RESEARCH GRANTS AWARDED

- **Research Area**: Cancer Genomics
  - **Principal Investigator**: Paul Han, MD
  - **$1.5M**: Harold Alfond Trust/Jackson Laboratory

- **Research Area**: Stroke
  - **Principal Investigator**: David Seder, MD
  - **$2.6M**: Patient Centered-Outcomes Research Institute

- **Research Area**: Autism
  - **Principal Investigator**: Matthew Siegel, MD
  - **$2.9M**: Simons Foundation & Nancy Lurie Marks Foundation

- **Research Area**: Metabolic Diseases - Obesity, Osteoporosis
  - **Principal Investigator**: Lucy Liaw, PhD
  - **$11M**: NIH’s National Institute of General Medical Sciences/Center of Biomedical Research Excellence Award

- **Research Area**: Cancer, Cardiovascular Disease, Substance Abuse, Aging
  - **Principal Investigator**: Clifford J. Rosen MD
  - **$20M**: NIH’s National Institute of General Medical Sciences/Clinical & Translational Research Award
Dear Friends,

Each year as the foliage is starting to garner our attention and as our fiscal year is coming to a close, I give a State of the Institute presentation to our faculty and staff. The presentation focuses on institutional and individual successes, opportunities going forward, and challenges old and new. Not surprisingly, part of the presentation is a report on the grant funding the Institute has received during the prior 12 months. It is the nature of our business that extramural funding ebbs and flows from month to month and year to year as new grants are awarded and older ones expire. Thus, there are good years and there are lean years — and then there is 2017.

The year just ended is the most remarkable funding year in the history of MMCRI. Through the hard work of our investigators, technical staff, administrative staff, and collaborators, MMCRI was awarded over $39 million in grants in 2017. These funds will serve to support our research activities with the goals of improving the care of our patients and our communities and advancing the science of medicine. Much of this funding came from two large federal grants of $20 million and $11 million, and three awarded by foundations/non-profit organizations.

This funding will advance research in chronic diseases such as cardiovascular, addiction, aging, and cancer, as well as metabolic diseases that include obesity and diabetes. In my recent address, I was anxious to acknowledge the principal investigators and research teams responsible for those major awards. But prior to that celebration, I chose to recognize one of our junior investigators, Michaela Reagan, and our Vector-borne Laboratory for their accomplishments in being awarded the smallest grants in 2017, each for about $2,000. Although comparably small in amount, each grant grew out of the same scientific drive, intellectual curiosity and dedication shown by those working on the largest grants in our portfolio. Each award, no matter the size, better positions us to accomplish our mission.

The pages that follow highlight the work underway from these research awards, and much more. I hope you enjoy taking a closer look at the research and the individuals taking on this exciting work. I extend my admiration and congratulations to all for helping make 2017 a year of wonderful accomplishments.

Sincerely,

Don St. Germain, MD, Director & Vice President of Research
Maine Medical Center Research Institute
MMCRi At A Glance

2017 Leadership

Executive Administration
Donald St. Germain, MD
Director & VP Research

Rick McAllister, MEd
Senior Director, Research Administration

Center Leadership
Thomas Gridley, PhD
Interim Director, Center for Molecular Medicine

Paul Han, MD, MA, MPH
Director, Center for Outcomes Research & Evaluation

Susan Santangelo, ScD
Director, Center for Psychiatric Research

Clifford Rosen, MD
Director, Center for Clinical & Translation Research

For a full list of Principal Investigators, Affiliated Faculty, and Staff, please visit our website, www.mmcri.org

2017 FAST FACTS

180 Staff Members

$39 Million Grants Awarded

200+ Clinical Trial Studies

255 Scientific Publications

12 Core Facilities with State of the Art Equipment (see in depth story, page 5) and BioBank Tissue Repository with Over 100,000 Human Tissue Samples Distributed

2017 Sources of Research Support

By Sponsor Type

Industry: 57.0%
Federal: 18.8%
Foundation & Nonprofit: 24.2%
Center for Molecular Medicine

Funding from NIH Helps Build Research Excellence in Understanding Causes of Metabolic Disease

It was an exciting summer for MMCRI; on the heels of a NIH $20 million award (see details page 6), the Institute was awarded a five-year, $11 million Center of Biomedical Research Excellence (COBRE) grant also by the National Institutes of Health. This funding will establish a multidisciplinary research center at MMCRI to model the basis of human metabolic diseases. This program includes partnerships between Maine Medical Center and the University of Maine, the University of New England and Brown University.

The COBRE program is led by Dr. Lucy Liaw, Associate Director of the Center for Molecular Medicine, with support from Dr. Cliff Rosen, Director of The Center for Clinical & Translational Research at MMCRI, and Dr. Irwin Brodsky, Maine Medical Partners Endocrinologist and Clinical Advisor. The overall goal is to address obesity, osteoporosis and diabetes – all metabolic diseases common in Maine – by understanding pathways that lead to these disorders.

“One feature of this COBRE award is that it supports young investigators as they embark upon independent research projects,” says Dr. Liaw. The COBRE award provides funding to four young investigators (see infographic, right) to conduct cellular, molecular, biochemical and clinical research. Dr. Liaw adds, “We have established a network of mentors and consultants to provide strong support for these investigators as they launch their careers. Fostering and maintaining talent in Maine is crucial for the growth of biotechnology in our state.”

The award also supports the expansion of state-of-the-art technology, including advanced protein and lipid analysis and bone measurements, and the assessment of physiology and body metabolism. For more details and progress of the metabolic COBRE: www.mmcri.org/metabolic_cobre.
Center for Molecular Medicine

New Federal Research Grants: Cancer, Heart, & Endocrine Disease

Drs. Peter Brooks, Sergey Ryzhov, and Arturo Hernandez in the Center for Molecular Medicine all were successful in obtaining new federal grant funding this past year to support innovative research projects.

Cancer & the Immune System
Peter Brooks, PhD
Peter Brooks is a cancer researcher with new funding from both the National Institutes of Health (NIH) and the Department of Defense (DOD). Both projects focus on the immune system and developing potential therapeutics that may help the body activate its natural immune cells to detect and destroy tumor cells. The DOD project focuses on ovarian cancer, which has been difficult to treat with current immunotherapies. The Brooks lab discovered that a cancer-specific fragment of collagen seems to allow ovarian cancer cells to hide from immune cells, and they have developed a specific antibody that can bind and block this collagen fragment. The project will test whether this antibody can thus “reactivate” immune control of ovarian cancer and assist in anti-cancer therapies. The NIH project focuses on malignant melanoma, for which the survival rate is still low, despite treatment. This laboratory research is critical in the development of new, targeted therapies with the potential to improve the health outcomes of cancer patients.

Heart Disease
Sergey Ryzhov, PhD
Dr. Ryzhov is also studying the body’s natural immune system, in the context of heart disease. Myocardial infarction, or a heart attack, happens to someone in the United States every 40 seconds. This NIH funded project studies the growth factor neuregulin and its interaction with its receptor, ERBB3. The Ryzhov lab discovered that this signaling axis controls the shift of inflammatory cells from a pro-inflammatory state to a pro-resolution state. Early after myocardial infarction, immune cells infiltrate to repair the heart tissue, but need to be shut down to avoid chronic inflammation. The lab has identified neuregulin as a factor that can promote resolution of inflammation, which could partly explain why neuregulin provides a beneficial effect following myocardial infarction.

Thyroid & Genetics
Arturo Hernandez, PhD
Dr. Hernandez studies the consequences of thyroid hormone alterations during the developmental period for neuroendocrine and neurological function in later life. His lab focuses on the type 3 deiodinase (Dio3), a critical enzyme that limits the levels of exposure to thyroid hormone. The recently awarded NIH grant is based on the finding that a developmental overexposure to thyroid hormone leads to neurological abnormalities not only in the individuals affected, but also in their unexposed descendants due to mechanisms of transgenerational epigenetic inheritance. Some of the neurological abnormalities observed include aberrant brain morphology and cytoarchitecture, hydrocephalus and altered mood and social behavioral profiles of relevance to human conditions like anxiety, depression, attention deficit and hyperactive disorder, autism and schizophrenia. This work may partly explain the unidentified heritable etiology of some of these conditions and lead to novel epigenetic-based clinical tools for risk assessment, prevention and response to clinical treatment.

PATENTS

AARON BROWN, PhD & LEIF OXBURGH, DVM, PhD
Culture conditions for expansion of nephron progenitor cells

VOLKHAND LINDNER, MD, PhD
Kit for detecting Cthrcl in a sample
High-Tech & Collaboration are Key Elements to Physiology Core Success

“Our Core feels like more of a collaboration than a service,” says Victoria DeMambro, Manager for Principal Investigator Cliff Rosen’s Physiology Core Facility at MMCRI. This atmosphere of collaboration brings her and her colleagues a tremendous amount of satisfaction in their efforts to provide researchers with comprehensive, in-house metabolic and cellular phenotyping of mouse strains.

The Physiology Core at MMCRI, established in 2012, was championed by Dr. Rosen and others, and developed initially in response to a new demand in the field of Stem Cell Biology that researchers move from cell-based assays to mouse models to study changes in whole organism physiology. With a focus on assessing metabolic phenotypes for novel mouse models of human disease, analyses from this core facility provide insight into “on target” and “off target” tissue phenotypes, and increase our understanding of the physiological implications of changes in regulators of stem and progenitor cell formation.

To complement assays for biochemical markers of skeletal and soft tissue metabolism, sixteen high-tech Promethion metabolic mouse cages (like the one behind DeMambro pictured above) provide eighty-seven distinct readings on each mouse per second—collected over the course of about five days per experiment—on mouse activity, body composition, oxygen consumption, CO2 production, heat production, physical and behavioral profiles, and diet and fluid intakes.

The Physiology Core provides this real-time data on metabolic phenotypes to fully complement other biochemical studies for comprehensive hematological, metabolic, and skeletal phenotyping. This output is coupled with dual energy X-ray absorptiometry/NMR analysis that measures in vivo body composition in a cross-sectional or longitudinal manner. A recently up-graded Seahorse XFe96 analyzer provides advanced cellular and mitochondrial bioenergetics data, to quantify oxidative phosphorylation and glycolysis in cells and tissues.

DeMambro notes many sources of satisfaction and success from the Physiology Core. Most important among these are being able to provide help to numerous new and established researchers who go on to publish their work, and helping a number of early-career investigators begin to acquire their own research funding. Her enthusiasm is high around the Core’s role in supporting MMCRI’s new COBRE in Mesenchymal and Neural Regulation of Metabolic Networks grant projects – each of which is led by an early-career MMCRI researcher. For more information on MMCRI’s 12 core facilities and services, please visit our website: www.mmcri.org.

Noteworthy

EVENTS

RESEARCH RETREAT - MAY 3, 2017
MMCRI and Maine Medical Center coordinated a multidisciplinary biomedical research symposium, bringing together more than 200 physicians, nurses, health care providers, scientists and trainees from over 15 hospital departments, as well as affiliate institutions in Maine, and from neighboring states in New England.

SEMINAR SERIES
MMCRI hosted 20 seminar guests in 2017.

DATA REVIEW SERIES
 MMCRI graduate students, postdoctoral trainees, Staff Scientists, and Core Directors delivered 32 Data Review Sessions for their colleagues in 2017.
$20M from NIH Will Establish Northern New England Clinical & Translational Research Network

In July, the National Institutes of Health (NIH)/National Institute of General Medical Sciences (NIGMS) awarded a five-year, $20 million research grant to Maine Medical Center and its partnering institutions, the University of Vermont and the University of Southern Maine, to establish the Northern New England Clinical and Translational Research Network (NNE-CTR), a consortium dedicated to enhancing collaborative biomedical research activities for the improvement of human health. This consortium joins nine other NIGMS supported regional networks across the country.

Clifford Rosen, MD, Director of the Center for Clinical and Translational Research at MMCRI, and Gary Stein PhD, Director of the University of Vermont Cancer Center, will co-lead the program along with Program Coordinators, Thomas Gridley, PhD, (MMCRI) and Gordon L. Jensen, MD, PhD, (UVM).

Collaborations with researchers at Tufts University School of Medicine and the Geisel School of Medicine at Dartmouth will serve to extend the capabilities of the network and its reach across the region.

The NNE-CTR aims to help researchers develop and implement innovative medical treatments for many chronic diseases prevalent in our region including cancer, heart disease, obesity, diabetes, Alzheimer’s disease and substance abuse. Research activities will also focus on defining optimal methods of disease prevention and health care delivery in rural environments, where approximately 60 percent of Maine’s population resides.

The network will also train the next generation of biomedical scientists, physicians and nurses in research methodology to attract additional research support to the region.

Such initiatives are critical in meeting the healthcare needs of the region’s aging population in an era when groundbreaking medical treatments are rapidly being developed.

“Our goal is to support innovative and transformative research, increase participation in clinical research and improve access of our rural residents to clinical studies. This will ultimately improve the health and vitality of the people of Maine, Vermont, and New Hampshire,” said Dr. Rosen.
**Clinical Investigator Spotlight: Dr. David Seder**

SETPOINT2 is an international, multi-site clinical trial to improve outcomes for patients who have suffered a severe stroke by assessing the best timing of tracheostomies. Heading this study is Dr. David Seder, the US Principal Investigator (Maine Medical Center), along with Dr. Julian Bösel, the German Principal Investigator (University of Heidelberg).

The SETPOINT2 study findings could benefit patients because the timing of a tracheostomy may affect the amount of sedating medications that is required, and could affect brain recovery and the body’s ability to return to pre-stroke activities. Preliminary studies suggest it could be beneficial to perform a reversible tracheostomy procedure earlier than is usually done after severe stroke (within the first 5 days) as opposed to delaying more than 10 days before performing the procedure. This $2.6 million dollar research grant was awarded by the Patient Centered Outcomes Research Institute (PCORI). The name SETPOINT2 stands for Stroke-Related Early Tracheostomy vs Prolonged Orotracheal Intubation in Neurocritical Care Trial2.

The SETPOINT2 study is committed to keeping patients informed as well as incorporating their insight for the research. Through the study’s website — (www.setpoint2.org) and quarterly newsletter, patients and site investigators can learn more about the study and its progress. In addition, both the US and German lead sites have Research Advisory Committees (RAC) that meet biannually. Each RAC is made up of former patients, caregivers, research coordinators, program managers, clergy, and other community support members to review the study’s progress and give insight to help shape the research program moving forward.

“The RAC is paramount for improving our study and patient outcomes,” says Seder. “I am excited about the study’s progress and are looking forward to enrolling more patients at our 24 sites across the US and Germany.”

---

**Vector-borne Disease Lab 2017 Update**

**Director, Robert Smith, MD, MPH**

As climate change disrupts ecological systems, established patterns of disease transmission by ticks and mosquitos change. In collaboration with the Maine Centers for Disease Control, the Vector-borne Disease Laboratory (VBDL) at MMCRI (with our vector ecologist Charles Lubelczyk as Project Leader) developed a program with two research initiatives: 1) creation of a statewide surveillance program for mosquito-borne viruses, and 2) development of a mosquito-rearing facility, to be used for the monitoring of pesticide resistance in mosquitoes.

Mosquito-borne West Nile virus and Eastern Equine Encephalitis are emerging in Maine, with cases, including one fatality, reported for the first time in our state during recent years. Collaborations with several University of Maine campuses as well as Acadia National Park and the University of Southern Maine (Fig. 1) employ students as field technicians, giving some their first experience in the fields of public health and eco-epidemiology.

The VBDL’s current research on tick borne diseases includes risk projection based upon climate change, studies on newly recognized agents of disease transmitted by deer ticks, and evaluation of a new diagnostic methodology for Lyme disease.

By 2050, Maine is expected to be approximately 2°C warmer and 5-10% wetter than present. Research associate and University of Maine PhD candidate Susan Elias has gathered data to test the hypothesis that Lyme disease in Maine is associated with warm winters and humid summers, in addition to focal high white-tailed deer density, presence of invasive plant species, and suburbanization.

**Dr. Rebecca Robich and Margaret Welch**

completed a survey of the presence of deer tick virus in Maine. The VBDL is seeking to better understand the ecological factors and human risk factors that can lead to rare but devastating human infections by this virus, which caused the death of a woman in the Midcoast area.

In collaboration with **Dr. Peter Krause** of Yale School of Public Health, **Dr. Robert P. Smith**, VBL Director, continued a multi-year study to better understand the pathogenesis and clinical spectrum of tick-borne babesiosis and of a newly recognized agent of relapsing fever, *Borrelia miyamotoi*.

On the Lyme disease front, the lab initiated a pilot project on the use of a novel diagnostic test for early Lyme disease. Our collaborators for this project include the Division of Infectious Diseases at Johns Hopkins and an independent biotech company. Lastly, if you’d like to read a historical journey, check out the VBDL’s co-founder Pete Rand’s memoir, *Of Ticks and Islands*, which provides a lively and personal account of our early adventures in the field.
Center for Psychiatric Research

First of its kind, SPARK Northern New England received funding April 2017

The major focus of the Center for Psychiatric Research is on uncovering the biological underpinnings of psychiatric disease and behavioral dysfunction including, for example, investigating genetic risk factors underlying neurodevelopmental disorders such as autism. SPARK is a landmark online research partnership designed to speed up our understanding of the causes of autism and how autism impacts all those affected.

SPARK’s goals are twofold. First, the project will identify the hundreds of autism genes at play and link them to the biological mechanisms that they govern, as well as any environmental factors to which those with autism may have been exposed. Second, it seeks to connect these individuals and families to research opportunities that advance the understanding of autism.

Maine Behavioral Healthcare and MMCRI were chosen as the clinical site for Northern New England, one of 25 clinical sites across the nation. “SPARK is a unique opportunity for people in Maine, New Hampshire and Vermont to participate in cutting edge research and receive results from the most advanced genetic analysis available,” says Matthew Siegel, M.D., Principal Investigator for SPARK Northern New England.

The study is funded by the Simons Foundation Autism Research Initiative. This first of its kind study will be done entirely online to encourage all in the autism community to participate, with the goal of establishing the largest online autism research cohort—50,000. There have been 703 participants enrolled to date in the SPARK Northern New England study.

Since there is no singular cause of autism, there is still much we do not know. The knowledge gained through scientific research like SPARK is moving us closer to better understanding the causes of autism and developing effective treatments and tools for the everyday challenges autism brings. For more information about SPARK Northern New England see sparkforautism.org/mainemedicalcenter.

---

Noteworthy

ECT’s Role in Patients with Dementia & Behavioral Disturbance

Dr. Rago is the Chief Resident for Research & Quality Improvement in Psychiatry at Maine Medical Center (MMC). She is currently the Principal Investigator on a study analyzing the efficacy and safety of electroconvulsive therapy (ECT) in patients with dementia and behavioral disturbance, which is taking place at the inpatient Psychiatry Unit (P6) at MMC. The study began in 2016 and is funded by a Mentored Research Grant from MMCRI.

“In addition to establishing the safety and efficacy of this intervention in this population, we anticipate that data collected in this observational study will provide insight into which patients (with what clinical manifestations) are predicted to have a positive response to ECT,” says Dr. Rago. “We also hope to inform future discussion of depression in patients with dementia.”
The Autism & Developmental Disorders Inpatient Research Collaborative (ADDIRC) is a research consortium of specialized child psychiatry in-patient units that serve children and adolescents with autism and developmental disorders. ADDIRC was launched in 2013 and is led by Dr. Matthew Siegel and Susan Santangelo. Until recently, adequate phenotypic and biological data from individuals severely affected by autism was lacking. Now that has changed due to the Autism Inpatient Collection (AIC) phenotypic database and biorepository which was created by the ADDIRC and is supported by grants from the Simons Foundation Autism Research Initiative and the Nancy Lurie Marks Family Foundation.

Highlights since the launch of ADDIRC & AIC:

- Screened 2172 inpatient youth (499 patients screened in year 4)
- 1158 Subjects enrolled & 911 Subjects with ASD confirmed
- Biosamples collected from 791 confirmed ASD subjects and 916 biological parents comprising 194 singletons, 278 proband/parent duos, and 319 trios
- 14 total manuscripts published or in review; 16 conference posters plus 3 recent abstracts submitted

The study is scheduled to conclude October 2018. For more information about ADDIRC, AIC and a list of Coordinating & Participating Site Members go to [www.mmcri.org/cpr](http://www.mmcri.org/cpr).

Study Looks at Effects of Earthquakes in Nepal

On April 25, 2015 a magnitude 7.8 earthquake struck Nepal, killing more than 8,000 people and injuring over 21,000. As a result, hundreds of thousands of Nepalese were homeless and entire villages were flattened in many areas. Complicating matters, on May 12, 2015 the largest aftershock occurred (magnitude of 7.4) followed minutes later by a magnitude 6.3 shock. More than 450,000 people were displaced overall.

The horrific effects of earthquakes go far beyond immediate physical destruction. It is difficult to imagine the losses both physical and mental that can occur during such devastation. Until now there was limited knowledge regarding post-disaster psychopathology, and even mental health in general in the Nepali population. Through internal funding, Susan Santangelo, the Director of the Center for Psychiatric Research at MMCRI, was able to launch the Nepal PTSD Project in March 2016.

“The goals of the project are to determine the prevalence of PTSD, depression, resilience and factors associated with event impact among earthquake survivors,” says Santangelo. “In addition, we trained college students in Skills for Psychological Recovery (SFR) to enable the students to train villagers to ultimately help each other.” Currently, data are being analyzed to determine the impact of teaching skills for psychological recovery to the villagers.

Autism & Developmental Disorders Inpatient Research Collaborative (ADDIRC) Update: Autism Inpatient Collection (AIC)

The Autism & Developmental Disorders Inpatient Research Collaborative (ADDIRC) is a research consortium of specialized child psychiatry in-patient units that serve children and adolescents with autism and developmental disorders. ADDIRC was launched in 2013 and is led by Dr. Matthew Siegel and Susan Santangelo. Until recently, adequate phenotypic and biological data from individuals severely affected by autism was lacking. Now that has changed due to the Autism Inpatient Collection (AIC) phenotypic database and biorepository which was created by the ADDIRC and is supported by grants from the Simons Foundation Autism Research Initiative and the Nancy Lurie Marks Family Foundation.

Highlights since the launch of ADDIRC & AIC:

- Screened 2172 inpatient youth (499 patients screened in year 4)
- 1158 Subjects enrolled & 911 Subjects with ASD confirmed
- Biosamples collected from 791 confirmed ASD subjects and 916 biological parents comprising 194 singletons, 278 proband/parent duos, and 319 trios
- 14 total manuscripts published or in review; 16 conference posters plus 3 recent abstracts submitted

The study is scheduled to conclude October 2018. For more information about ADDIRC, AIC and a list of Coordinating & Participating Site Members go to [www.mmcri.org/cpr](http://www.mmcri.org/cpr).
Understanding New Genomic Tumor Tests

CORE’s focus is on conducting innovative research to understand and improve patient-centered outcomes in healthcare delivery. In 2017, CORE received a $1.5 million subcontract to lead the outcomes evaluation for the Maine Cancer Genomics Initiative (MCGI). Led by the Jackson Laboratory (JAX) and supported by the Harold Alfond Foundation, the MCGI is a unique collaboration between research and clinical institutions to evaluate implementation of precision medicine in oncology throughout Maine.

A team at CORE, led by Principal Investigator Dr. Paul Han (pictured above), is partnering with the MCGI team at JAX (led by Drs. Jens Reuter & Andrey Antov), to study the implementation of tumor genomic testing and downstream outcomes that will inform the implementation of precision medicine in oncology, and develop a sustainable research-healthcare system partnership model.

The research aims of the MCGI are:

- To characterize the feasibility and outcomes of implementing tumor genomic testing in oncology practice.
- To understand physician and patient knowledge, attitudes, and experiences regarding the implementation of tumor genomic testing in oncology practice.

The MCGI has begun recruiting and enrolling patients and physician participants at oncology practices throughout the state. CORE’s team is working closely with their JAX colleagues to carry out the study protocol and collect data that will inform the implementation of tumor genomic sequencing in community settings as precision medicine becomes more widely adopted throughout the United States. CORE’s multidisciplinary team on the MCGI includes Leo Waterston, MA, Sue Miesfeldt, MD, Eric Anderson, PhD, Christine Duarte, PhD, Lee Lucas, PhD, Kim Murray, MS, Caitlin Gutheil, MS, and Hayley Mandeville, MPH.

“Cancer patients typically get their care at community hospitals, in rural or suburban settings, and this is especially true in Maine,” says Dr. Han. “The MCGI provides a unique opportunity to understand and improve the implementation of emerging genomic technologies in community-based settings in Maine and beyond.”

What are the key Components of MCGI?

- Provide 1800 cancer patients with access to genomic tests
- Establish a collaborative Maine-wide precision medicine research network
- Provide educational programs on cancer genomics and precision medicine
- Design a study protocol that measures the impact of the initiative and provides basis for future research

Graphic Source: The Jackson Laboratory 2017
Reducing the Risks of Lung Cancer through Prevention & Education

The Maine Lung Cancer Coalition (MLCC) is a 4-year statewide, multi-institution, multi-disciplinary initiative, begun in August 2016, whose goals include improving evidence-based lung cancer prevention, early detection, stakeholder engagement and education, and research and data analytics to gain a better understanding of lung cancer determinants, disparities, and outcomes. MMCRI is the lead institution for the Coalition, which is led by Dr. Paul Han (Principal Investigator), Dr. Neil Korsen (Co-PI), and Leo Waterston (Project Director). The MLCC is funded by grants from the Bristol-Myers Squibb Foundation and the Maine Cancer Foundation totaling $5.4M, and in-kind support was provided by the Maine Economic Improvement Fund. The MLCC brings together diverse stakeholders across the entire state to work together to reduce suffering and death from lung cancer, with a special focus on vulnerable rural populations with limited access to health care.

The MLCC held its first annual Advisory Board meeting in June 2017, at Pineland Farms in New Gloucester, Maine. The Advisory Board members represent key stakeholder groups in Maine, including healthcare providers, legislators, insurers, employers, government, and lung cancer survivors. Several MLCC consultants also attended the meeting including Dr. Jamie Studts, Principal Investigator of the Kentucky LEADS Collaborative, who shared his experience leading a similar statewide lung cancer initiative. Lung cancer is the leading cancer killer of both men and women in the United States, with Maine’s lung cancer rates 30% higher than the national average. The MLCC will help to change those figures in Maine by developing, implementing and evaluating innovative programs to increase access to lung cancer prevention and treatment services in Maine, targeting rural high-risk populations.

Noteworthy

As part of CORE’s partnerships with the Maine-Health Center for Performance Improvement and the MMC Department of Medical Education, Dr. Kathleen Fairfield helped lead the development of a new 1-year Certificate in Health Improvement, offered jointly through MMC and The Dartmouth Institute for Health Policy & Clinical Practice (TDI). The MMC-TDI Certificate Program is designed for inter-professional teams who are willing to analyze practice patterns and population health reports to understand improvement opportunities. These teams will leverage partnerships outside traditional boundaries, foster inter-disciplinary teamwork, and lead the change to improve health care delivery and population health. The program’s inaugural cohort is currently completing the certificate, with plans for a new cohort to enroll every year.

In partnership with the MMC Department of Medical Education, CORE is leading the evaluation of the (Inter-professional Partnership to Advance Care and Education (iPACE) program, an innovative project to redesign the clinical learning environment to improve inter-professional care and education. Funded by the “Pursuing Excellence” initiative of the Accreditation Council for Graduate Medical Education (ACGME), the iPACE program aims to optimize patient-centered care; resident engagement in patient safety and quality; provider and staff well-being and satisfaction; and the efficiency of care and education. The centerpiece of the program is the establishment of a new 18-bed patient care unit fundamentally redesigned to foster inter-professional clinical learning and care. MMC is one of 8 premier “Pathway Innovator” institutions in the country that was selected to participate in this ACGME program.

CORE hosted seven students and trainees over the past year, including undergraduate, graduate, medical, and postdoctoral trainees from around the United States and Europe. These internships and fellowships resulted in several peer-reviewed abstracts, publications, and presentations at national medical conferences.

For more information about CORE go to www.mmcri.org/core
What is your connection to Maine Medical Center Research Institute?
I first heard about MMCRI in October of 2015 when I sat down at a guest lecture given by Dr. Lucy Liaw at University of Southern Maine. I had enrolled at USM to complete a second degree with the eventual aim of applying to MD programs. A newcomer to science, I had been fascinated by my introductory courses like cellular biology, physiology and biochemistry. The fact that Dr. Liaw’s talk drew on concepts from not just one but seemingly all of these disciplines sparked my curiosity. I attended MMCRI’s open house, and a few weeks later was welcomed to the Liaw lab as an academic intern. I remained at the Dr. Liaw’s lab for the following 18 months in what would prove to be my most enriching and exciting academic experience to date. I was fortunate enough to work not only as an intern, but subsequently as an American Heart Association funded fellow and finally a research assistant. In July of 2017 I left MMCRI to begin as an MD candidate at Tufts University School of Medicine in the Maine Track program.

Why did you seek a research position at MMCRI?
As I listened to Dr. Liaw's guest lecture in 2015, it dawned on me that science is an unending endeavor and that her lab just down the road at MMCRI was actively posing and exploring new questions about the biology of blood vasculature. I was thrilled by the idea that there were thousands of questions still unanswered - unasked, even - building upon those fundamental concepts I was studying at USM.

What surprised you or was unexpected about working at MMCRI?
I was most surprised and impressed by the spirit of mentorship, collaboration, and education guiding the work at MMCRI. I returned to academics in 2015 after pursuing a career as a journalist in New York, working at various television networks over the course of six years. My experience showed me that in many other fields and industries work is often siloed and independent.

How did the experience influence your professional/career ambitions? MMCRI exposed me to a world of biomedical research that pushes forward the boundaries of biochemistry, genetics, and developmental biology every day. Though I will, one day, practice medicine as a specialized clinician, I hope that my career can encompass research as a physician scientist. Without my experiences at MMCRI, I might never have discovered the joys and rewards of scientific research.

Noteworthy

MMCRI/INBRE CAREER PANEL “Exploring Graduate School and Careers in Science, Biomedical & Health Research”, was held on May 30, 2017, and included an overview of UMaine PhD and USM MPH programs, a career panel of 14 professionals, and a tour of MMCRI.


FIELD TRIPS HOSTED Scarborough High School Gifted & Talented Program, Greater Portland Christian School Chemistry & Biology classes, and several high schools in Central Maine with Gifted & Talented programs.
**Career Development Awards for Young Investigators**

MMCRI supports the training and career development of young professionals pursuing careers in biomedical research. These outstanding young investigators have been successful in receiving recognition and external funding for their research:

**NIH Predoctoral Research Fellowship**
Sarah McCarthy, Oxburgh Lab  
To study factors involved in abnormal development of the kidney and help find treatment for chronic kidney disease.

**NIH Postdoctoral Research Fellowships**
Katie Bishop, PhD, Rosen Lab  
To study the mechanism by which Dock7, a novel therapeutic target, promotes bone formation and couples bone remodeling in order to develop more effective treatments for osteoporosis.

Sarah Peterson, MD, PhD Sawyer/Ryzhov Lab  
To investigate the role of Neuregulin/ERBB3 signaling in resolving the systemic inflammatory response following open heart surgery.

**American Heart Association Postdoctoral Fellowship**
Amanda Lessard, PhD, Sawyer/Ryzhov Lab  
To investigate the role of retinoic acid in repair of the adult heart after cardiac injury.

**American Heart Association Predoctoral Fellowship**
Jessica Davis-Knowlton, Liaw Lab  
To investigate the role of vascular smooth muscle cell Notch2 on atherogenesis and plaque burden.

**American Heart Association Mentored Clinical and Population Research Award**
Michael Robich, MD  
To study the potential beneficial effects of resveratrol on the cardiovascular system particularly in patients with diabetes mellitus.

**NIH Career Development Awards**
Katherine Motyl, PhD  
To determine the neural and skeletal mechanisms through which a particular protein alters bone and marrow fat metabolism.

Elizabeth Rendina-Ruedy, PhD  
To study bone metabolism in patients with type 2 diabetes mellitus to better understand bone biology which might ultimately contribute to the development of novel therapies to protect patients from diabetic fracture.

**Abby Fleisch, MD, MPH**  
To investigate preventable early life determinants such as prenatal air pollution exposure in order to better inform public health interventions to improve early childhood health.

Teresa May, DO  
To identify cardiac arrest patients at high risk of seizure during their ICU stay and see if changes in their treatment will help their brains heal.

**Alexa Craig, MD**  
To study the safety and efficacy of delayed rewarming in neonates as a post-cardiac surgery temperature management strategy to improve developmental outcomes.

**American Association For the Surgery of Trauma Research Education and Scholarship Award**
Damien Carter, MD  
To study the application of topical stress signaling inhibitor on burned skin areas to more effectively treat patients with severe burns.

**NIH Small Grant Program (R03)**
Anyonya Guntur, PhD  
To better understand the metabolic pathways that control lineage allocation and identify novel anabolic therapeutic targets that may help in treatment of osteoporosis.

---

**FACTS & FIGURES**

10 Rotating & Fulltime Graduate Students  
10 Research Fellows  
29 Academic Interns:  
15 different labs & research areas  
2 International Visiting Scholars  
2 MMC Medical Residents  
6 Student Employees
Enhancing the health of our population through excellence in research across the spectrum of the biomedical and health sciences.

By donating to MMCRI, you help bring the latest scientific discoveries to the bedside and improve the quality of care patients receive. Today’s groundbreaking study could be tomorrow’s life-saving treatment. Your gift will help support research projects that further our understanding of disease processes, which enables us to develop better diagnostics and treatment.

Areas of opportunity for support of MMCRI’s laboratory-based or clinical research projects include: Cardiovascular Disease, Cancer, Bone and Mineral Disease, Molecular Biology and Genetics, Clinical Trials, Psychiatric Research, and Vector Borne Diseases.

Our efforts go beyond research, as well: by supporting our summer scholarships, you will help us educate and cultivate the next generation of researchers, and ensure that the quest for knowledge and insight continues for years to come.

If you’re interested in supporting the work of Maine Medical Center Research Institute, please contact Laura Hellen of the Philanthropy Department at (207) 662-5587 or by email at lhellen@mmc.org.