

The future of medicine is at

OHIO STATE

**\$3
BILLION**
in capital
improvements

**Ranked 2nd
in the nation**
for highest percentage
of African American
students

**TOTAL
NIH FUNDING
↑38.1%**

10,000 +
transplants performed

*Future Interdisciplinary Health Sciences building,
home of the new Ohio State College of Medicine*



LETTER FROM THE DEAN



It's just the right time to be at The Ohio State University College of Medicine. We are busy, innovative and rapidly growing — and large — with 2,500 students (850 in medicine) and 2,100 faculty, including 1,600 physicians and scientists at The Ohio State University Wexner Medical Center and 500 at Nationwide Children's Hospital. We are the only academic medical center in central Ohio and beyond, serving a population of more than 2 million.

As I reflect on our accomplishments this past year, I'm in awe. We are growing at an unprecedented rate. I credit our talented physicians, scientists, staff and students for their aspiration to be one of the nation's top academic medical centers. The work they do every day — to provide high-quality differentiated clinical care, educate the next generation of physicians and healthcare providers, and produce the innovation that will inform the future care of our patients — is inspiring.

DISTINCTIVE CLINICAL CARE

Our faculty at the College of Medicine deliver high-value care with unparalleled patient experience and access — treating the most complex patients in our region and the nation. This means our patients are the first to benefit from the discoveries that are happening right here, every day. Perhaps this would be our solid organ transplant program which has doubled in volume over the past four years and is now in the nation's top 10, or our innovative treatments for leukemia that draw patients from across the globe. These and so many similar programs are what differentiate our faculty at Ohio State. Every time we care for a patient at Ohio State, it's a reminder of our responsibility to improve people's lives.

INNOVATIVE RESEARCH

Over the past three years, growing innovation has been a major focus of the college, with strategies that include enhancing research infrastructure, developing a positive research culture and recruitment. The 2018-2019 fiscal year set a record for the College of Medicine's research funding; we received nearly \$270 million in extramural funding (up 28% over the previous year). We received more than \$164 million in contracts and subcontracts from the National Institutes of Health this past fiscal year (up almost 40%). As you'll learn in the following pages, this valuable support allows our scientists to address the world's most pressing health issues, from cardiovascular disease to addiction to autoimmune disease to cancer.

INTERPROFESSIONAL EDUCATION

Ohio State is one of two universities in North America with seven health sciences colleges, all in close proximity. Our focus is interdisciplinary education, with the goal of creating a learning environment that prepares students across the health disciplines to provide team care. Ohio State trainees are among the best in the country. For example, our incoming medical student class has an average 3.8 GPA and a 514 MCAT score. Moreover, we're proud of our diversity. For the past six years, a majority of the incoming medical school class has been women, and recently we were ranked 2nd in the nation by *U.S. News & World Report* for Medical Schools with the highest percentage of African American students outside of historical black colleges and universities.

TALENTED FACULTY

We are growing rapidly. Over the past three years, we've added 415 new faculty to the College of Medicine, increasing our number from 1,690 to over 2,100. If that's not enough, we plan to grow by an additional 500 faculty over the next five years to meet our expanding clinical and research needs. We have some of the most brilliant physicians, teachers and researchers in the nation and have recruited over the last three years 14 new department chairs from a variety of top institutions. Two of our most recent appointments include J. Nwando Olayiwola, MD, from UCSF, chair of Family and Community Medicine, who's an innovative leader in transforming primary care delivery through the integration of high-value technology, and Benjamin Segal, MD, from Michigan, chair of the Department of Neurology, who is internationally recognized for his work in multiple sclerosis and neuroimmunology. We are proud that our four most recent chairs have been women.

UNPARALLELED GROWTH

With this tremendous growth, we need new facilities. We are investing over \$3 billion in capital improvements to create the campus of the future, shaping the best possible environment for clinical care, learning and research. These facilities include a new 840-bed inpatient hospital, four large outpatient care centers, an interdisciplinary research facility and a new College of Medicine that will be part of an interdisciplinary health sciences center.

I am thrilled with everything we've accomplished and am excited about the years ahead. I truly believe the future of medicine is here at Ohio State. There will not be a more exciting place to be over the next 10 years than THE Ohio State University College of Medicine.

A handwritten signature in black ink, appearing to read 'K. Craig Kent'.

K. Craig Kent, MD
Dean, College of Medicine
Vice President for Health Sciences
Leslie H. and Abigail S. Wexner Dean's Chair in Medicine

 @KCraigKentMD



TABLE OF CONTENTS

Letter from Dean K. Craig Kent, MD	2
Education	6
Lead.Serve.Inspire curriculum	7
Degrees offered	8
New leaders	10
Using AI and machine learning to advance educational opportunities	12
Research	16
R35 funding awarded for spinal cord injury research	17
The power of team science: new P01 awards at Ohio State	18
Using cryo-electron microscopy to understand protein molecules	21
Ohio State facts	22
Growth /\$3 billion in capital improvements	24
Recent grants over \$2 million	26
Why Ohio State? It's the people	30
The Ohio State University Wexner Medical Center	32
Nationwide Children's Hospital	33
Columbus: Midwest friendliness, metropolitan style	33
Clinical	34
Ohio State discoveries help boost transplants over 10,000	34
Ohio State leading life-saving research to fight opioid crisis	36
Ohio State poised to lead in immunology research	38
National appointments	41
Student-managed free clinic	42
Letter from Hal Paz, MD, executive vice president and chancellor for Health Affairs at The Ohio State University and CEO of the Ohio State Wexner Medical Center, on the future of academic health care	44

EDUCATING **TOMORROW'S** PHYSICIANS

Training Ohio State students for residency with clinical experiences and interprofessional learning

The College of Medicine's Lead.Serve.Inspire. curriculum incorporates the six core competencies residency programs are required to teach: patient care, medical knowledge, practice-based learning, systems-based practice, communication and professionalism. When students graduate from the College of Medicine, they're highly proficient in the core competencies expected of graduating residents, making them a top choice among the nation's best residency programs.

Early longitudinal clinical experiences

Offered in a competency-based framework, the Lead.Serve.Inspire. program ensures that our students are prepared to provide the best possible health care to an ever-growing, diverse population. The LSI curriculum takes a holistic, "systems" approach to human biology and fully integrates basic science learned in the classroom with clinical science applied in the clinical setting.

First-year medical students enter into a clinical setting within the first two months of the program, seeing patients alongside a practicing physician. Through longitudinal, practice-based service, they continue to see patients as they apply classroom knowledge and clinical skills to more complex and diverse patient populations.

In systems-approach learning blocks, they study the parts of the human body and how those parts function systemically, and the associated pathological expressions and their diagnoses and treatments, while seeing patients with those very disorders.

A team-based environment, emphasizing self-directed learning with multiple assessment methods, gives the student individualized learning opportunities while producing standardized outcomes. Case discussions held in small learning groups also help to integrate core foundational concepts into clinical reasoning, patient care and patient management.

- Fully integrated basic and clinical sciences
- Early longitudinal practice-based clinical service
- Self-directed, individualized learning with multiple assessment methods for standardized outcomes
- Faculty coaching for strong clinical skills development
- Projects requiring critical thinking and synthesis of material
- Clinical problem solving in a team-based environment

Interprofessional education and practice

With seven health sciences colleges in close proximity to one another, Ohio State is uniquely positioned to educate all health sciences students interprofessionally. Our medical students work with peers from seven health sciences colleges in an acute intensive care rounding simulation to understand roles and responsibilities of the other health and social science professionals. This unique learning environment is essential in preparing our medical students for their residency. It builds a climate of mutual respect, improves interprofessional communication skills and increases proficiency in designing interprofessional plans of care, which can improve patient outcomes. Disciplines include: nursing, medicine, medical dietetics, occupational therapy, physical therapy, pharmacy, respiratory therapy, social work and speech therapy.

100%

of students participate in
**LONGITUDINAL QUALITY
& PATIENT SAFETY
CURRICULUM**

236

average

**Step 1 USMLE
score**

92%

of students involved in
**FACULTY-MENTORED
RESEARCH**

**For the
past 6 years,**

more than half of the
incoming class have
been **women**

100%

**of students participate
in SERVICE LEARNING**

DEGREES AND PROGRAMS OFFERED AT THE COLLEGE OF MEDICINE

Undergraduate Programs (degree)

Biomedical Science (BS)
Athletic Training – HRS
Health Information Management and Systems – HRS
Health Sciences – HRS
Medical Dietetics – HRS
Medical Laboratory Science – HRS
Radiologic Sciences and Therapy – HRS
Respiratory Therapy – HRS

Graduate Programs

Medicine (MD)
Genetic Counseling (MS)
Medical Science (MS)
Pathology (MS)
Bioethics (MA)
Biomedical Sciences (PhD)
Anatomy (MS & PhD)
Applied Neuroscience (MS)
Respiratory Therapy – HRS (MS)
Health and Rehabilitation Sciences – HRS (MS)
Health and Rehabilitation Sciences – HRS (PhD)
Clinical Doctorate in Physical Therapy – HRS
Clinical Doctorate in Occupational Therapy – HRS

Residency

Anesthesiology
Dentistry
General Practice Residency
Maxillofacial Anesthesia
Maxillofacial Surgery

Emergency Medicine
Emergency Medicine/Internal Medicine Combined Residency
Family Medicine
University Track
Urban Track
Internal Medicine
Internal Medicine/Pediatrics Combined Residency
Dermatology
Neurological Surgery
Neurology
Obstetrics and Gynecology
Ophthalmology
Orthopedic Surgery
Podiatry
Otolaryngology
Pathology
Physical Medicine & Rehabilitation
Plastic Surgery
Psychiatry
Radiation Oncology
Radiology – Diagnostic
Radiology – Interventional
General Surgery
Colon & Rectal Surgery
Urology

Fellowships

Anesthesiology – Adult Cardiothoracic Anesthesiology
Anesthesiology – Ambulatory Business
Anesthesiology – Critical Care Medicine
Anesthesiology – Neuro-Anesthesia
Anesthesiology – Clinical Bioethics

Anesthesiology – Obstetric Anesthesiology
Anesthesiology – Pain Medicine
Anesthesiology – Regional Anesthesia
Emergency Medicine – Administrative
Emergency Medicine – EMS
Emergency Medicine – Global Health
Emergency Medicine – Medical Education
Emergency Medicine – Oncology
Emergency Medicine – Research
Emergency Medicine – Ultrasound
Family Medicine – Clinical Informatics
Family Medicine – Integrative Medicine
Family Medicine – Sports Medicine
Internal Medicine

Cardiology – Adult Congenital Heart Disease
Cardiology – Advanced Heart Failure & Transplant Cardiology
Cardiology – Cardiac Imaging
Cardiology – Cardiovascular Disease
Cardiology – Clinical Cardiac Electrophysiology
Cardiology – Interventional Cardiology
Dermatology – Micrographic Surgery and Dermatological Oncology
Endocrinology, Diabetes & Metabolism
Gastroenterology – Advanced Endoscopy
Gastroenterology – Inflammatory Bowel Disease
Gastroenterology – Pancreas
Gastroenterology – Transplant Hepatology

Geriatric Medicine
Hematology & Medical Oncology
Hematology/Oncology – Advanced Research
Cutaneous Lymphoma Fellowship
Gastrointestinal Medical Oncology Research
Hospice & Palliative Medicine
Infectious Diseases
Nephrology – Lupus/ Glomerulonephritis/Vasculitis
Nephrology – Transplant Nephrology
Pulmonary Disease & Critical Care – Sleep Medicine
Pulmonary Disease & Critical Care – Interventional Pulmonology
Rheumatology
Neurological Surgery – Complex and Oncological Spine
Neurological Surgery – Endovascular
Neurological Surgery – Minimally Invasive Cranial Surgery
Neurological Surgery – Minimally Invasive Spinal Surgery
Neurological Surgery – Skull Base/ Fractional
Neurological Surgery – Stereotactic and Functional
Neurology – Behavioral Neurology and Neuropsychiatry
Neurology – Clinical Neurophysiology
Neurology – Geriatric Neurology
Neurology – Movement Disorders
Neurology – Multiple Sclerosis
Neurology – Neuro-Oncology
Neurology – Neuro-Otology

Neurology – Neurocritical Care
Neurology – Neuromuscular Medicine
Neurology – Vascular Neurology
Ob/Gyn – Female Pelvic Medicine & Reconstructive Surgery
Ob/Gyn – Maternal-Fetal Medicine
Ob/Gyn – Gynecological Oncology
Ophthalmology – Cornea
Ophthalmology – Glaucoma
Ophthalmology – Medical Retina/ Ocular Oncology
Ophthalmology – Neuro/Plastics
Ophthalmology – Surgical Retina
Orthopedic Surgery – Adult Reconstruction
Orthopedic Surgery – Hand & Upper Extremity Surgery
Orthopedic Surgery – Musculoskeletal Oncology
Orthopedic Surgery – Podiatry
Orthopedic Surgery – Spine Surgery
Orthopedic Surgery – Sports Medicine
Otolaryngology – Facial Plastics
Otolaryngology – Head & Neck Surgical Oncology
Otolaryngology – Head & Neck International
Otolaryngology – Laryngology
Otolaryngology – Neurotology
Otolaryngology – Rhinology
Otolaryngology – Skull Base Surgery Fellowship (Craniomaxillofacial)
Otolaryngology – Allergy & Immunology
Pathology – Anatomic & Clinical
Pathology – Blood Banking/ Transfusion Med

Pathology – Cytopathology
Pathology – Hematology
Pathology – Renal Transplant
Physical Medicine & Rehabilitation – Neuromodulation
Plastic Surgery – Aesthetic
Plastic Surgery – Microsurgery
Psychiatry – Addiction Medicine
Psychiatry – Child & Adolescent Psychiatry
Psychiatry – Forensic Psychiatry
Psychiatry – Psychosocial Oncology
Psychiatry – Psychosomatic Medicine
Radiation Oncology – Central Nervous System & Pediatric
Radiation Oncology – Medical Physics
Radiology – Abdominal Imaging
Radiology – Breast Imaging
Radiology – Diagnostic
Radiology – Musculoskeletal
Radiology – Neuroradiology
Radiology – Oncologic Neuroradiology
Radiology – Vascular & Interventional Radiology
Surgery – Critical Care
Surgery – Burn
Surgery – Minimally Invasive Fellowship
Surgery – Complex General Surgical Oncology
Surgery – Thoracic
Surgery – Transplant
Surgery – Vascular
Urology – Endourology Fellowship

NEW LEADERS

Over the past few years, the College of Medicine has recruited or promoted several top luminaries to create the future of medicine

123
net new faculty
MEMBERS
recruited in FY19

2,100
faculty
MEMBERS

Goal to recruit
500+
net new faculty
members by 2024

NEW LEADERS

Quinn Capers IV, MD
Vice Dean, Faculty Affairs

Tim Huerta, PhD
Chief Research Information Officer

NEW CHAIRS

Isabelle Deschênes, PhD
Chair, Department of Physiology and Cell Biology
Bernie Frick Research Chair in Heart Failure and Arrhythmia

Cheryl Lee, MD
Chair, Department of Urology
Dorothy M. Davis Chair in Cancer Research

Lang Li, PhD
Professor and Chair, Department of Biomedical Informatics

Rama Mallampalli, MD
Chair, Department of Internal Medicine
S. Robert Davis Chair of Medicine

Amy Moore, MD
Chair, Department of Plastic and Reconstructive Surgery
Robert L. Ruberg, MD, Endowed Chair in Plastic Surgery

Sayoko (Sy) Moroi, MD, PhD
Chair, Department of Ophthalmology and Visual Science
Carl M. and Grace C. Baldwin Chair in Ophthalmology

J. Nwando Olayiwola, MD, MPH, FAAFP
Chair, Department of Family Medicine

Eugene Oltz, PhD
Chair, Department of Microbial Infection and Immunity

Timothy Pawlik, MD, PhD, MPH
Chair, Department of Surgery
The Urban F. Meyer III and Shelley M. Meyer Chair for Cancer Research
Surgeon in Chief

K. Luan Phan, MD
Chair, Department of Psychiatry and Behavioral Health
Charles F. Sinsabaugh Chair in Psychiatry

Phillip Popovich, PhD
Chair, Department of Neuroscience

James Rocco, MD, PhD
Chair, Department of Otolaryngology – Head and Neck Surgery
Mary E. and John W. Alford Research Chair in Head and Neck Cancer

Benjamin Segal, MD
Chair, Department of Neurology
Co-director, Ohio State Neurological Institute
Director, Neuroscience Research Institute
Gilbert and Kathryn Mitchell Chair

NEW DIRECTORS

Ricardo Carrau, MD
Director, Division of Skull Base Surgery

Maged Costantine, MD
Director, Division of Maternal Fetal Medicine

Jeffrey Horowitz, MD
Director, Pulmonary, Critical Care and Sleep Medicine

Zihai Li, MD, PhD
Director, Pelotonia Institute for Immuno-Oncology

Ann Scheck McAlearney, ScD, MS
Executive Director, CATALYST, The Center for the Advancement of Team Science, Analytics and Systems Thinking

Nahush Mokadam, MD
Director, Division of Cardiac Surgery

Matthew Old, MD
Director, Division of Head and Neck Oncologic Surgery

David O'Malley, MD
Director, Division of Gynecologic Oncology

Benjamin Poulouse, MD
Director, Division of General and Gastrointestinal Surgery

Timur Sarac, MD
Director, Division of Vascular Diseases and Surgery

Minka Schofield, MD
Director, Division of General Otolaryngology

Carrie Sims, MD
Director, Division of Trauma, Critical Care and Burn

Allan Tsung, MD
Director, Division of Surgical Oncology

Yiping Yang, MD, PhD
Director, Division of Hematology



USING ARTIFICIAL

and machine learning to advance educational opportunities

In the Virtual Reality in Medical Education (VRiME) lab at The Ohio State University College of Medicine, they're taking virtual reality learning to a whole new level. By using artificial intelligence (AI) and machine learning to create a high-tech experience, they not only eliminate the need for patient actors but provide students with a high-fidelity, state-of-the-art system to practice their clinical skills.

“By incorporating artificial intelligence (AI) into virtual reality simulations, we can create interactive scenarios so the student gets as close to a real-world scenario as possible.”
— Douglas Danforth, PhD

“Our teaching strategies need to go beyond passive training,” says Douglas Danforth, PhD, an academic program director at the College of Medicine. “By incorporating artificial intelligence into virtual reality simulations, we can create interactive scenarios so the student gets as close to a real-world scenario as possible.”

“Advancements in technology have opened up new pathways for students to learn and become the best healthcare providers possible,” says K. Craig Kent, MD, dean of the Ohio State College of Medicine and vice president for Health Sciences. “Our College

of Medicine is at the forefront of this movement with artificial intelligence that allows students to perfect vital clinical skills.”



Few universities are using virtual reality this way, and Ohio State is expertly positioned for the collaboration needed to make this technology successful. One of the lab's learning modules is designed to teach trainees how to better communicate with patients who have limited English proficiency and may struggle to understand complicated diagnoses or the physician's instructions. Students, residents, fellows and other physicians can have a free-form, in-depth conversation with virtual patients to gather their medical history and diagnose their condition.

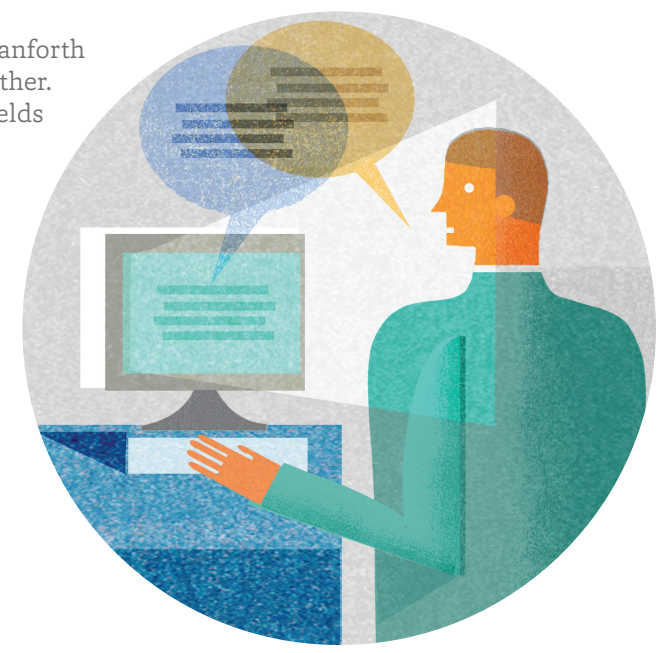
AI and machine learning — the technology used to drive Apple's Siri or Amazon's Alexa — is the engine that gives the student a real-world experience. “The challenge is that we don't have millions of conversations to train the AI as Apple or Amazon has,” Dr. Danforth says. “So we have to use additional strategies and approaches to train the machine to understand the natural language of a doctor-patient interaction. This way, the app can intelligently react to any phrase the student asks and have a fluid conversation.”

INTELLIGENCE

That's where cross-college collaboration comes into play. To build the right technology, Dr. Danforth collaborated across campus with colleagues in the departments of Linguistics, Computer Science and Engineering, and the Advanced Computing Center for the Arts and Design at Ohio State to create the virtual patients.

“It was great having them just a few blocks away,” Dr. Danforth says. “The team has worked for nearly seven years together. Accessibility to all these brilliant minds in their own fields made the process possible.”

Perfecting the functional language capabilities and making the scenarios as natural as possible were key. Ohio State went beyond and made sure the application incorporated non-verbal communication, as well. Motion-capture suits helped designers record movements of medical student volunteers, who modeled patients reacting with true-to-life emotions. Their motions were then applied to the virtual characters, says Kellen Maicher, a College of



Medicine VR developer and a learning and development consultant for The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute.

“We made sure the movements were natural and matched the emotions patients might feel during an exam. Patients’ body language, too, is so important when performing an exam,” Maicher says.

“Advancements in technology have opened up new pathways for students to learn and become the best healthcare providers possible.”

— K. Craig Kent, MD

IMPROVED LEARNING

“Without this app, students have to practice with one another or with community members trained to act in patient roles,” Dr. Danforth says. “That’s expensive and time-consuming.”

Those methods also limit students’ opportunities for feedback. With the app, students receive a report at the end of the conversation, immediately assessing whether they asked necessary questions.

The extra practice is especially important when learning to communicate with patients with limited English proficiency, like one particular virtual patient in the training module, Mr. Martinez.



Unlike other virtual patients, whose voices are synthetic and can string together various sounds to create infinite dialogue possibilities, Mr. Martinez’s accented voice is provided by a local actor who recorded the answers for many conversation paths. Creating a custom synthetic voice for Mr. Martinez is one of VRiME’s next goals.

Soon, the module featuring Mr. Martinez will add extra prompts and scoring sections aimed at training students to know when it’s appropriate to use interpreters, and Mr. Martinez will begin to ask students to explain things in simpler language that he can understand.

“As part of the training, we also introduce techniques such as ‘teach-back,’ which help trainees ensure that non-native English speakers understand their diagnoses and treatment plans,” Dr. Danforth says. “We’re excited about all the things artificial intelligence learning can do to improve the educational experience for our students.”

“These virtual encounters provide new and exciting ways to practice important medical skills.”
— Douglas Danforth, PhD, an academic program director at the College of Medicine

At left, Dr. Danforth stands in front of one of the virtual patients he helped develop for the VRiME lab’s AI training program.

EXPANDING AI & VR POSSIBILITIES

A new virtual character representing a cancer patient will help healthcare providers practice conversations with patients who’ve received a difficult diagnosis.

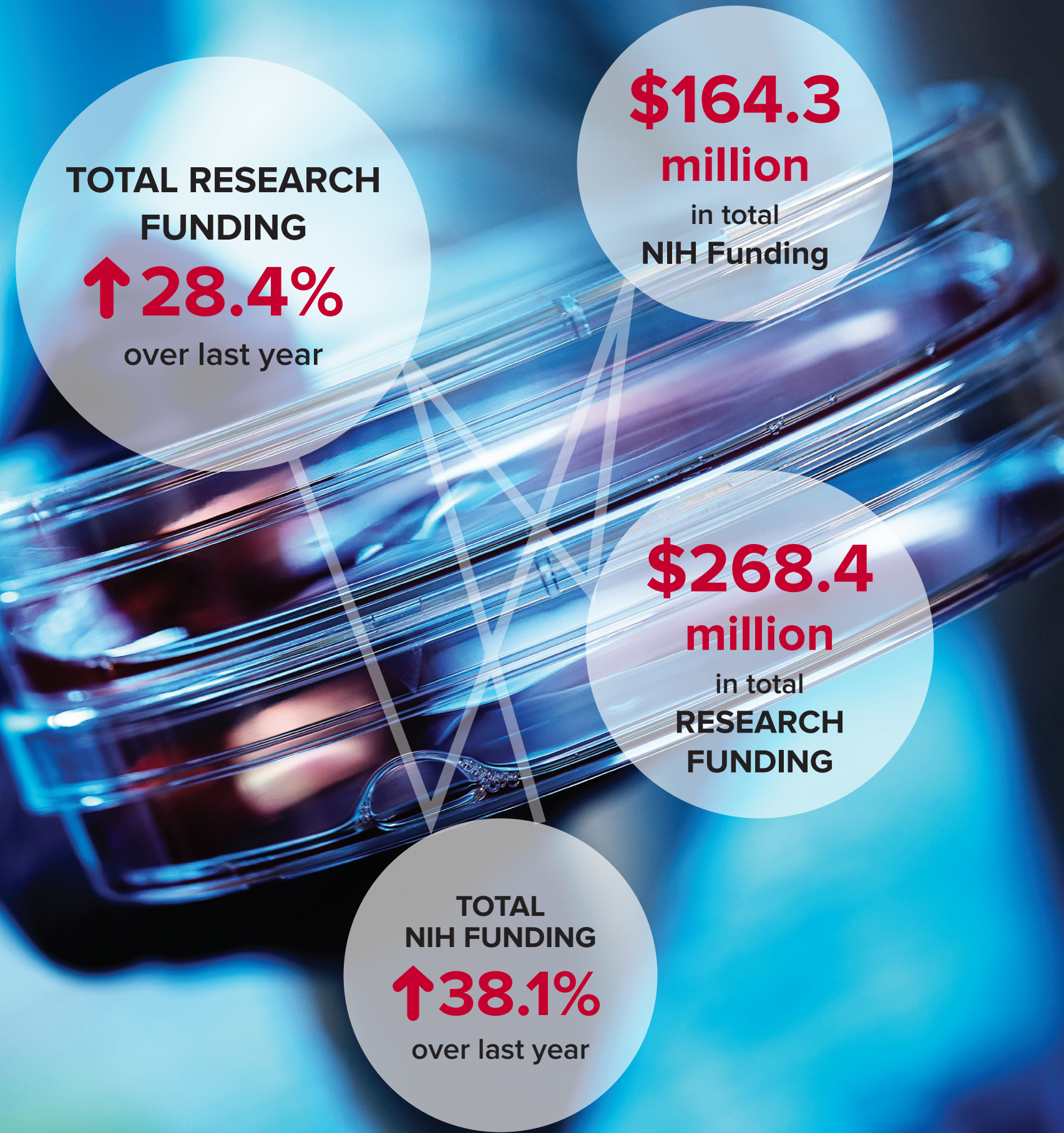
The team is also developing a virtual patient with opioid use disorder, a project supported by a grant from the U.S. Department of Health and Human Services.

A five-year, \$1.8 million grant from the Agency for Health Care Research and Quality supports another unique training program designed to train emergency medicine specialists and first responders in mass casualty scenarios. While wearing a VR headset, users can treat virtual victims in the setting of a subway bombing, for example, to practice triage and lifesaving procedures.

Dr. Danforth says the next steps for that program are to refine the virtual environments and create an assessment system that can automatically evaluate trainee proficiency. The system will be tested with first responders, including paramedics and firefighters, and additional virtual mass-casualty scenarios, such as mass shootings, will be developed.

With each of these programs, developers are able to build upon previous work to create new scenarios and reach more types of medical trainees, Dr. Danforth says.

“These virtual encounters aren’t designed to replace existing training with human actors or real patients. Rather, these programs provide new and exciting ways to practice important medical skills prior to working with real patients in real clinical settings.”



POPOVICH RECEIVES PRESTIGIOUS **R35 AWARD** FOR SPINAL CORD INJURY RESEARCH

Phillip Popovich, PhD, has been studying spinal cord injury (SCI) for more than 30 years.

Thanks to a prestigious R35 Research Program Award from the National Institute of Neurological Disorders and Stroke, the professor and chair of the Department of Neuroscience at The Ohio State University College of Medicine can continue his vision of helping individuals who suffer a spinal cord injury.

In addition to impairing mobility, SCI often causes secondary health conditions, including cardiovascular disease, bowel and bladder dysfunction, metabolic disease (with increased obesity and diabetes) and immune dysfunction with increased risk for developing life-threatening infections or sepsis. Many of these conditions develop because SCI disrupts the nervous system, leading to a breakdown of communication between the brain, spinal cord and immune system.

“As a result of SCI, the spinal cord can no longer effectively communicate with the major organ systems,” Dr. Popovich says. “This causes different comorbidities or secondary disease processes that affect quality of life and can lead to premature death.”

“Patients and physicians have known that these comorbidities exist, but exactly how or why they develop isn’t well understood.”

Dr. Popovich says that, with the help of the R35 award, he and his team at the College of Medicine are working to understand why those systemic pathologies develop so that healthcare providers can more effectively treat them.

“This is an area of research that many SCI scientists are becoming more interested in. It’s helping the research community and physicians begin thinking about SCI as a whole-body disease, rather than just a problem of paralysis.”

Dr. Popovich, also executive director of Ohio State’s Belford Center for Spinal Cord Injury, says the goal of his R35 is in line with the overall mission of the center, where the research team is using a holistic vision to guide the research that will reduce the onset or impact of secondary complications after SCI.

The R35 award is designed to encourage ambitious, creative science by providing stable funding to outstanding investigators’ research programs, offering them the freedom to pursue longer-term, innovative research. It’ll support Dr. Popovich’s research with up to \$750,000 per year for eight years.

“I was very honored to receive this grant,” Dr. Popovich says. “It’ll certainly improve the efficiency and the impact of my research, enabling me to consolidate research efforts into one topic area that I’ve been working on my entire career. We can now, in some ways, attack this problem without the distractions and worries that come with having to maintain many different funding sources. I appreciate the support from the National Institutes of Health and my colleagues.”



THE POWER OF TEAM SCIENCE

Ohio State scientists earn top program grants for translational research

The National Institutes of Health's Research Program Project Grants (P01) support broad, long-term programs that involve three or more groups of investigators working on separate research projects that contribute to one overall objective.

P01 grants are the gold medals of research. Highly competitive and selectively awarded, these large grants – often awarded in sums in the tens of millions of dollars – elevate the reputations of the associated institutions.

“The P01 grants not only allow us to bring together individuals with complementary expertise, but they also provide financial support for those expertise ‘cores,’ which house different scientific areas of interest.”

— Rama Mallampalli, MD

“The P01 grants not only allow us to bring together individuals with complementary expertise, but they also provide financial support for those expertise ‘cores,’ which house different scientific areas of interest,” says Rama Mallampalli, MD, chair of the Department of Internal Medicine at The Ohio State University College of Medicine.

Dr. Mallampalli has earned an \$11.6 million P01 grant for his five-year investigation to find a new therapy to stimulate the immune systems of patients who have developed acute respiratory distress syndrome (ARDS) from severe pneumonia.

“The grants are difficult to get because it’s difficult to achieve that synergy among multiple research groups,” says Electra Paskett, PhD, MSPH, The Ohio State University Marion N. Rowley Professor of Cancer Research, director of the Division of Cancer Prevention and

Control in the Ohio State College of Medicine, and associate director for population sciences at The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute.

Dr. Paskett would know: Her public health initiative has been awarded an \$11 million P01 grant to test prevention programs to address elevated rates of cervical cancer in Appalachia. The five-year research project involves clinics in health systems across four states using four principal investigators, 25 faculty-level investigators and additional external consultants.

Ohio State’s multidisciplinary research model is especially supportive of that synergy – Ohio State faculty, staff and students are accustomed to approaching research from multiple, complementary areas of focus and collaborating among different health sciences colleges.



DR. MALLAMPALLI'S SCIENCE

Despite decades of intense study of the initial, inflammatory phase of ARDS, mortality rates are still high because new pharmacotherapies haven't emerged to treat the condition. Dr. Mallampalli's program project challenges the concept that ARDS is solely a hyper-inflammatory disorder and instead focuses on the immunosuppression that manifests in ARDS patients.

“This looks at new ways by which people with severe pneumonia lose their immune defense system,” Dr. Mallampalli says. “Often, they're immunosuppressed like cancer patients, and this P01 will be providing resources to identify new targets that will serve as a platform for designing new compounds or drugs that can be used to stimulate the immune system to combat infection.”

To evaluate this hypothesis, researchers supported by cores of experts in bioimaging and human biorepository services will use state-of-the-art molecular, cell, human-based systems and lipidomic tools in human subjects with ARDS. Their work could create a paradigm-changing model for ARDS pathogenesis, changing the way ARDS therapies are studied and developed in the future.

“What I'd like to see happen is that we can identify a novel protein that can serve as the basis for analyzing that protein's behavior to eventually design, synthesize and test new immunomodulatory compounds for patients with severe pneumonia,” Dr. Mallampalli says.

DR. PASKETT’S SCIENCE

The goal of Dr. Paskett’s program project is to create a clinic-based integrated prevention program that focuses on the major causes of cervical cancer: tobacco smoking, human papillomavirus (HPV) infection and lack of cervical cancer screening. Her team will present a family-focused cancer-risk reduction program within federally qualified health clinics in 10 health systems in Kentucky, Ohio, Virginia and West Virginia.

“What’s exciting to me is that we’ll be going into each of these clinics and personalizing how this intervention rolls out in each clinic based on their staff and their community,” Dr. Paskett says. “We’ll identify what works best, capitalize on their strengths and give tips.”

Dr. Paskett, who has studied cervical cancer for 35 years, explained that the project is testing a novel strategy of bundling prevention services and using implementation science to address healthcare disparities in underserved populations such as those in Appalachia. It’s designed to target the individual, social, community health system and broader contextual-level barriers related to the burden of cervical cancer.

The interventions the team creates will be offered to eligible female patients and age-eligible children and young adults in the region. They’ll then test the effectiveness of the integrated cervical cancer prevention program and evaluate the impact of the program, including implementation and acceptability, with attention to short- and long-term impact and sustainability.

“By creating solutions that are sustainable after we leave, we’ll be able to reach a lot more people through the clinic staff as part of their routine care than we could for any of our other studies, which were individual-level, randomized trials,” Dr. Paskett says.



INFLUENCING THE FUTURE OF HEALTH CARE

Dr. Mallampalli’s and Dr. Paskett’s projects both aim to identify solutions for problems that impact large populations of patients.

ARDS affects about 200,000 Americans each year, and patients with ARDS face a high mortality rate – as high as 46%.

The American Cancer Society estimates that, in 2019, about 13,170 new cases of invasive cervical cancer will be diagnosed, and about 4,250 women will die of cervical cancer. The region Dr. Paskett’s team is studying has one of the highest rates of cervical cancer and cervical cancer deaths in the United States.

Dr. Mallampalli and Dr. Paskett both look forward to finding solutions for patients that can be implemented as quickly as possible, leveraging the strong relationships their investigators have developed over years of collaborating with one another and with other universities.



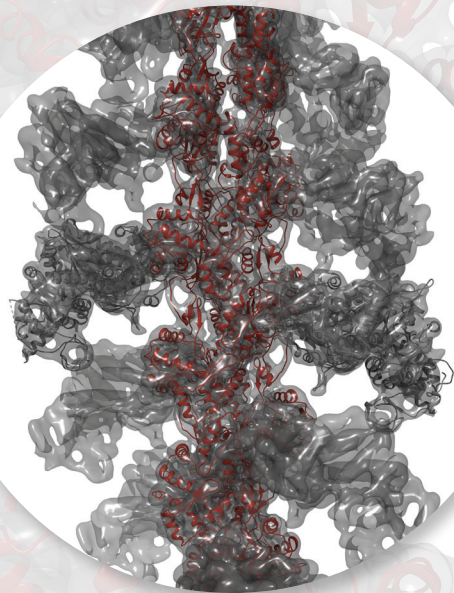
Ohio State researchers use cryo-electron microscopy to understand protein molecules

Researchers at The Ohio State University College of Medicine are using new technology to explore large proteins in unprecedented detail. Myosins — molecular nanomachines that convert chemical energy to generate force and motion on actin tracks — are ubiquitous and play a critical role in numerous aspects of biology, including cell migration, cell adhesion, muscle contraction and neuronal memory. Altered regulation of myosins is linked to several diseases, including cancers, cardiovascular diseases, muscular dystrophies and addiction to opioids.

“Understanding how proteins work at the atomic level is essential to understanding the foundations of human biology.”
— K. Craig Kent, MD

“Understanding how proteins work at the atomic level is essential to understanding the foundations of human biology,” says K. Craig Kent, MD, dean of The Ohio State University College of Medicine. “The work of Krishna Chinthalapudi, PhD, assistant professor of Physiology and Cell Biology, and his team underlies efforts to develop new drugs and medical treatments that will revolutionize the way we treat our patients.”

This image from Dr. Chinthalapudi’s laboratory reveals an important snapshot of myosin (gray) on actin (red) using cryo-electron microscopy, a powerful technique that makes it possible to view the structures of large proteins in unprecedented detail. These details allow the researchers to study how myosin and actin interact in health and disease. By capturing these high-resolution snapshots of myosin and actin, Dr. Chinthalapudi’s laboratory will inform the future development of precision medicines to treat disease.



Ohio

STATE FACTS

As one of the largest universities in North America, The Ohio State University boasts more than 12,000 courses, 18 colleges and schools, and more than 200 academic centers and institutes. We're a top 12 public research university, a member of the Association of American Universities and named one of the most innovative universities in the nation by *U.S. News & World Report*. In addition to our main campus in Columbus, we have six regional campuses throughout central Ohio. There are more than 68,000 students and 7,000 faculty who call themselves Buckeyes.

"All these brilliant minds, in hundreds of different disciplines, are just a few blocks away from one other."

— Peter Mohler, PhD

"All these brilliant minds, in hundreds of different disciplines, are just a few blocks away from one another," says Peter Mohler, PhD, vice dean for Research at the College of Medicine. "We've had medical researchers partner with linguistics, engineering, food science...the list is endless. They've had the chance to collaborate with the best minds in other fields — all at Ohio State."

What makes Ohio State unique is that, while it's large, it still has a small-town feel. Located in the heart of Ohio, it exudes Midwest values.

"The people here really care about you and want to see you succeed," says Quinn Capers IV, MD, vice dean for Faculty Affairs at the College of Medicine. "So whether you're partnering with someone on a research project or being mentored through your faculty tenure, everyone here is willing to help."



**18th
largest
university research
LIBRARY**

Named one of
the *nation's* most
innovative
universities

**1,764-acre
MAIN campus**

**Ranked 17th
nationally**
for graduate
employability

**68,000+
students enrolled**
**7,000+
faculty members**

**550,000
living ALUMNI**

\$3 BILLION IN CAPITAL IMPROVEMENTS

The Ohio State University is investing more than ever in creating the campus of the future, developing state-of-the-art environments for teaching, learning and research.

Outpatient Care – West Campus

- Central Ohio's first proton therapy treatment facility
- Outpatient operating rooms
- Urgent care with a 23-hour observation unit
- Interventional radiology
- Pre-anesthesia center
- Diagnostic imaging
- Endoscopy

Three Suburban Outpatient Care Centers – Dublin, New Albany and Powell

- Primary care and urgent/walk-in care
- Specialized medical services such as ENT, Ob/Gyn and eye care
- Ambulatory surgery and endoscopy
- Oncology and mammography
- Behavioral health
- Surgery specialties
- Diagnostic services
- Retail pharmacy

Interdisciplinary Health Sciences Center

- 225,000-square-foot interprofessional learning facility
- Home to the new College of Medicine
- Centerpiece of a new health sciences education quadrangle
- Classrooms ranging in capacity from 15 to 300, rich with new teaching technology
- Integrated wellness center and a large reading room with study tables
- Enhanced anatomy and surgical practice labs

Interdisciplinary Research Building

- 270,000-square-foot biomedical research building
- 8,000 square feet of core lab space
- 100 wet labs for experimental research
- 16,000 square feet for collaborative space
- A 15,000-square-foot vivarium

NEW Inpatient Hospital

- 840 patient beds in private-room settings
- State-of-the-art diagnostic, treatment and inpatient service areas (emergency department, imaging, operating rooms, critical care and medical/surgical beds)
- Leading-edge digital technologies to advance care and teaching
- Largest single facilities project ever undertaken at the university

RECENT GRANTS OVER \$2 MILLION

Claire Verschraegen, MD received a grant, along with other researchers, from the National Cancer Institute for “OSU as a network lead academic participating site for the NCI NCTN.”



\$2.76 million

Brian Ahmer, PhD, professor, Department of Microbial Infection and Immunity, received a grant from the National Institute of Allergy and Infectious Diseases for “**Salmonella-specific therapeutics.**”

\$3.54 million

Brian Ahmer, PhD, professor, Department of Microbial Infection and Immunity, received a grant from the National Institute of Allergy and Infectious Diseases for “**Microbial ecology of the inflamed intestine.**”

\$2.53 million

Megan Ballinger, PhD, assistant professor, Department of Internal Medicine, received a grant from the National Heart, Lung and Blood Institute for “**The pivotal role of macrophages in regulating pulmonary fibrosis.**”

\$2.13 million

Ruth Barrientos-Wood, PhD, associate professor, Department of Psychiatry, received a grant from the National Institute on Aging for “**Neuroinflammation, inflammatory challenge and memory.**”

\$4.21 million

Clara Bloomfield, MD, professor, Department of Internal Medicine, received a grant from the National Cancer Institute for “**ITSC for leukemia: Novel molecular strategies for NCTN ‘individualized’ therapies.**”

\$2.69 million

Ginny Bumgardner, MD, PhD, professor, Department of Surgery, received a grant from the National Institute of Allergy and Infectious Diseases for “**Investigating a novel cellular therapy to prevent and treat acute antibody-mediated kidney transplant rejection.**”

\$4.05 million

John Byrd, MD, professor, Department of Internal Medicine, and William Carson III, MD, professor, Department of Surgery, received a grant from the National Cancer Institute for “**OSU K12 training grant in oncology.**”

\$6.6 million

David Carbone, MD, PhD, professor, Department of Internal Medicine; William Carson III, MD, professor, Department of Surgery; Arnab Chakravarti, MD, professor and chair, Department of Radiation Oncology; David O’Malley, MD, professor, Department of Obstetrics and Gynecology; and Claire Verschraegen, MD, professor, Department of Internal Medicine, received a grant from the National Cancer Institute for “**OSU as a network lead academic participating site for the NCI NCTN.**”

\$2.69 million

Vadim Fedorov, PhD, professor, Department of Physiology and Cell Biology, received a grant from the National Heart, Lung and Blood Institute for “**Integration of structure and signaling in cardiac pacemaker function.**”

\$2.34 million

Daniel Gallego Perez, PhD, assistant professor, Department of Surgery, received a grant from the National Institute of Biomedical Imaging and Bioengineering for “**Novel nanoscale approaches to whole tissue reprogramming.**”

\$2.49 million

Paul Goodfellow, PhD, professor, Department of Obstetrics and Gynecology, and Elaine Mardis, PhD, professor, Department of Pediatrics, received a grant from the National Cancer Institute for “**Combined NGS tumor-based detection of germline Lynch syndrome mutations and prognostic classification of endometrial cancers.**”

\$2.04 million

Deliang Guo, PhD, associate professor, Department of Radiation Oncology, received a grant from the National Institute of Neurological Disorders and Stroke for “**Determining the role of lipid droplets in glioblastoma and their therapeutic potential.**”

\$2.4 million

Lianwang Guo, PhD, MS, associate professor, Department of Surgery; and K. Craig Kent, MD, dean, College of Medicine, received a grant from the National Heart, Lung and Blood Institute for “**Targeting PERK: An endothelium-protective stent-free strategy for mitigation of intimal hyperplasia after vascular surgery.**”

\$2.48 million

Renzhi Han, PhD, associate professor, Department of Surgery, received a grant from the National Heart, Lung and Blood Institute for “**ANO5 in muscle health and disease.**”

RECENT GRANTS OVER \$2 MILLION

\$4.38 million

Susan Havercamp, PhD, associate professor, Department of Psychiatry, received a grant from the Administration for Community Living for **“Can you hear me now? Listening to people with intellectual and developmental disabilities in health research.”**

\$2.03 million

Shuman He, MD, PhD, associate professor, Department of Otolaryngology – Head and Neck Surgery, received a grant from the National Institute on Deafness and Other Communication Disorders for **“Neural encoding and auditory processing of electrical stimulation in pediatric cochlear implant users.”**

\$65.95 million

Rebecca Jackson, MD, professor, Department of Internal Medicine, received a grant from the National Institute on Drug Abuse for **“Optimizing HEALing In Ohio Communities.”**

\$2.35 million

Rosa Lapalombella, PhD, associate professor, Department of Internal Medicine; Alice Scott Mims, MD, assistant professor, Department of Internal Medicine; and Paul Goodfellow, PhD, professor, Department of Obstetrics and Gynecology, received a grant from the National Cancer Institute for **“Targeting NAMPT in acute myeloid leukemia.”**

\$2.97 million

Maryam Lustberg, MD, MPH, associate professor, Department of Internal Medicine, received a grant from the National Cancer Institute for **“Prevention of paclitaxel-induced peripheral neuropathy with nilotinib.”**

\$2.62 million

Jianjie Ma, PhD, professor, Department of Surgery, received a grant from the National Heart, Lung and Blood Institute for **“Ca signaling cross-talk from SR to mitochondria in heart muscle.”**

\$3.62 million

Jianjie Ma, PhD, professor, Department of Surgery, received a grant from the U.S. Department of Defense for **“Developing MG53 as a novel protein therapeutic for acute lung injury.”**

\$11.69 million

Rama Mallampalli, MD, chair and professor, Department of Internal Medicine, received a grant from the National Heart, Lung and Blood Institute for **“Immunosuppression in acute lung injury.”**

\$2.45 million

Jeffrey Parvin, MD, PhD, professor, Department of Biomedical Informatics, received a grant from the National Cancer Institute for **“Multiplexed functional analysis of BRCA1 and BARD1 missense variants in DNA repair.”**

\$3.64 million

Anil Parwani, MD, PhD, MBA, professor, Department of Pathology, received a grant from the National Institutes of Health for **“Appalachian and Great Lakes Research Biospecimen Resource (AGL-RBR) of the Cooperative Human Tissue Network (CHTN).”**

\$11.07 million

Electra Paskett, PhD, MSPH, professor, Department of Internal Medicine, received a grant from the National Cancer Institute for **“Improving uptake of cervical cancer prevention services in Appalachia.”**

\$2.83 million

Vinay Puduvalli, MBBS, professor, Department of Neurology; Deepa Sampath, PhD, assistant professor, Department of Internal Medicine; Ramesh Ganju, PhD, professor, Department of Pathology; and Bhuvaneswari Ramaswamy, MD, PhD, associate professor, Department of Internal Medicine, received a grant from the National Cancer Institute for **“Characterization of onalespib, a novel long-acting Hsp90 inhibitor, as a chemo and radiosensitizer in adults with newly diagnosed glioblastoma.”**

\$2.22 million

Murugesan Rajaram, PhD, assistant professor, Department of Microbial Infection and Immunity, received a grant from the National Institute of Allergy and Infectious Diseases for **“Molecular mechanism of cardiac inflammation and dysfunction in Pseudomonas aeruginosa infection.”**

\$2.22 million

Bhuvaneswari Ramaswamy, MD, PhD, associate professor, Department of Internal Medicine, and Ramesh Ganju, PhD, professor, Department of Pathology, received a grant from the National Institutes of Health for **“Addressing cancer disparity through defining the molecular link between breast feeding and triple-negative breast cancer.”**

\$2.01 million

Timothy Sahr, MPH, MA, Ohio Colleges of Medicine Government Resource Center, received a grant from the Ohio Department of Medicaid for **“Ohio Medicaid Assessment Survey (State).”**

\$3.21 million

Timothy Sahr, MPH, MA, Ohio Colleges of Medicine Government Resource Center, received a grant from the Centers for Medicare and Medicaid Services for **“Ohio Medicaid Group VIII Assessment (Federal).”**

\$4.32 million

Timothy Sahr, MPH, MA, Ohio Colleges of Medicine Government Resource Center, received a grant from the Centers for Medicare and Medicaid Services for **“Ohio Medicaid Assessment Survey (Federal).”**

\$2.44 million

Cynthia Sieck, PhD, MPH, assistant professor, Department of Family Medicine, received a grant from the National Institute on Aging for **“Total engagement and activation measure (TEAM): Developing a measure of the capacity for patients to engage in their health care.”**

\$2.99 million

Kristin Stanford, PhD, associate professor, Department of Physiology and Cell Biology, received a grant from the National Institute on Aging for **“BAT as a therapeutic for the metabolic and cardiac dysfunction with senescence.”**

\$2.04 million

Paul Stoodley, PhD, professor, Department of Microbial Infection and Immunity, received a grant from the National Institute of General Medical Sciences for **“The role of Staphylococcus aureus aggregate formation in establishing biofilms in chronic orthopaedic periprosthetic joint infection.”**

\$2.56 million

Noah Weisleder, PhD, professor, Department of Physiology and Cell Biology, received a grant from the National Institute on Aging for **“Regulation of store-operated calcium entry during muscle aging.”**

\$3.38 million

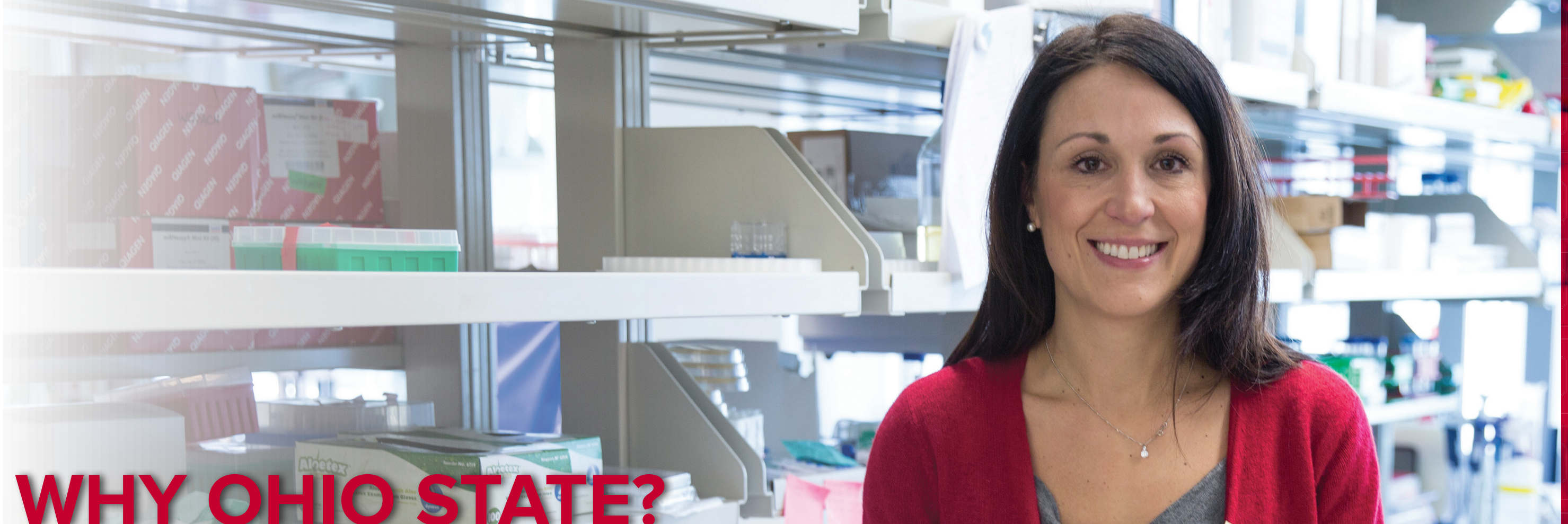
Bryan Whitson, MD, PhD, professor, Department of Surgery, received a grant from the National Heart, Lung and Blood Institute for **“Preservation and rescue of the lung donor allograft for transplantation.”**

\$2.04 million

Ruili Xie, PhD, assistant professor, Department of Otolaryngology, received a grant from the National Institute on Deafness and Other Communication Disorders for **“Cellular mechanisms of age-related hearing loss.”**

\$2.13 million

Sung Yoon, PhD, professor, Department of Biological Chemistry and Pharmacology, received a grant from the National Institute of Diabetes and Digestive and Kidney Diseases for **“Role of proNGF-p75 signaling in bladder control after spinal cord injury.”**



WHY OHIO STATE?

It's more than just the innovative science – it's the people

Rosa Lapalombella, PhD, has led life-changing research at The Ohio State University College of Medicine and The Ohio State Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC – James) since 2006, after earning her PhD at the University of Bologna in her native Italy. She now calls Columbus home.

Dr. Lapalombella's work has contributed to the translation of five therapeutic agents into clinical trials for chronic lymphocytic leukemia (CLL), she's been part of 10 grant-funded research initiatives, she's a co-holder of a patent for therapeutic-agent delivery methods to treat B-cell-related disorders and she's been the recipient of numerous research awards.

She's associate director for basic research in the Division of Hematology and director of the Pelotonia Fellowship Program. Her research focuses on epigenetic alterations of cancer cells and the development of experimental therapeutics for hematologic disease.

MENTORSHIP AND PRESTIGE

"My passion for hematology and Ohio State's connection to Dr. Byrd brought me here," Dr. Lapalombella says. "They were making history with CLL treatment."

In 2006, Dr. Lapalombella took advantage of a six-month opportunity to study CLL in the lab of John Byrd, MD, a renowned cancer researcher at the College of Medicine and the OSUCCC – James. Dr. Byrd has since led research teams whose work turned CLL, long considered a death sentence, into a relatively manageable illness for many patients.

"When I started at the lab, chemotherapy was the standard treatment for patients with CLL. The research conducted in the lab on ibrutinib has significantly changed the way patients are now treated. While these drugs don't cure CLL, patients can go on this pill and expect to live as long as they would without the disease. I wouldn't have had the chance to be a part of saving their lives if it wasn't for Dr. Byrd's mentorship."

"For me," Dr. Byrd says, "one of the most important things in science is not only doing work that impacts patients' lives, but leading forth and bringing diversity to science in terms of women, people of color, people of different nationalities and economic backgrounds, and first-generation college grads like me."

CLINICAL TRIALS

Since starting with Dr. Byrd's lab, Dr. Lapalombella has seen it grow from a dozen members to more than 80, and it's garnered an international reputation for its innovative research. As a faculty member at the Ohio State College of Medicine, she works with many companies to help translate their new drugs into clinical trials. For example, during a test with one company, they discovered the drug to be too toxic with their mice. Her team was able to help them formulate a new, safer drug that's now been used with more than 1,000 patients across many cancers, including those with myeloma who've failed standard therapies.

"In Dr. Byrd's lab, I've learned to use my expertise to improve patients' lives across many diseases, not just leukemia," Dr. Lapalombella says.

PAYING IT FORWARD

Dr. Lapalombella mentors the next generation of cancer scientists. "Under Dr. Byrd's incredible mentorship, I grew from a trainee into a tenured associate professor in the College of Medicine," she says. "I'm now able to help students and watch them grow and learn. It's one of the most important things I do – developing future physician-scientists."

"I'm now able to help students and watch them grow and learn. It's one of the most important things I do – developing future physician-scientists."
— Dr. Lapalombella, PhD



OHIO STATE WEXNER MEDICAL CENTER

Ohio State College of Medicine students learn at one of the most comprehensive health sciences and academic medical centers in the country. The Ohio State University Wexner Medical Center is home to more than a dozen affiliated research centers and seven hospitals, which provide care to more than 64,000 inpatients annually.

The hospitals include University Hospital and East Hospital, the medical center’s two full-service hospitals; Richard M. Ross Heart Hospital, dedicated to the study, treatment and prevention of cardiovascular diseases; Harding Hospital, an inpatient and outpatient psychiatric hospital; Dodd Rehabilitation Hospital, one of America’s best rehabilitation centers; and the Brain and Spine Hospital, with specialized units for stroke care, neurotrauma and traumatic brain injuries, spinal cord injuries and spine surgery, epilepsy, chronic pain, acute rehabilitation and neurosurgery. In addition, there’s a unified physician practice, representing more than 1,200 preeminent physicians, and a network of community-based primary and subspecialty care facilities that manage more than a million patient visits each year.

Adjacent to University Hospital is The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC – James), a dedicated cancer hospital and research center.

Clinical areas of distinction include: cancer, heart, neurology, transplantation, diabetes, musculoskeletal, digestive diseases and critical care. Research programs of distinction are allergy and infectious disease; behavioral health and addiction; cancer; genomics and immunology; health policy; heart, lung and blood; metabolic diseases; neurological disorders; pharmaceutical sciences; precision medicine; translational data analytics; and translational sciences.

This year, The Ohio State University Wexner Medical Center was named to *U.S. News & World Report’s* “Best Hospitals” list for the 27th consecutive year. *U.S. News* consistently ranks Ohio State as the top hospital in central Ohio. Our nationally ranked specialties include an Ear, Nose and Throat program that’s ranked third in the country.



Nationwide Children’s Hospital in Columbus is nationally recognized as being among the best children’s hospitals and highly funded pediatric research institutes. It’s been named **#7** in *U.S. News & World Report’s* “Best Children’s Hospital Honor Roll.” This top distinction is awarded to only 10 children’s hospitals with the most exceptional performance across all specialty rankings.

Ohio State’s partnership with Nationwide Children’s Hospital (NCH) began in 1916, and today it’s one of Ohio State’s largest medical training classrooms. All Ohio State medical students complete their pediatric rotations at NCH. In addition, the College of Medicine and the OSUCCC – James have partnered with NCH on thousands of clinical and research programs, and hundreds of Ohio State’s faculty also see patients, conduct research and teach at NCH.

COLUMBUS: MIDWEST FRIENDLINESS, METROPOLITAN STYLE

The Ohio State University College of Medicine is home to exciting new research, innovative healthcare delivery and unique, multidisciplinary education. But the city surrounding the university has grown quickly with exciting developments of its own.

Big-city culture and small-town affability welcome you to Columbus, the best of both worlds.

BIG

- The 14th-largest city in the U.S. and the second-largest in the Midwest, behind Chicago
- The fourth-fastest-growing city in the country

AFFORDABLE

- A stable economy of diverse fields, including hubs in the restaurant, fashion, education, engineering and pharmaceutical industries

DIVERSE

- 134 nations represented, 109 languages
- The 15th-largest LGBTQ population among U.S. cities
- Retail test market hub of the U.S.

THRIVING

- Five Fortune 500 businesses and 14 Fortune 1000 companies
- A destination for startups, thanks to affordability and opportunities for venture capital

SMART

- Home to more PhDs than the national average
- The largest concentration of PhDs in the Midwest
- More than 50 college and university campuses
- 13 area high schools in the top 10% of *U.S. News* rankings

ACCESSIBLE

- Average commute of 20.8 minutes
- Within 550 miles of about half of the U.S. population
- More than 150 daily nonstop flights to 40 airports at John Glenn Columbus International Airport

CLINICAL CARE

New research initiatives and clinical trials at The Ohio State University College of Medicine have improved transplant outcomes. More than 10,000 transplant surgeries have now been performed at The Ohio State University Wexner Medical Center — a milestone reached by less than 10% of the nation’s transplant centers.

Ohio State’s Comprehensive Transplant Center has cared for patients with diseases of the heart, lung, kidney, liver and pancreas since 1967. It’s already a large program, ranked ninth by volume in the United States. But its 125 physicians, nurses and staff, who are dedicated to helping patients receive the gift of life, hope to see that volume increase even more.

“Our goal is to continue to grow as much as we can and to help as many patients as we can,” says Kenneth Washburn, MD, executive director of the Ohio State Comprehensive Transplant Center and director of the Division of Transplantation Surgery.

OHIO STATE DISCOVERIES HELP TRANSPLANTS OVER 10,000

One way to accomplish this is to increase the number of usable organs for transplantation. As a major academic medical center, Ohio State is committed to training the next generation of transplant surgeons and clinicians and has the resources to support translational research to improve transplant outcomes.

In the Comprehensive Transplant Center’s Biorepository, life-altering biomedical discoveries are being pioneered using patient-approved biological samples as well as medical history information that can be studied to change the ways we prevent, diagnose and treat disease and perform transplantations in the future.

Physician-scientists at the College of Medicine also are advancing organ perfusion, the ability to rehabilitate organs that were once considered unusable.

Ohio State was the first transplant center in Ohio to perform the ex-vivo lung perfusion clinical trial. In its Organ Assessment and Repair Center, donated lungs are placed in

an incubator-like dome and attached to a circuit that removes excess water and ventilates and repairs the lung tissue.

In 2019, Ohio State launched the TransMedics clinical trial for ex-vivo liver perfusion, a multi-site trial using similar technology.

“The number of lives we’re able to save through liver transplantation is limited by an inadequate pool of qualified donors,” says Sylvester Black, MD, site principal investigator on the trial, assistant professor of Surgery and an Ohio State transplant surgeon. “In addition to preserving livers for transplant, this promising technology can be used to assess and potentially improve the function of livers that are traditionally not transplantable, which may expand the donor pool.”

“Our goal is to continue to grow as much as we can and to help as many patients as we can.”

–Kenneth Washburn, MD

BOOST

“This promising technology can be used to assess and potentially improve the function of livers that are traditionally not transplantable, which may expand the donor pool.” – Sylvester Black, MD

Another new clinical trial can decrease wait times for people who need kidney transplants by making it possible for patients without hepatitis C to safely receive kidneys infected with the virus. Livers, too, have similarly been made available to patients after having been exposed to hepatitis C or other diseases. The practice would have been unthinkable only a decade ago, but groundbreaking new treatments for hepatitis C offer a cure rate of at least 97%.

So far, all of Ohio State’s trial patients who have received kidneys with the hepatitis C virus have been cured of hepatitis C – most within one month, says Reem Daloul, MD, a transplant nephrologist in the College of Medicine’s Division of Nephrology and the study’s principal investigator.

“Here at Ohio State, our goal is to make this opportunity available to all interested transplant patients by the end of 2020,” Dr. Daloul says. “The more organs available, the more lives we can save – with fewer people waiting on the lengthy state and national wait lists.”

It’s just a fraction of the ambitious endeavors at Ohio State to get organs to those who desperately need them.

“The bottom line is that we’re here to help prevent people from dying,” Dr. Washburn says. “And it’s really exciting to see how teams at Ohio State have come together for a common mission to help save lives.”



OHIO STATE LEADING LIFE-SAVING RESEARCH TO FIGHT OPIOID CRISIS

A \$65.9 million federal research grant will fund an Ohio State University College of Medicine-led consortium of academic, state and community partners committed to reducing opioid deaths by 40% within three years. Ohio has the second-largest number of opioid deaths in the country. With southern Ohio being ground zero for this national epidemic, the College of Medicine is well positioned to provide the leadership, insights and implementation strategies needed to create behavioral changes within the communities.

The Ohio State College of Medicine will lead the efforts of three dozen faculty in the colleges of Pharmacy, Public Affairs, Public Health, Nursing, Education and Human Ecology, Engineering, Arts and Sciences, Social Work, and Food, Agricultural and Environmental Sciences, as well as experts from six other Ohio universities, state agencies and community organizations.

“We were able to leverage the collaborative nature of Ohio State and its relationships throughout the state of Ohio to develop a research team that’s tackling one of the nation’s most important medical crises.”

— K. Craig Kent, MD

As a comprehensive research institution, Ohio State is able to offer uniquely multidisciplinary resources to address the complexities of the opioid epidemic, says K. Craig Kent, MD, dean of The Ohio State University College of Medicine and vice president for Health Sciences.

“This national research initiative is further evidence of the growing strength of The Ohio State University College of Medicine as a research powerhouse,” Dr. Kent says. “We were able to leverage the collaborative nature of Ohio State and its relationships throughout the state of Ohio to develop a research team that’s tackling one of the nation’s most important medical crises.”

The initiative is part of the National Institutes of Health-funded HEALing Communities Study (HCS). The HCS will test the impact of community processes that help implement evidence-based practices across multiple sectors – including health care, behavioral health and criminal justice settings – that address opioid overdose deaths, examining associated outcomes within highly affected communities in Ohio.

“Ohio State is investigating many solutions to the opioid epidemic. As one of our initiatives, Ohio State’s College of Medicine and College of Pharmacy are partnering on an opioid alternative research collaborative to test new therapies. The project is funded by a \$5.2 million grant from the Ohio Development Services Agency.”

Peter Mohler, PhD, vice dean for Research



“By applying evidence-based interventions, this initiative will save lives in Ohio communities and serve as a model for communities across the nation,” says lead investigator Rebecca Jackson, MD, director of Ohio State’s Center for Clinical and Translational Science and associate dean for clinical research in the College of Medicine.

The study hypothesizes that communities will increase naloxone distribution, expand the utilization of medication for opioid use disorder and reduce high-risk opioid prescribing. Ultimately, the purpose of the study is to work with communities so that they can make decisions about what works best for them.

After implementing evidence-based prevention methods and treatment interventions in different settings, the Ohio coalition will then provide stakeholders on the front lines of the opioid epidemic with real-time, practical information about which techniques are most effective.

“It will empower communities with information and sharing expertise,” Dr. Jackson says.



“By applying evidence-based interventions, this initiative will save lives in Ohio communities and serve as a model for communities across the nation.”

— Rebecca Jackson, MD

OHIO STATE POISED TO LEAD IN IMMUNOLOGY RESEARCH

The immune system, as Eugene Oltz, PhD, explains, is the body's most natural treatment for nearly any malady.

His lab at The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC – James) is dedicated to harnessing the functions of the immune system to destroy cancer, treat autoimmune diseases and prevent infectious disease. It's just one of several ways Ohio State is investing in a medical revolution driven by immunology research.

“Immunotherapy provides exciting and expanding arsenals for fighting cancer. It refuels the immune system so that it can find and destroy the sneaky cancer cells wherever they hide.”

— Zihai Li, MD, PhD

“Advances in immunotherapy mean that there are increasingly optimistic conversations when it comes to serious diagnoses,” says Dr. Oltz, who joined The Ohio State University College of Medicine this year as chair of its Department of Microbial Infection and Immunity. “But a lot of work remains.”

Throughout his career, much of Dr. Oltz's work has focused on the changes that occur in normal immune cells that lead to autoimmune diseases and cancer. The lab's current active research program also investigates the impact of DNA damage on chromosome structure and gene expression.

“We're also learning how to turn on large panels of genes that have closely related functions, with the ultimate goal of taking cells from a patient, flipping some of their ‘master switches’ and

re-engineering the patterns of genes that they express to make them more effective therapeutics when we put them back into the patient,” Dr. Oltz says.

“Insights from these studies will guide strategies to create targeted epigenetic therapeutics for cancer, autoimmunity and chronic inflammatory diseases.”

MOLDING RESEARCH LEADERS

Helping drive that progress is an Ohio State program that provides rigorous research training in immunology and professional career development for surgical trainees who have exceptional academic achievement, clinical skills, professionalism and leadership potential.



Zihai Li, MD, PhD, founding director of the Pelotonia Institute for Immuno-Oncology

It's led by Ginny Bumgardner, MD, PhD, associate dean for Research Education, professor of Surgery and a transplant surgeon in the Ohio State Comprehensive Transplant Center. Dr. Bumgardner directs the Medical Student Research program, the Department of Surgery's Research Training Program and the College of Medicine's Master of Medical Science Program.

Dr. Bumgardner was just awarded a \$1.6 million, five-year T32 competitive renewal grant from the National Institutes of Health's National Institute of Allergy and Infectious Diseases for her project: Advanced Research Training in Immunology for Surgical Trainees (ARTIST).

“These funds will support the surgeon-scientist pipeline and encourage new collaborations between Ohio State's surgery faculty and basic-scientist investigators through co-mentorship of surgical trainees investigating surgical problems with an immunologic basis,” Dr. Bumgardner says. “The training program has significantly impacted the preparedness and commitment of trainees to a research career. Three ARTIST T32-supported surgery residents made the career decision to pursue a PhD.”

The 2019-2024 ARTIST T32 funding cycle increases the number of postdoctoral training positions from two to four per year.

INVESTING IN LIFE-ALTERING DISCOVERIES

“It's our job to find out why immunotherapy doesn't yet work as well for every diagnosis, and we can do this through collaborations between basic and clinical researchers,” Dr. Oltz says. “That's one of the major missions at Ohio State: to enhance basic and translational research in immunology in multiple areas, including in Ohio State's new institute for immuno-oncology.”

To Zihai Li, MD, PhD, founding director of the new Pelotonia Institute for Immuno-Oncology (PIIO), a recent public announcement and celebration of the institute's formation wasn't the beginning, but a continuation of early successful endeavors in this relatively new area of cancer research and therapy, widely considered the next frontier in cancer prevention and treatment.

"You may ask this question: 'Cancer immunotherapy — are we there yet?'" Dr. Li said at the PIIO celebration. "The answer is a resounding 'Yes!' Immunotherapy provides exciting and expanding arsenals for fighting cancer. It refuels the immune system so that it can find and destroy the sneaky cancer cells wherever they hide."

Dr. Li said immunotherapy also can stop cancer cells from developing and spreading, decreasing chances for recurrence.

"In the last five years, we've seen extraordinary results of immunotherapy for several cancer types, including lung cancer, melanoma, leukemia and others," he said. "However, there are many remaining critical, unanswered questions regarding cancer immunotherapy."

Hence the need for an institute dedicated to this modality. The PIIO at the OSUCCC – James is a comprehensive bench-to-bedside research initiative focused on harnessing the body's immune system to fight cancer at all levels — from prevention to treatment and survivorship.

Pelotonia, a grassroots cycling event, has raised over \$202 million for cancer research initiatives, and the majority of this work is conducted by researchers in the College of Medicine. The PIIO was made possible by a pledge of more than \$102 million over the next five years. The largest portion of this pledge — \$65 million — will fund the PIIO. The OSUCCC – James is also supporting the PIIO with \$35 million to expand and sustain research infrastructure.

Ohio State's cancer program will add up to 32 faculty over the next five years to work within the PIIO. Multi-phase laboratory renovations will take place to create advanced cellular lab facilities, immune monitoring and discovery platforms, immunogenomics, systems immunology and other research areas for start-up initiatives and collaborations with other academic centers and industry partners.

OSUCCC Director Raphael Pollock, MD, PhD, says the potential for immunotherapy is so strong that university leaders are confident it will become another standard treatment modality for cancer, along with surgery, systemic therapy such as chemotherapy and hormonal therapy, precision or targeted therapies, and radiation therapy.

Continuing Ohio State's emphasis on immunology research, the college is searching for a director of Transplant Immunology to complement an already robust solid organ transplantation program.

"We've learned over time that the immune system plays a fundamental role in most disease processes," says K. Craig Kent, MD, dean of the College of Medicine and vice president for Health Sciences. "With all of our new recruits and the strength of our existing faculty, we're well on our way to being one of the top immunology programs in the nation."



NATIONAL APPOINTMENTS

Anil Agarwal, MD

Professor of Internal Medicine
President-Elect, American Society of Diagnostic and Interventional Nephrology

Ricardo Carrau, MD

Professor of Otolaryngology - Head and Neck Surgery
President, North American Skull Base Society

David Cohn, MD

Professor of Gynecologic Oncology
President-Elect, Society of Gynecologic Oncology

Wendy Frankel, MD

Chair of Department of Pathology
President-Elect, United States and Canadian Academy of Pathology

Diane Gorgas, MD

Professor of Emergency Medicine
Director, American Board of Emergency Medicine

Darrell Gray, MD, MPH

Associate Professor of Internal Medicine
Chair, American College of Gastroenterology's Minority Affairs and Cultural Diversity Committee

John Grecula, MD, FACR

Professor of Radiation Oncology
President-Elect, International Society of Intraoperative Radiotherapy

Geri Hewitt, MD

Professor of Obstetrics and Gynecology
President-Elect, North American Society for Pediatric and Adolescent Gynecology

K. Craig Kent, MD

Dean, The Ohio State University College of Medicine
Chair, American Board of Surgery

Leon McDougle, MD, MPH

Professor of Family Medicine
President-Elect, National Medical Association

Sheryl Pfeil, MD

Professor of Internal Medicine
President-Elect, Alpha Omega Alpha Honor Medical Society



STUDENT-MANAGED

FREE CLINIC

It's Thursday night at the Columbus Free Clinic, and second-year medical students from The Ohio State University College of Medicine are training first-year students on how to take care of the 30 patients they'll see that night.

"You'll get your patients from the undergraduate volunteers at the front desk and lead them into a room to begin the patient history," says Bryn Dougherty, referrals coordinator and a second-year medical student. "When you're done with your examination, you'll present to the volunteer physician or nurse practitioner to discuss the diagnosis."

A team of medical students runs this clinic. They manage the volunteers, create staffing schedules for the physicians and medical students, purchase supplies, work with facilities, coordinate with other healthcare professional students and follow up with patients to explain lab or imaging results.

Few medical school-affiliated free clinics in the U.S. offer the level of care and breadth of service as those at Ohio State. "The whole operation is managed by the students," says Robert Cooper, MD, faculty advisor at the Ohio State College of Medicine. "They get real-world experience running the entire, complex operation of a primary care clinic."



First- and second-year medical students volunteer for several shifts a year for early clinical experience that prepares them for rotations in the third year. "This is the most important part of medical education outside of the curriculum," says Emma Barrett, volunteer coordinator and a second-year medical student. "I knew how to use a stethoscope and can already write a coherent note in the EMR. Above all here, you learn compassion and empathy."

"The whole operation is managed by the students," says Dr. Robert Cooper, faculty advisor at The Ohio State University College of Medicine. "They get real-world experience running the entire, complex operation of a primary care clinic."

A few years ago, the Columbus Free Clinic expanded its services. "We have students from the colleges of Social Work, Law, Nursing and Pharmacy who all come here to help patients. Since we have so many different professional schools here at Ohio State, these students can learn how to interact with one another in a real-world situation," Dr. Cooper says.

The Ohio State Wexner Medical Center supports the students and the Columbus Free Clinic by providing free space, labs, radiology and prescription drugs.

Other free clinics staffed by Ohio State providers include services for Spanish-speaking patients, the Asian and Muslim communities, and other vulnerable populations. Throughout the year, more than 2,000 patients will be seen by more than 300 first- and second-year Ohio State medical students, giving them early clinical learning experiences and providing a valuable service to the community.

"This is why I went to medical school," Dougherty says. "To help people."

"This is why I went to medical school," medical student Bryn Dougherty says. "To help people."

LETTER FROM HAL PAZ, MD



In July, Ohio State welcomed Hal Paz, MD, as the university's inaugural executive vice president and chancellor for Health Affairs. He leads all seven health sciences colleges and is CEO of the \$4 billion Ohio State Wexner Medical Center enterprise, which includes seven hospitals, our nationally ranked Ohio State College of Medicine, more than 20 research institutes, a practice plan and an accountable care organization.

I'm thrilled to lead The Ohio State University's efforts in building the future of academic health and couldn't be prouder of how our College of Medicine has been leading the way. We now have the unique opportunity to bring together the largest array of health sciences colleges in the nation that reside on one campus. Few academic health centers in North America have such mass in terms of health and health care, and can work so collaboratively across disciplines.

Interprofessional education is the new model

A comprehensive flagship university like Ohio State can marshal all of its resources and intellectual prowess in fields as diverse as the health sciences, economics, social work, agricultural extension and even climate science to identify solutions and foster innovation. We're training physicians, dentists, nurses, optometrists, pharmacists, veterinarians and other healthcare practitioners and public health professionals together in simulations and clinical experiences, and in an interprofessional education curriculum.

The Ohio State College of Medicine is leading the way

Ohio State has invested in creating the ideal environments for interprofessional collaboration among all health sciences, with The Ohio State University College of Medicine forming a cornerstone of this new model. I'm astounded by the college's tremendous growth and excited about its strong trajectory. As I've toured the college, I've met some of the most brilliant minds in academic medicine who are pushing the boundaries to find life-altering discoveries that translate into clinical treatments and cures. The students are a diverse group of forward thinkers, learning advanced skills in working with healthcare teams while delving into groundbreaking research.

In my brief time here at Ohio State, I've learned how extraordinary our faculty, students, researchers and clinicians are. I can say for certain that the future of academic health care is here at Ohio State.

Hal Paz, MD
Executive Vice President and Chancellor for Health Affairs at The Ohio State University and Chief Executive Officer of The Ohio State University Wexner Medical Center

You can follow Dr. Paz on @drhpaz and on LinkedIn



After reciting a medical student oath and receiving their white coats, first-year Ohio State College of Medicine students celebrate their formal convocation, forming the letters O-H-I-O with their arms – an Ohio State tradition.



 **THE OHIO STATE UNIVERSITY**
COLLEGE OF MEDICINE

medicine.osu.edu

medicine.osu.edu/alumni19

medicine.osu.edu/recruiting19

 @OhioStateMed

 @ohiostatemed

 OhioStateMed



Future Interdisciplinary Health Sciences building, home of the new Ohio State College of Medicine



THE OHIO STATE UNIVERSITY
COLLEGE OF MEDICINE

370 W. 9th Ave.
Columbus, OH 43210

Non-Profit
U.S. Postage
PAID
Permit No. 711
Columbus, OH