

Facilities and Other Resources – The Ohio State University

Instructions

1. Personalize the content below specific to your proposal by including colleges, institutions, cores and/or programs you collaborated with (if applicable) and deleting any that do not pertain to your project.
 2. Delete information that does not pertain to your project (e.g., specific clinical sites).
 3. Delete instructions.
 4. To obtain budget to include with the grant application, please [submit a request \[external link\]](#).
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The Ohio State University Clinical and Translational Science Institute (CTSI)

The Ohio State University Clinical and Translational Science Institute (CTSI) is a collaboration between The Ohio State University, The Ohio State University Wexner Medical Center and Nationwide Children's Hospital dedicated to advancing today's discoveries to improve health for all.

The CTSI is funded through a multi-year award from the National Institutes of Health's [National Center for Advancing Translational Sciences \(NCATS\) Clinical and Translational Science Awards \(CTSA\)](#) Program. The CTSI aims to be a national leader and model CTSA hub in advancing impactful clinical and translational research at The Ohio State University and Nationwide Children's Hospital.

The CTSI serves the entire clinical and translational research and science community across Ohio State and Nationwide Children's Hospital and partners with community health and education agencies and regional institutional networks. The CTSI provides resources, educational programs and funding opportunities to help advance clinical and translational research and science.

Julie Johnson, PharmD is the director and principal investigator of the Clinical and Translational Science Institute, associate dean for Clinical and Translational Research in the Ohio State College of Medicine and associate vice president of Research at The Ohio State University.

The Ohio State University and Research Institute at Nationwide Children's Hospital offer rich scientific and educational environments for the CTSI with state-of-the-art resources that are accessible to investigators and research staff.

Founded in 1870 as Ohio's primary land grant institution under the Morrill Act of 1862, The Ohio State University has become a top research university over the past 155 years. Originally named the Ohio Agricultural and Mechanical College, it was renamed in 1878. With \$1.449

billion research budget, Ohio State is a leader in research and is ranked among the world's most innovative universities.

Ohio State is one of the largest universities in the United States, with 8,400 faculty members, 66,000 undergraduate and graduate students, 18 different colleges and over 400-degree programs. Ohio State consistently ranks among the top 20 national public universities according to U.S. News & World Report. Faculty and staff participating in this proposal hold research and teaching positions from colleges across the university, including:

- College of Arts and Sciences
- Fisher College of Business
- College of Dentistry
- College of Education and Human Ecology
- College of Engineering
- Knowlton School of Architecture
- College of Food, Agricultural, and Environmental Sciences
- School of Environment and Natural Resources
- Moritz College of Law
- College of Medicine
- School of Rehabilitation and Health Sciences
- College of Nursing
- College of Optometry
- College of Pharmacy
- John Glenn College of Public Affairs
- College of Public Health
- College of Social Work
- College of Veterinary Medicine

The Ohio State University Wexner Medical Center is one of the largest and most diverse academic medical centers in the country. It is consistently ranked in "Best Hospital" by U.S. News & World Report Magazine and boasts eight specialties ranked among the best in the country. The University Health System Consortium has also ranked it in the top ten academic medical centers nationally in quality and accountability measurements. The Wexner Medical Center is recognized for its leadership and innovation in information technology, including the development of a system-wide computerized recordkeeping system that allows the paperless and confidential exchange of clinical information.

Wexner Medical Center expert physicians and researchers are leaders in personalized health care, giving people access to unique disease prevention and treatment options based on their own genetic makeup and lifestyle. Wexner Medical Center includes the College of Medicine, seven hospitals, a Comprehensive Cancer Center, more than 20 research centers and institutes, numerous outpatient clinics and multiple other services, core laboratories and more than 2,000 active clinical trials in virtually every medical specialty. Wexner Medical Center also includes a unified physician practice, representing more than 800 pre-eminent physicians and a network of community-based primary and subspecialty care facilities that manage more than 900,000 patient visits each year.

The Ohio State University College of Medicine has been a leader in innovative programs, initiatives and curriculum for more than a century. As one of the largest and most diverse academic medical centers in the country, it has trained more than 20,000 physicians and countless thousands of other affiliated health care professionals. The College of Medicine features 20 clinical departments, eight basic science departments and an outstanding School of Health and Rehabilitation Sciences offering undergraduate, master's and PhD programs.

CTSI-Specific Resources

Appalachian Translational Research Network

The Ohio State University CTSI is a founding member of the Appalachian Translational Research Network (ATRN) is a 501(c)3 collaborative society, designed to strengthen translational and public health research and training efforts throughout Appalachia. The ATRN's goal is to improve health among residents in Appalachia by fostering collaborative partnerships among institutions and community-partners within the region to enhance translational research. This network has ten institutional partners (Penn State University, The Ohio State University CTSI, Ohio University, Wake Forest School of Medicine, University of Cincinnati, iThrive – an integrated Translational Health Research Institute of Virginia, West Virginia University CTSI, University of Kentucky CCTS and Pitt CTSI), representing six states.

The ATRN hosts an annual Health Summit each year, rotating hosting through the institutional partners that draws many participants, including researchers and community organizations, to discuss pressing issues that tie this region together.

The Ohio State University CTSI offers a limited number of complimentary memberships to faculty and staff at The Ohio State University and Nationwide Children's Hospital, as well as CTSI community partners. Beverly Stringer is the liaison for The Ohio State University CTSI.

CTSI Community Engagement Program

The CTSI Community Engagement Program supports the development of researcher/participant and researcher/community partnerships. Such partnerships require familiarity with research participant perspectives, outreach and engagement best practices and available resources. Services available through the Community Engagement Program, with a particular emphasis on developing trusting partnerships in Appalachia Ohio, include assistance in project planning for community-based or community-engaged projects; assistance with recruitment, data collection or other study-related activities in Appalachian-based projects; collaborative opportunities with Appalachian Translational Research Network (ATRN) community partners; collaborative opportunities with ATRN institutional/regional partners; and collaborative opportunities with Ohio State researchers to conduct studies in the Appalachian region. Jeff Grever is the Community Engagement team manager.

Recruitment and Retention Services

CTSI Recruitment and Retention Services (RRS) provides consultation to research team members to help facilitate the process of recruiting and retaining study participants by sharing the best tools and methods available in study participant recruitment and retention. Since the most successful approach to recruitment is a combination of multiple tools and strategies, RRS can help guide recruiters through the process and offers a toolbox of options such as ResearchMatch, MyChart for Research Recruitment, StudySearch, HERO line, as well as assistance for creating recruitment marketing materials such as brochures, fliers and postcards, social media campaigns and advertisements. Mary Becker is the Recruitment and Retention Services team manager.

REDCap Services

REDCap is a secure, web-based application for building and managing online surveys and data collection forms. REDCap's easy design environment allows investigators to create data capture forms with features like a built-in audit log and configurable user rights. It was specifically designed for research data collection, which sets it apart from other commercial survey building tools like Qualtrics or SurveyMonkey. The CTSI and the Biomedical Information Department (BMI) co-host the installation of REDCap at Ohio State and provide consultation, training and account management services.

Regulatory Knowledge and Support

CTSI Regulatory Knowledge and Support (RKS) enhances research operations by collaborating with internal Ohio State and Nationwide Children's Hospital research partners, core services and external entities, such as the Food and Drug Administration (FDA) and the National Institutes of Health (NIH). RKS provides the following services:

- Provides study oversight services including Data Safety and Monitoring Board (DSMB), independent safety monitor, independent study monitoring through source verification and regulatory reviews and/or conducting independent quality checks/audits
- Provides guidance for establishing a DSMB
- Consultations for development of data and safety monitoring plans, protocols, consent forms, IRB applications, FDA Investigational New Drug (IND) and Investigational Device Exemption (IDE) applications, essential documents and/or grant submission documents
- Guidance for regulatory processes including various IRB submissions, including single IRBs for multi-site studies, FDA IND and IDE submissions, ClinicalTrials.gov Registration and grant submissions processes
- Consultations for regulatory, International Council for Harmonization Good Clinical Practices (ICH-GCP) and NIH requirements
- Serves as a subject advocate for clinical trials
- Provides training, guidance and compliance communications to the university regarding ClinicalTrials.gov

The Regulatory Knowledge and Support (RKS) Team is led by Dr. Michael Para, who is the RKS Director. April Green serves as the RKS team manager and Sarah Stenger serves as the Research Compliance Analyst.

CTSI Trial Innovation Unit/Trial Innovation Network

The NIH-funded TIN is a national collaborative initiative aimed at improving investigator-initiated multicenter trial operations for Clinical and Translational Science Award (CTSA) consortium members across the United States, including all investigators at Ohio State and NCH. The TIN provides services for all aspects of proposal development and execution, including Efficacy to Effectiveness (E2E) consultations on clinical trial design, development of robust recruitment plans and materials, serving as a Central IRB and serving as a clinical and/or data coordinating center.

Other CTSI Services

Tracking and Evaluation, Comparative Effectiveness Research, Clinical Research Center, Clinical Research Services, Research Education, Training and Career Development (including programming for K12 and T32 scholars and clinical research professionals), Translational Technologies and Core Resources, Pilot Translational and Clinical Research Programs, Spark Awards (formerly Voucher Program), Research Concierge and others detailed in the UM1 proposal modules.

Ohio State Resources

Biomedical Informatics Department

The Biomedical Informatics Department (BMI) is in a purpose-built facility comprising over 40,000 sq. ft. on the second and third floors of Lincoln Tower. BMI is located near The Ohio State University Wexner Medical Center, the Colleges of Pharmacy, Public Health and Engineering, as well as campus-wide scholarly resources, thereby creating networking opportunities and facilitating meetings and collaborations. BMI incorporates a suite of consultative services, including electronic health record (EHR) content development for research purposes, research data warehousing and registries, electronic data capture/management, bioinformatics, biostatistics and software engineering. Importantly, BMI strongly supports training in the responsible conduct of research and facilitates/encourages access to the online CITI training modules, attendance to the department's seminar courses and faculty-led research-in-progress sessions and research ethics support through the Ohio State CTSI Design, Biostatistics and Research Ethics Support and Training Core and the Ohio State Center for Ethics and Human Values. Computing resources are described under Equipment. Dr. Lang Li is chair and Dr. Soledad Fernandez is vice chair of the department.

CATALYST

The Center for the Advancement of Team Science, Analytics, and Systems Thinking (CATALYST) within the College of Medicine focuses on advancing research and discovery in the delivery of health services across the continuum of care using a team science approach. Directed by Dr. Ann McAlearney, the associate dean for Health Services Research, CATALYST supports transformational research in areas such as health equity, implementation science, health information technology adoption and use, patient engagement, maternal and fetal health, patient safety and quality improvement, management practices in health care and patient-reported outcome measurement and improvement.

The vision of CATALYST is to provide the infrastructure necessary to acquire extramural funding, improve the quality of scholarship, develop faculty in the areas of health services and implementation science research and increase the educational capacity of the institution while serving to extend the research, education and clinical enterprises of the COM. Through CATALYST, faculty investigators and research staff all have access to technical support including personal computers, the campus-wide network and software to support analysis. All members of CATALYST have individual offices as well as shared collaborative space to facilitate group efforts.

Clinical Research Center

The Clinical Research Center (CRC) provides research support for researchers across The Ohio State University, Wexner Medical Center and Nationwide Children's Hospital. The CRC is funded by The Ohio State University College of Medicine as part of the Center for Clinical Research Management. Core services include an Analytical and Development Laboratory, Processing Laboratory, Research Nutrition Laboratory, Study Coordination and Nursing. The unit houses research subjects for both inpatient and outpatient studies. Research areas located on the unit include 12 hospital beds with an outpatient bay, DXA room, laboratories for processing and freezing samples and running assays and a research nutrition/production kitchen. Approximately 17 people are employed in the CRC including a Dietitian, Lab Technicians, Nurses, Clinical Research Coordinators and Clinical Research Assistants. The CRC annually supports approximately 100 investigators, providing services for over 150 studies with 2,700 participant research visits.

Clinical Trials Office

The Clinical Trials Office (CTO) provides a centralized infrastructure to facilitate the development, implementation and management of clinical trials at The Ohio State University Comprehensive Cancer Center (OSUCCC) - James. The CTO is made up of 17 separate disease teams and employs nearly 300 staff. They open approximately 150 new clinical trials and enroll approximately 1000 patients per year. Many are original studies initiated by The James investigators. The CTO's centralized infrastructure includes protocol implementation and coordination, regulatory management, clinical trial agreements and budgets, internal auditing, clinical trial education and database management. The CCC holds UM1-NO1 and LAPS grants.

The CTO is overseen by a CTO medical director and administrative director. There are five assistant directors who oversee Non-Therapeutic Research, the Clinical Trials Processing Lab, several Operations Teams, Regulatory and 17 Disease Teams.

The CTO has a robust infrastructure that support training, education and quality assurance. Advarra OnCore is utilized as its CTMS including and electronic Regulatory module and an Electronic Data Capture system which is 21 CFR 11 compliant.

Grants Management

The Grants Management Offices (GMO) at The Ohio State University Wexner Medical Center consists of the College of Medicine GMO (COM GMO) and Ohio State Comprehensive Cancer Center GMO (CCC GMO). The COM GMO supports all non CCC – James areas in the College of Medicine The CCC GMO manages grant activities for CCC members.

The role of both offices is to assist a faculty member with grant proposal submissions, new faculty grant transfers, budget development, document creation, etc. Upon award of a grant, the relevant grants office will assist with personnel appointment, budget management, the submission of progress reports and grant close-out.

Ohio State Enterprise for Research, Innovation and Knowledge (ERIK)

The Ohio State Enterprise for Research, Innovation and Knowledge (ERIK) positions the university to expand curiosity-driven research and creative expression activities. It further develops the research community to be leaders both today and, in the future, and grows the innovation ecosystem to address societal challenges. ERIK is comprised of four pillars – Knowledge Development and Discovery; Innovation and Partnership; Research and ERIK Operations; and Educate and Safeguard Research and Innovation. It houses numerous interdisciplinary research centers and institutes that transcend college boundaries and disciplines as well as multiple university cores. ERIK strengthens team science efforts including support for federal strategic grant submissions. ERIK team members are responsible for review boards for human subjects, animal research and biohazard research along with other regulatory components for the university. ERIK supports innovation and commercialization efforts and manages corporate partner and economic development opportunities. The Center for Software Innovation and the Keenan Center for Entrepreneurship report to ERIK. ERIK is also responsible for the strategic direction of the innovation district as it relates to accelerating research and innovation opportunities. Dr. Peter Mohler is the executive vice president of ERIK.

- **Innovation Commercialization**
 - The Enterprise for Research, Innovation and Knowledge's Innovation and Licensing team advances the university's research to impact lives by translating Ohio State innovations into business opportunities in the global marketplace. The team is the first resource for inventors at the university and engages with faculty and staff to help evaluate, protect and ultimately find the right market for intellectual property—through licensing or creating a startup company. To accelerate a more focused approach to support innovation and commercialization activities Ohio State is establishing domain specific teams to support innovation and commercialization. The first team, Health Sciences Innovation, launched in 2024 and is focused on innovations in health and life sciences.
- **Responsible Research Practices Team and Institutional Review Board (IRB)**
 - The Enterprise for Research, Innovation and Knowledge's Responsible Research Practices team provides administrative support to the university research community and the committees responsible for research review and oversight. They help Ohio State faculty, staff and student researchers navigate research

requirements through education and quality improvement initiatives designed to facilitate research, improve efficiencies and ensure regulatory compliance. Ohio State has full AAHRPP accreditation from the Association for the Accreditation of Human Research Protection Programs (AAHRPP). The Ohio State Institutional Review Board (IRB) serves as the IRB of record for participating clinical sites. As the IRB of record, Ohio State IRB is responsible for conducting the review of the study protocol in accordance with 21 CFR Parts 50, 56, 312 and 812, 45 CFR 46 and applicable international and local regulations and laws with respect to the initial review, continuing reviews and any potential modifications to the protocol. Ohio State IRB reviews reported adverse events, unanticipated problems involving risks to subjects and any incident of serious noncompliance in accordance with the IRB's defined policies and procedures. All research-related documents require Ohio State IRB review and approval prior to use. The Ohio State IRB operates in a transparent manner, readily providing IRB meeting minutes to sites per requests, and investigators and sites are notified in writing of all IRB decisions.

- Sponsored Programs
 - The Enterprise for Research, Innovation and Knowledge sponsored programs team partners with faculty and staff to provide the highest quality research administration at all stages of sponsored projects, from identifying funding sources through award closeout. The team facilitates the scholarly activities of the research community as it positions the university to be the leading public research institution in the nation.

Information Technology, Biostatistics and Informatics Resources

The Ohio State Information Technology, Biostatistics and Informatics Resources, under the direction of CRIO Dr. Tim Huerta, develops and serves the informatics and information infrastructure to support research. Dr. Huerta holds appointments in Family Medicine and Bioinformatics and is a senior faculty member in CATALYST – the Center for the Advancement of Team Science, Analytics and Systems Thinking in Health Services and Implementation Science Research

Keenan Center for Entrepreneurship

The mission of the Keenan Center for Entrepreneurship is to inspire, engage and empower entrepreneurs in their endeavors to change the world. We do this by providing educational and experiential learning activities, supporting curiosity and exploration and building connections and community. Keenan Center training opportunities include a local NSF I-Corps program which provides a process to help scientists and researchers explore the market opportunity of

their research. Contact the Keenan Center to learn how these learning opportunities can be tailored to fulfill commercialization and entrepreneurial development components of grant proposals.

Office of Technology and Digital Innovation (OTDI)

The Office of Technology and Digital Innovation (OTDI) at The Ohio State University, under the leadership of the Vice President and Chief Information Officer, provides a comprehensive suite of technology services that support the university's mission to foster academic excellence, innovative research and enhanced community engagement. OTDI comprises several key areas, including Application Services and Business Solutions, Data and Integration Services, Digital Security and Trust and Research Technology and Infrastructure Services each playing an essential role in advancing Ohio State's strategic objectives.

Ohio Supercomputer Center

The Ohio Supercomputer Center (OSC) provides high performance computing (HPC) resources and services for the state of Ohio and is a member of the Ohio Technology Consortium, a division of the Ohio Department of Higher Education. Founded in 1987, OSC serves higher education institutions and commercial clients, supporting their research and educational needs. In addition, OSC provides access to HPC resources around the globe with its web-based portal, Open OnDemand, funded by the National Science Foundation.

Research Commons

The Research Commons at The Ohio State University Libraries is a campus community where graduate students, faculty and postdoctoral researchers can connect with experts for support at any stage in the research lifecycle. It enhances the Libraries' mission by providing a hub for collaborative, interdisciplinary research that is both expertise- and technology-enabled. Focus areas of support for researchers include funder data management assistance, where the Research Commons staff helps with writing data management plans for grant proposals, best practices in data organization, data sharing and preservation guidance, evaluating data for re-use and understanding ethics, policies and federal requirements. Research Commons also provides research data support, including best practices in research data management and sharing, tools and workflows for scientific reproducibility and the discovery and (re)use of open and proprietary data sources. They also provide research impact services. Research impact is the use of data, tools and techniques to communicate the value of your scholarly work, show how your work influences others in your field and beyond and ensure that your work is visible and discoverable.

They also provide data visualization services, helping students, faculty and staff determine the best format to present data based on research questions, data type, audience and medium. This includes creating static, dynamic and interactive visualizations and infographics, identifying appropriate data visualization software and training for a variety of data visualization tools including free and open-source options, Ohio State-licensed resources and other specialized software such as Adobe Illustrator, Adobe Photoshop, Adobe InDesign, Tableau, Gephi and Cytoscape. The Research Commons aids with Geographic Information Systems (GIS) by assisting with finding and creating geospatial data sets, cleaning, organizing and managing geospatial data, designing and carrying out spatial analyses, mapping and geo-visualization, identifying appropriate GIS methods, tools and software and offering training for a variety of GIS tools and web-based mapping platforms.

They also support digital humanities (DH) researchers with expertise in various methods and tools, assisting with refining project scope, accessing digital content, writing grant proposals, finding collaborators, project management, content and data management, determining the best methods and platforms/tools for a project and exploring options for hosting, data sharing and curation. Research Commons also provides qualitative data and community engagement services, including interdisciplinary consultations and instruction sessions on qualitative research design, qualitative coding, data storytelling, sustainability, community engagement and qualitative data visualization.

SCARLET

The Ohio State University CTSI, in concert with programmers in the Department of Biomedical Informatics, developed a research registry platform named the Scalable Analytics Registry for Rapid Learning and Translational Science (SCARLET). A research registry platform is a secure, web-based application that leverages REDCap and Integrated Health Information Systems (IHIS) for data capture. Research data sourced from REDCap is merged with clinical data sourced from IHIS. The registry pipeline software takes specific data points from the REDCap database and extracts IHIS data from the Information Warehouse; it then integrates this data into a standard Observational Medical Outcomes Partnership (OMOP), or in other words, the registry. The front end of that data conduit involves a query portal that could be used and further developed to provide database search queries. Research IT will extend SCARLET to “SCARLET for All” by bringing this technology to all eligible research studies by June 2020 at no cost to the researcher. Studies are eligible if their IRB and consent documents allow for full access to the medical record. Starting in July, we will begin working with the IRB to identify active studies, reach out to the Principal Investigators and engage them to determine whether access is appropriate. This will reduce efforts related to securing research data for studies and facilitate statistical analysis.

Translational Data Analytics Institute (TDAI)

TDAI is a foundational component of Ohio State's Discovery Themes Initiative, launched in 2015, in which the University made significant investments to address complex, pressing societal issues (grand challenges). Membership in TDAI provides an exceptional environment for cross-college interdisciplinary and external collaboration. Our 250+ Affiliated Faculty are part of an active community of scientists, representing 15 colleges and more than 60 disciplines, who work on developing programs, resources and collaborative projects that span traditional academic units. Within the five Communities of Practice (CoP) infrastructure, interdisciplinary teams of faculty work collaboratively to 1) conduct research with translational value, 2) identify and pursue funding and publishing opportunities that advance the community's research agenda, 3) forge partnerships with industry and community organizations working in relevant spaces and 4) provide training through creation of internships and academic programming. Dr. Tanya Berger-Wolf is faculty director of TDAI and Dr. Cathie Smith is managing director.

The Translational Data Analytics Institute at Ohio State is dedicated to enabling a community of excellence in data-centric translational interdisciplinary research, scholarship and creative expressions with impact in society. Through its resources and structure, TDAI supports the entire research lifecycle, from ideation to funding matching, to post-award project management and communication. TDAI provides cyber-, data and human infrastructure, together with space, expertise and connections, as well as activities such as workshops, invited speakers, ideation sessions, pilot grants, interdisciplinary training, external partnership development, funding matching, resourcing, proposal development, AI and data literacy training and communications.

- **Computing and Training Resources**
 - Through TDAI, Affiliated Faculty are connected to a vast network of existing and developing shared resources including datasets and databases, and robust opportunities to test new technologies and platforms through external partnerships. Examples include data from SmartColumbus, computational and educational support from the Ohio Supercomputer Center, Wi-Fi data from Aruba Networks, NSF Imageomics Institute, COVID-19 public data and more. TDAI supports a virtual [Data Commons](#) connecting users for sharing data sets, knowledge and software; shared [research data science services](#) to accelerate technology transfer, health- and business-related analyses and development of a secure interoperable analytical pipeline; and a federated access to a variety of [high performance computing and cloud-based environment](#) to integrate, develop and incorporate workflow specifications compliant with the FAIR (Findable, Accessible, Interoperable and Reusable) Data Principles. In addition,

TDAI has worked with nearly a dozen partners across campus to map, coordinate and make accessible special events, workshops and seminars related to data literacy and data analytics; these include data analytics for beginners, data visualization tools, working with big data in Amazon Web Services and more.

- Facilities

- In June 2018, TDAI opened a 19,000 sq. ft. data analytics facility in the heart of the Ohio State campus in [Pomerene Hall](#). Located between the academic core of campus and the Wexner Medical Center, TDAI provides a state-of-the-art convening space for faculty research teams. TDAI has three large, configurable project rooms that can accommodate between 35-175 people; software, hardware and visualization labs; hoteling workstations; and private conference rooms with capacity ranging from 4-35 people. Each room provides hands-free digital technologies that enable device casting and remote connection to colleagues across the world. Also located within Pomerene Hall is a maker's space ([Innovation Studio](#)) in partnership with the College of Nursing, to support prototyping tools for both student and faculty projects. TDAI also has an Ideation Zone, a two-story adaptive space with whiteboards, a visualization lab, interactive displays and a bar top area that has hosted some of the largest or most important research events on campus since 2018.

- Data Science Research Services

- To address the TDAI community need for data science and analytics (DSA) expertise and support, TDAI is laying the groundwork to build a Data Science Research Service. This DSA ecosystem supports TDAI faculty-led research and education, while simultaneously providing experiential DSA training opportunities for Ohio State post-doctoral scientists, graduate students and undergraduate students. The TDAI Data Science Corps is comprised of the DSA Consulting and Services and a Data Literacy Program. The services arm offers consulting services on research projects and grant proposals, as well as support for collaborative research projects. Other efforts include providing data-as-a-service through Data Makers (creation of data from sensors and other endpoints and orchestration and management of associated resources that provide computation and networking); guidance and expertise on the development of data privacy, data usage and data management plans; and access to living lab testbeds (i.e., Pomerene Hall). The Data Literacy Program – which also leverages training materials through the international [Carpentries](#) organization – complements the services by providing workshops and experiential learning opportunities for the entire Ohio State campus. A PhD-level Data Scientist directs the Data Science Corps, leading implementation of both services and data

literacy by TDAI fellows (post-doctoral scientists, graduate students and undergraduates). Thus, TDAI's Data Science Corps not only serves the DSA needs of TDAI and the university community, but also serves as a training ground or hub for DSA workforce development and talent in central Ohio.

Center for Biostatistics

The Center for Biostatistics at The Ohio State University was instituted in 2001 with the mission to provide a single, readily identifiable and responsive source of expertise with whom biomedical investigators both within and outside Ohio State can collaborate in all aspects of study design, data management and statistical analysis of clinical, epidemiological, public health and laboratory research data. The Center provides statistical support to biomedical investigators at The Ohio State University Wexner Medical Center, The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC – James), the Clinical and Translational Science Institute, the health sciences colleges and other investigators throughout and outside the university. It is comprised of a diverse group of biostatisticians and programmers, as well as affiliated bioinformaticians and support staff from the Department of Biomedical Informatics. The Center is currently led by Dr. Soledad Fernandez, director and Dr. Guy Brock, associate director. Both have over 15 years of continual NIH funding and experience collaborating with investigators in the biomedical sciences and have taken leadership roles in biostatistics oversight of multiple large program project and center awards. This includes leading the Biostatistics, Epidemiology and Research Design Core of the CTSI (led by Dr. Guy Brock) and Comprehensive Cancer Center Biostatistics Shared Resource (BSR) (led by Dr. Soledad Fernandez). The Center also runs the Biostatistics Resources at Nationwide Children's Hospital (BRANCH), with Dr. Guy Brock as the director.

Secondary Data Core

The Secondary Data Core (SDC) is a shared resource for researchers at The Ohio State University and affiliated with the Center for Biostatistics (CFB) and Clinical and Translational Science Institute (CTSI). The SDC consists of more than a dozen members (i.e., service providers, generally biostatisticians and analysts) and more than 20 partners (e.g., principal investigators and research staff). Meetings to review study design, data sources and discuss tips/tricks in working with secondary data are held monthly and are open to all Ohio State faculty, staff and students who are interested. In addition, the SDC in partnership with the CTSI has hosted an annual Secondary Data Symposium every May since 2020; the morning session focuses on grant writing and the afternoon session focuses on demonstrating the breadth of data sources and research interests across Ohio State. Additionally, PIs can contact the SDC through a shared email to request consultations and/or collaborations. The SDC collaborates extensively with the

Data Access, Analysis and Coordination division within CFB to host and manage large secondary databases.

The SDC provides expertise in obtaining, analyzing and disseminating research across a range of databases and patient populations. More specifically, SDC members are Co-Investigators on more than six NIH-funded R01s and collectively have more than 100 coauthored manuscripts studying administrative claims data from Centers for Medicare and Medicaid Services. Their experience extends to another administrative claims database, MarketScan (> 10 coauthored publications), as well as a wide range of specialty databases: National Cancer Database (> 30 publications), National Surgical Quality Improvement Program (> eight publications) and Healthcare Cost and Utilization Project Databases (e.g., NIS, NRD; > six publications). Additionally, the SDC collectively has experience with Epic Cosmos, the Women's Health Initiative and the Behavioral Risk Factor Surveillance System.

The Ohio Primary Care Innovation Network (OPCIN)

The Ohio Primary Care Innovation Network (OPCIN) is a partnership between the Ohio Association of Community Health Centers (OACHC) and The Ohio State University Clinical and Translation Science Institute (CTSI). MPI Dr. Seuli Brill serves as the Director of OPCIN, which was established in 2022, interfaces Ohio's robust Federally Qualified Health Center (FQHC) network, including 400+ locations spanning 72 of Ohio's 88 counties, and delivering three million patient visits annually to 854,000 Ohioans as of 2022. FQHCs serve at the front lines of clinical care and innovation within urban and rural communities facing the greatest health disparities – 49% of all patients served by the OPCIN are from rural areas of the state. The OPCIN Ohio State/OACHC statewide pragmatic research partnership catalyzes and advances health equity through placing established clinical trials infrastructure in FQHC primary care settings to serve patients across Ohio who face a high burden of health inequities and remain underrepresented in research. The OPCIN operates using a shared governance model between Ohio State and the OACHC to facilitate advancement of community, healthcare and patient stakeholder-led research priorities [e.g. substance use disorder (SUD), rural health and women's health]. Development, dissemination and implementation of evidence-based AUD and SUD care remains a leading OPCIN research priority because of its alignment with OACHC and Ohio State Health Improvement Plan (SHIP) priorities. In fact, while the OPCIN was formalized in 2022, Ohio State and OACHC have a track record of successful collaboration on equity centered pragmatic RCTs focused on implementation of evidence-based practices for substance use disorder (SUD) treatment, including the multistate NIH-funded HEALing Communities Study.

Selected Ohio State Clinical and Translational Science / Clinical and Translational Research-Related Centers and Institutes and Cores

Cardiovascular Basic/Translational Research Cluster

Laboratory - The Davis Heart and Lung Research Institute (DHLRI) was created over 2 decades ago to foster an integrated program encompassing fundamental research, education and preventive efforts in heart and lung diseases. The physical plant is comprised of >220,000 sq ft of research space over six different research buildings for ~100 principal investigators throughout the Ohio State Medical Center campus. Faculty in the Institute study integrated aspects of cardiopulmonary function including heart failure and arrhythmia, ischemic injury and repair, idiopathic pulmonary fibrosis, acute lung injury, environmental factors for cardiopulmonary disease, integrated aspects of metabolic disease, adipose tissue biology, genetic basis of human disease and advanced therapeutics.

The DHLRI houses extensive facilities and equipment resources, providing faculty access to bioinformatics, cell sorting and cytometry, confocal microscopy, proteomics, Seahorse XF Metabolic Analyzer, EPR/MRI imaging, echocardiography, NMR spectroscopy, mass spectrometry, metabolic monitoring cages (CLAMS), confocal microscopy and super resolution imaging, microarray, gene sequencing and real time PCR facilities (investment of >\$55 million). The DHLRI also houses the Bob and Corinne Center for Heart Failure and Arrhythmia, ~30,000 sq ft of renovated space in the Wexner Medical Center (Graves Hall) with shared equipment to support modern molecular biology, cell biology, animal physiology, electrophysiology, cell culture and virus production. Shared equipment includes an EVOS imaging system; an optical mapping system (MiCAM Ultima-L) for voltage and calcium imaging of isolated, Langendorff-perfused heart preparations; echocardiographic imaging system for rodents; a Langendorff apparatus and circulation pumps for isolation of cardiomyocytes; patch clamp rigs with amplifiers, data acquisition system and inverted microscope for electrophysiology; a dual bio amp and 4 channel recorder for measurement of surface electrocardiograms; implantable telemeters and recording system for recording electrocardiograms in unanesthetized animals; ultracentrifuges and low-medium speed centrifuges with multiple rotors; qRT-PCR machines; cryostat for preparation of frozen tissue sections; tissue culture hoods; a spectrophotometer; thermal cyclers for PCR; -80 and -20degC freezers; HPLC equipment; yeast and bacterial incubators; DNA and protein gel systems; Bio-Rad gel imaging docs; scintillation counters; autoclaves.

Core Facilities – DHLRI runs several cores to support physiological research that offer innovative technologies for basic and clinical research (described below). DHLRI investigators also have

access to state-of-the-art Core labs operated by the Comprehensive Cancer Center or other units at the Ohio State Wexner Medical Center, including Bioinformatics, Campus Microscopy and Imaging Facility, Comparative Pathology and Genomics. Each of these Cores is directed by a faculty scientist who is a leading expert in the relevant technology with an experienced full-time manager who supports the application needs of the users.

Small Animal Imaging Core – The Small Animal Imaging Core (SAIC) at the Davis Heart and Lung Research Institute is a comprehensive small animal imaging facility available to investigators at The Ohio State University and other academic and commercial institutions. This facility includes high resolution imaging equipment (MRI, ultrasound, microCT and optical), X-ray irradiator, body composition analyzer and personnel trained in the operation of each imaging modality and small animal handling procedures, as well as analytical software support for quantitative image analysis. In addition to providing interim animal housing for serial imaging studies, the SAIC also offers on-site suites for surgical procedures and animal care provided by the University Laboratory Animal Resources. Image reconstruction, multi-modality fusion, quantitative image analysis, high resolution graphics and networking to the facility's server are also available.

Interventional Cardiology Cath Lab Core – The Davis Heart and Lung Research Institute's Interventional Cath Core fosters the development of interventional devices, therapies and techniques by providing a translational laboratory setting where basic research findings can be developed into clinically relevant treatments for cardiovascular diseases. The non-GLP core is set up to accommodate a wide variety of interventional cardiac procedures using large animal models. Minimally invasive chronic procedures are permitted in this space. Non-cardiac studies can also benefit from the use of fluoroscopic guidance allowing real time x-ray confirmation during procedures. Orthopedic groups have found it useful for guiding injections into joints. The aide of a contrast agent makes it possible for surgeons to look for leaks following procedures in the GI tract. The core is equipped with an OEC 9800 mobile C-arm with cardiac package and digitally archived images. Support equipment include an anesthesia machine, ventilator, basic monitoring equipment (ECG, pressure, pulse Ox), cautery, IV pump and power injector.

Cardiovascular Imaging Research Center – Cardiovascular Imaging Research Center (CIRC) provides support for advanced cardiovascular imaging and/or image analysis for their human subjects or large animal research. Modalities include: 1) 1.5T Siemens MAGNETOM Sola (located in the Ross Heart Hospital); 2) 3.0T Siemens MAGNETOM Vida (located at Martha Morehouse Outpatient Care); and 3) 0.55T Siemens MAGNETOM Free.Max (located at Martha Morehouse Outpatient Care). The core helps to identify the optimal imaging modality and to design appropriate imaging experiments and data analysis strategies. Investigators are guided

through the process of scheduling and executing imaging experiments in the CIRC, where image acquisition and analysis will be performed by CIRC personnel.

Flow Cytometry Core – The DHLRI flow cytometry core provides cell sorting and immunophenotyping services for DHLRI members. The flow core provides instrumentation for full-spectrum analytical cytometry (Cytex Northern Lights) as well as cell sorting (Cytex Aurora CS). With these instruments, investigators can utilize full spectrum profiling (FSP) to design and implement highly complex assays (25+ biomarkers with a 3-laser system) and perform up to 6-way cell sorting, as well as plate sorting. DHLRI members can receive instrument training and troubleshooting upon request.

Metabolism Core – Columbus Instrument's Comprehensive Lab Animal Monitoring System (CLAMS) incorporates sub-systems for open circuit calorimetry and activity in an environmental chamber: Oxymax/CLAMS is the one-test solution for simultaneous multi parameter assessment of one to nine mice. Operation of Oxymax/CLAMS and data collection is performed by an integrated program. The resulting secure data sets can be exported to Comma Separated Value (CSV) files and provide the link between Oxymax/CLAMS and your existing data analysis tools.

Center for HOPES

The Center for Health Outcomes and Policy Evaluation Studies (HOPES), located in the Ohio State's College of Public Health, was established in 1994 to conduct applied health services, outcomes and policy research to help public and private organizations evaluate clinical and programmatic effectiveness, quality of care and service provision and overall value of public health investments. Our mission is to use scientific methods to support health equity and social justice by building capacity for data-informed decision-making.

All our studies are performed in close collaboration with our clients, which include government agencies, health care systems, foundations, private sector industries and community health organizations, along with other public and private entities.

Center for Human Resource Research (CHRR)

The Center for Human Resource Research (CHRR) was founded in 1965 to manage the National Longitudinal Surveys of Labor Market Experience (NLS) for the U.S. Department of Labor, a project that continues to this day. CHRR is a multidisciplinary research organization affiliated with the Division of Social and Behavioral Sciences in the College of Arts and Sciences at Ohio State. CHRR is responsible for designing survey instruments, overseeing fieldwork and generating and disseminating fully documented data sets to researchers in government, private

research organizations and universities around the world. These interests range from the production of substantive analyses of economic, social and psychological aspects of individual labor market behavior to examining the impact of government programs and policies. CHRR's strengths are in the areas of survey design, analysis and data documentation and dissemination. The CHRR system has the best record for the timely production and distribution of public use files from computer-assisted personal interviewing (CAPI) surveys. In addition to conducting a diverse number of surveys, CHRR staff members continue to contribute innovative applications of ideas and technology to the field of survey methodology.

Center for Public Health Practice (CPHP)

The Center for Public Health Practice (CPHP), directed by Dr. Andrew Wapner, integrates the work of practitioners and academicians to improve the health of people and the well-being of communities. Programs and services are designed to increase the skills of public health practitioners and to build the capacity of organizations across Ohio. Included among its areas of expertise are workforce and organizational development, adult learning, group facilitation and process design, project management and practice-based research. The work of the CPHP is funded through grants and fee-for-service initiatives, including the federally funded Ohio Public Health Training Center, one of 37 public health training centers located across the U.S. funded through the Health Resources and Services Administration.

Center for Urban Regional Analysis (CURA)

The Center for Urban and Regional Analysis (CURA) is an interdisciplinary research innovation hub which brings together researchers from across campus to integrate spatial modeling and urban science to solve some of our communities most challenging problems. Founded in 2001, CURA has spent over two decades working with partners to solve complex geographic problems through research and outreach. Our mission is research and outreach to foster more sustainable, resilient and connected communities in Ohio and beyond using geospatial science and technologies. We serve as a bridge across academia, industry, the public sector and the community through basic and applied urban research, research-based undergraduate and graduate training and outreach.

Comparative and Translational Medicine Program (CTMP)

The Comparative and Translational Medicine Program (CTMP) provides an integrated platform for preclinical and translational research and training for studies involving animals with natural disease. The CTMP is comprised of three major components: involving animals with natural disease. It is comprised of three major components:

- Blue Buffalo Veterinary Clinical Trials Office

- The Blue Buffalo Veterinary Clinical Trials Office (BBVCTO) aids in the design, execution and evaluation of veterinary clinical trials of client-owned animals. The BBVCTO facilitates the conduct of such studies through input into clinical trial design, networking with regional veterinarians to ensure timely enrollment, assistance in collection and coordination of data and establishment of standard operating procedures.
- Veterinary Biospecimen Repository
 - The Veterinary Biospecimen Repository (VBR) collects and stores tissue specimens from diseased animals and data warehouse on disease diagnosis, pathology, treatments and other clinical outcomes. The VBR represents a remarkable resource that continues to assist investigators as they strive to develop new prevention and treatment strategies for both animals and humans.
- Comparative Pathology and Mouse Phenotyping
 - The Comparative Pathology and Mouse Phenotyping Shared Resource and the Histology and Immunohistochemistry service have merged into a single unit within the Department of Veterinary Biosciences (VBS). While intrinsically involved with the teaching and education missions of VBS, the combined service now offers anatomic pathology (necropsy, phenotyping, biopsy and slide evaluation), clinical pathology and histology (including immunohistochemistry and tissue microarrays) support to researchers both within the College of Veterinary Medicine as well as throughout The Ohio State University, including Nationwide Children's Hospital.

Foods for Health (FFH)

The goal of the Foods for Health (FFH) initiative is to advance interdisciplinary research that defines the relationship among foods, disease prevention and health promotion. The future of food is one where nutritional recommendations are precise and eating healthy is easier. Solutions that help us achieve this goal will come from all disciplines, and Ohio State continues to be optimally positioned for innovative research. Our community is empowered by an expansive campus that uniquely co-locates Colleges of Food, Agricultural and Environmental Sciences, Education and Human Ecology, Arts and Sciences, seven Health Sciences colleges, a top-ranked academic Medical Center and a Comprehensive Cancer Center. FFH researchers work collaboratively to discover new ways in which foods can enhance health.

Institute for Behavioral Medicine Research

Established in 1996, the Institute for Behavioral Medicine Research (IBMR) is the cornerstone of a broad research program at The Ohio State University in the field of psychoneuroimmunology (PNI) – the study of how the brain interacts with the body's immune system. This field has

evolved from a novel area of curiosity to an important scientific field, one that has meaningful implications for public health and great promise for enhancing medical treatments.

Institute for Materials and Manufacturing Research

The Institute for Materials and Manufacturing Research (IMR) was established in 2006 with a central goal: to guide Ohio State's materials and manufacturing-allied research enterprise to be among the very best in the nation, impacting the forefront of materials and manufacturing research, winning the most competitive and prestigious research programs and centers and enabling the attraction of top talent in areas that exploit the multi-college breadth of the university. IMR brings together a large, diverse, interdisciplinary community consisting of more than 265 faculty members from 40 departments and 10 colleges who are actively engaged in research and innovation across the materials continuum. It has supported efforts for receiving large awards from NSF, DoD and other Federal sources and has led research and educational partnerships with industry partners. IMR signature research areas span from semiconductors and advanced energy to emergent materials, AI-enabled manufacturing and biomedical research applications.

Institute for Population Research (IPR)

The Institute for Population Research (IPR) was established in 2000 as a multi-disciplinary research center that nurtures population and health research at Ohio State. IPR supports research in all facets of population and health. IPR faculty and graduate student affiliates span six colleges and sixteen departments, and IPR serves as a bridge between behavioral and biomedical scientists at Ohio State. Through its Geographic Core, IPR offers advice on incorporating geographic analysis in population and health research projects. Working groups are an opportunity for a small set of IPR affiliates to explore research areas that are of great significance and/or newly emerging. Recent working groups have been organized for health disparities, geographic analysis of health and complex systems analysis. IPR occupies a 6000 sq. ft. suite of offices in Ohio State's Townshend Hall, comprising several faculty affiliate offices, a dedicated seminar room, a graduate student suite and space for hosting research projects, including those requiring special consideration for restricted or sensitive data.

Kirwan Institute for the Study of Race and Ethnicity

The Kirwan Institute for the Study of Race and Ethnicity is a nationally recognized research center with a 21-year record of impact. Our research team is committed to advancing research on race and ethnicity through focuses on community engaged research, innovation, multi-sector collaborations and policy impact. We specialize in pairing data-informed analysis and community engagement to diagnose the structural conditions that drive inequity as well as identify strategic intervention points for advocacy and policy. To date Kirwan has collaborated

with policy makers in over 400 jurisdictions across the U. S. and worked with national and community-based partners to create innovative policy that effects change through applied research and strategy development. Our expertise crosses multiple domains of interest – poverty, maternal and infant health, education, criminal justice and housing. Community engagement is a critical component of the Kirwan research process. The Kirwan Institute remains a trusted community and university partner on a range of initiatives, from revitalization to data-driven assessments for community-led change. Join us in fostering equitable research that empowers communities and drives actionable solutions for a better future.

Ohio State Biomedical Animal Care and Use Program

Ohio State's biomedical animal care and use program maintains federal registration and assurance with regulatory agencies and is accredited by AAALAC International. The Ohio State University's large, consolidated biomedical animal program supports an extensive and comprehensive research initiative, including the Colleges of Medicine, Public Health, Veterinary Medicine, Dentistry, Pharmacy, Biological Sciences and Social and Behavioral Sciences. The university's core biomedical research vivarium (University Laboratory Animal Resources, ULAR) consists of 10 buildings located primarily within the Health Sciences complex. ULAR has approximately 85,000 square feet of animal housing space consisting primarily of rodent barrier housing utilizing individually ventilated caging systems. Facilities for accommodating large animals, rabbits and nonhuman primates are also available, along with support facilities that include an experimental surgery suite, a small animal imaging core and biohazard housing at the ABSL2 and ABSL3 levels. The facilities include mouse procedure rooms, necropsy facilities and accommodations for immunocompromised animals for a variety of studies across the translational research continuum. A team of board-certified laboratory animal veterinarians provides clinical and research support for the program. The Institutional Animal Care and Use Committee (IACUC) provides oversight for the program and reviews all proposals seeking to use animals at Ohio State.

Ohio State Biochemistry and Molecular Biology Core

The Biochemistry and Molecular Biology Core provides and maintains selected instrumentation and offers sufficient training to facilitate end-user operation. Major pieces of supported equipment include real-time PCR: Roche Lightcycler 480 and Lightcycler 1.2, Surface plasmon resonance biosensor (Biacore 3000), Phosphorimager (Molecular Dynamics/Amersham), PTC-225 PCR Tetrad (MJ Research), Alphascreen (Alpha Innotech), Typhoon Imaging (General Electric) and Wallac MicroBeta TriLux.

Ohio State Bioinformatics Center

The Biomedical Informatics Shared Resource (BISR) supports advanced biological and biomedical research conducted by Ohio State researchers by facilitating high-throughput, novel experiments that link multidimensional phenotypic and biomolecular data sets. BISR utilizes and coordinates data-intensive computational methods for all high throughput data analysis, as well as pathway and network analysis. BISR also assists researchers with accessing publicly available data to generate new hypotheses and draw new conclusions via integrative analysis of both public and private data sources. BISR fosters collaborations with Ohio State researchers; customizes analysis workflows to meet the unique needs of their projects, interprets and presents results, works on manuscript preparation and design and planning of grant applications. Specific applications include the following:

- Analysis of next generation sequencing data including whole exome-sequencing, RNA-sequencing, smRNA-sequencing, CHIP-sequencing, ATAC-sequencing and whole genome re-sequencing.
- Analysis of long read sequencing (such as PacBio and Oxford Nanopore Sequencing) including QC and error correction of long reads, gene/gene isoform expression, novel gene discovery and full-length isoform identification, de novo fusion gene detection and corresponding fusion isoform expression profiles, allele-specific expression and haplotyping, de novo genome assembly, denovo transcriptome assembly, methylation calling, nucleosome positioning and chromatin accessibility.
- Single-cell RNA-seq data analysis services:
 - Basic scRNA-seq data analyses, including quality control, alignment, trimming, assembly, differentiation expression and clustering, using developed pipelines
 - Advanced scRNA-seq data analyses, including but not limited to cell trajectory discovery, cell type prediction, co-regulated gene module identification
 - Selective scRNA-seq analyses in aim to solving specific issues such as drop-out issue, immense expression data (i.e., 10X scRNA-seq data)
 - Result interpretation and interpretation
 - An all-in-one user-friendly web server for scRNA-seq analysis
 - Integrative analysis of single-cell multi-omics data to enhance the effectiveness and efficiency
- Metagenomic data analysis services:
 - Metagenomic data analysis including species/strain composition profiling, taxonomic analysis, abundance analysis, phylogenetic analysis, whole-genome shotgun analysis
 - Metatranscriptomic data analysis including functional profiling, expression activity analysis, 16S ribosomal RNA analysis, whole-transcriptome shotgun analysis

- Advanced joint metagenomic and metatranscriptomics data analysis for more accurate gene-level, species-level and strain-level analysis
- Network studies in microbiome and host–microbiota interactions based on high-throughput multi-omics data
- Causality study between human microbiota and diseases
- Existing tools/pipelines recommendation, analyst training and guidance
- Analysis of microarray datasets, including mRNA (Affymetrix), SNP and micro-RNA.
- Analysis of nCounter NanoString data.
- Proteomics data analysis:
 - Protein/peptide identification and quantification from label-free and label-based tandem mass spectrometry data
 - Post-translational modification analysis (PTM), such as phosphorylation
 - Downstream bioinformatics analysis, such as: differential expression analysis, pathway analysis and functional enrichment, analysis, network analysis, involving finding pivotal proteins in the networks
- Metabolomics data analysis:
 - LC-MS data preprocessing (including quality control assessment of raw chromatograms, peak calling, retention time alignment and preliminary identification using MS2 data if available)
 - Interpretation of liquid-chromatography untargeted metabolomics datasets, which include relative abundances of a broad spectrum of polar and non-polar small molecules (< 1500 Daltons)
 - Statistical analysis to identify biologically relevant metabolites
 - Pathway enrichment analysis of relevant metabolites
- Integrative analysis of publicly available datasets (dbGaP, GEO, TCGA) using search parameters defined by the OSUCCC – James researchers.
- Pathway analysis of results from sequencing and microarray data.
- Custom bio-molecular data management, application development, deployment and support.
- CRISPR Screening:
 - Experimental Design
 - Cancer-specific essential genes
 - Synthetic lethal partners
 - Drug resistance mechanism
- Precision cancer medicine services:
 - Integrating gene expression profiles, mutations and phenotype features to predict target, drug and biomarker in precision cancer medicine
 - Identification of potential druggable targets

- Assessment of efficacy drugs and associated biomarkers

Ohio State Campus Microscopy and Imaging Facility (CMIF)

Located on the second floor of the Biomedical Research Tower, the CMIF offers a full range of microscopes for live (BSL2 compliant) and fixed sample imaging including a suite of confocal microscopes, transmission electron microscopy and super resolution microscopy. The CMIF offers training on all our microscopes and full support during office hours. Advanced users can operate equipment out of office hours with options for extended use for longer term experiments. The CMIF also offers advice in experimental design, data interpretation, data analysis and figure preparation with the goal of maximizing microscopy-based research. In addition, the CMIF offers equipment and services to prepare specimens for transmission electron and scanning electron microscopy.

Our major equipment includes: an FEI Tecnai G2 Spirit BioTWIN digital transmission electron microscope, a Nikon A1R laser scanning confocal microscope, an Olympus FV1000 MPE confocal and multiphoton laser scanning microscope, two Olympus FV3000 laser scanning confocal microscopes (a 7 laser system and a five detector system with a near infrared laser), an Olympus FV1000 upright laser scanning confocal microscope, a Zeiss Axioskop brightfield system with fluorescence and polarized light microscopy capability and a Nikon N-SIM/N-STORM super-resolution microscope system consisting of Structured Illumination Microscopy (SIM), Total Internal Reflection (TIRF) and Stochastic Optical Reconstruction Microscopy (STORM) imaging capabilities. In addition, the CMIF has sample preparation equipment: a Reichert Ultracut E microtome, a Leica EM UC7 Ultramicrotome, a Leica EM UC6 Ultramicrotome equipped with an FC6 Cryo unit, Pelco BioWave Pro microwave processing system, Tousimis Autosamdri-931 critical point dryer and an EMS Quorum 150T S sputter coater. Additionally, the CMIF has a Nikon AXR laser scanning confocal microscope located in the basement of the Pelotonia Research Center. All instruments are staff-operated or self-operated after training.

Ohio State Campus Chemical Instrument Center (CCIC)

The Campus Chemical Instrument Center (CCIC) was founded in 1981 as a unit of the Office of Research (OR) and is now a center under the Ohio State Enterprise for Research and Innovation Knowledge (ERIK). The mission of the CCIC is to provide state-of-the-art research facilities for the entire campus in three areas: Nuclear Magnetic Resonance (NMR), Mass Spectrometry (MS) and Proteomics. Since the NMR, MS and Proteomics Facilities are central hubs for the Ohio NMR and Ohio MS Consortia, respectively, all researchers in the colleges and universities of the State of Ohio have access to all facilities of the CCIC with the same user fees. The Ohio State OR/ERIK provides personnel support of the CCIC. Equipment funding has been provided by Ohio

Department of Higher Education, National Institutes of Health, National Science Foundation and OR/ERIK.

- NMR capabilities including the National Gateway Ultrahigh Field NMR Center
 - A cutting-edge ultrahigh field 1.2 GHz nuclear magnetic resonance (NMR) spectrometer has been funded by the National Science Foundation (NSF), which will be the centerpiece of the new National Gateway Ultrahigh Field NMR Center. Once commissioned, this next generation NMR instrument will be open to United States NMR researchers in the fields of biomolecular NMR of proteins and nucleic acids in solution and in the solid state, materials science and metabolomics. This instrument complements existing high-field capabilities of the CCIC NMR facility which also includes functional NMR instruments for both solution and solid-state analyses, from 600, 700, 800, 850 and 1200 MHz magnetic field strengths.
- Ohio State Proteomics Shared Resource

The Proteomics Shared Resource (PSR) provides researchers access to advanced mass spectrometry instrumentation and analysis for protein identification, characterization and quantification. Using a variety of analytical platforms, researchers can discover novel differentially expressed proteins in serum, urine, BAL fluid, saliva, frozen tissues, formalin-fixed tissues and cell lysates. The PSR is part of the Campus Chemical Instrument Center managed by the Ohio State Office of Research. PSR is an interdisciplinary unit that provides researchers with technical expertise and state-of-the-art instrumentation needed to identify proteins, protein modifications, protein interactions and protein biomarkers as well as protein quantitation studies. The PSR can identify proteins from solution, 1D and 2D gels using electrophoresis and imaging equipment, robotic sample handlers and (tandem) mass spectrometers. PSR provides high-quality, affordable service for identifying proteins, protein modifications, protein interactions and protein biomarkers as well as protein quantitation studies; consultative services and technical assistance in experimental design and implementation in protein sample preparation, separation and purification, as well as in image analysis, mass spectrometry and data mining; education and training for basic and clinical investigators in proteomics analysis applications and capabilities; advanced methods of sample pre-fractionation prior to mass spectrometric analysis and protein identification; analysis of complex mixtures of proteins by 2D-HPLC and tandem mass spectrometry, especially for evaluating protein and chemical biomarkers for cancer and therapeutic regimen.

Medical Modeling, Materials and Manufacturing (M4) Division

The M4 Division at the Center for Design and Manufacturing Excellence (CDME) is where medicine and advanced manufacturing converge to develop engineering solutions for real-world needs in clinical medicine. The M4 Division works with collaborators to develop and de-risk

biomedical research and medical device development through user requirements definition, concept generation, design and prototyping for engineering testing and clinical trials. The M4 Division leverages 45,000 square feet of ITAR and HIPAA compliant facilities, over \$20M in manufacturing equipment and the technical expertise of the six other divisions across CDME to best advance biomedical technology.

Ohio State Center for Ethics and Human Values

The Center for Ethics and Human Values is Ohio State's hub for respectful discussion and interdisciplinary engagement on the ethical challenges that shape the University and the broader community—an essential part of "Education for Citizenship." A faculty-led, University-level center, it has collaborated with more than forty academic departments and programs in a dozen Ohio State colleges, covering a wide range of scientific and humanistic disciplines. It has also worked closely with university efforts including the Shared Values Initiative, the Provost's Civil Discourse Project, the Office of Diversity and Inclusion and the Office of Research.

Ohio State Center for Healthy Aging, Self-Management and Complex Care

The Center for Healthy Aging, Self-Management and Complex Care in the College of Nursing brings together a community of internationally renowned nurse scientists, scholars, clinicians and educators dedicated to advancing our knowledge and response to the issues of complex care, self-management and health promotion among vulnerable and aging populations. The team comes together to cultivate innovations that affect care delivery spanning all settings and adult ages.

Ohio State Center for Knowledge Management

Ohio State's Center for Knowledge Management (CKM), housed in the John A. Prior Health Sciences Library, is one of the nation's most comprehensive repositories of global biomedical knowledge and intellectual capital. The CKM provides cost-effective access to biomedical knowledge, identifies and makes available knowledge and key research findings, expedites packaging of information content as reusable and shareable resources, facilitates understanding and helps incorporate information resources into work processes. The CKM supports The Ohio State University Wexner Medical Center in its three-part mission of research, education and patient care through advances in the acquisition, organization, storage and distribution of biomedical and other health science-related information.

Ohio State Center of Microbiome Science (CoMS)

The Center of Microbiome Science (CoMS) mission is to empower microbiome science for the design and prediction of microbial communities in animal, plant, human, environmental and engineered systems. CoMS is a highly interdisciplinary network of investigators at Ohio State

University and Nationwide Children’s Hospital representing over 120 faculty from nine colleges. CoMS provides exceptional research resources, computational support, networking opportunities and training. This includes the Microbiome Platform which employs a microbiome navigator and three full-time data analysts to offer comprehensive support for microbiome science projects, from guidance on experimental design, to DNA / RNA extraction and sequencing, to standard and custom analyses of microbiome data. CoMS also supports a Microbiome Science Training Track for graduate students, trainee-led working groups, over 70 bioinformatic applications available through the Ohio Supercomputer Center for microbiome analyses, and regular seminars, workshops and an annual symposium to feature cutting-edge advances in microbiome science.

Ohio State Center for RNA Biology

The Center for RNA Biology is a cross-college interdisciplinary center that was formed to facilitate and promote state-of-the-art RNA-related basic and translational research. Through collaborations, education and outreach, the CRB will continue to promote RNA science at Ohio State and throughout the Midwest to address major societal challenges.

Members and Activities

The Center for RNA Biology is the home to [45 labs](#) spanning five colleges and encompassing a broad range of RNA-related research. The Center facilitates a monthly [seminar series](#), held on the second Tuesday of the month during the school year, that hosts world-renowned speakers from around the country to talk about their scope of work in the RNA field. The center also hosts an [Annual Symposium](#) together with the [NIH Cellular, Molecular and Biochemical Sciences T32 training grant](#) and the [Schoenberg Lectureship](#) in partnership with Science Sundays.

The Center runs a competitive Graduate [Fellowship Program](#), a [Summer Undergraduate Research Program](#) and is supported by a [Student Organization](#).

The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC – James)

OSUCCC – James is the only cancer program in the United States that features a National Cancer Institute (NCI)–designated comprehensive cancer center aligned with a nationally ranked academic medical center and a freestanding cancer hospital on the campus of one of the nation’s largest public universities. It is one of only 57 NCI-designated comprehensive cancer centers in the nation, a designation that has been maintained through competitive renewal since 1976. At the most recent renewal, OSUCCC – James earned the NCI’s highest ranking, “exceptional,” for its third consecutive review, and received a five-year, \$23 million NCI support

grant. The NCI survey team stated that the OSUCCC – James “should serve as the model for other matrix university-based centers.” At Ohio State, more than 300 cancer researchers and their teams from 11 of our 15 colleges work collaboratively, across multiple disciplines, to improve the effectiveness of cancer prevention, diagnosis and treatment.

In addition to its five scientific programs and 18 shared resources ranging from gene editing and genomics to target validation and clinical trials support, the OSUCCC – James supports tissue-based translational research through a biomarker development resource, the Drug Development Institute and clinical trial support. The OSUCCC – James supports community-engaged research and clinical care through its Center for Cancer Health Equity (CCHE) and has a specific emphasis with internal cross-cutting themes including immune-oncology with the Pelotonia Institute of Immuno-Oncology (PIIO), Center for Tobacco Research, the Center for Cancer Engineering (CCE-CURES), in addition to growth in translational genomics and cancer metabolism. Detailed information regarding the OSUCCC – James’s research services are available at the OSUCCC – James Research Website. Several specific Shared Resources with high continuous utilization by CTSI-supported researchers include:

- **Bioinformatics Shared Resource (BISR)**
 - The Biomedical Informatics Shared Resource (BISR) described above analyzes high-throughput, high-dimensional biological data and other biomedical data and information using state-of-the-art informatics tools and high-quality informatics analysis for OSUCCC – James investigators.
- **Biospecimen Services Shared Resource (BSSR)**
 - Including tissue procurement through our IRB-approved Total Cancer Care Protocol, a repository, linkage to deidentified clinical data and facilitated collaborations
- **Clinical and Translational Science Shared Resource (CTSSR)**
 - Supports customizable biomarker assays and other correlative science applications for clinical trials
- **Clinical Treatment Unit and Clinical Trials Processing Laboratory.**
 - CTU/CTPL specializes in treating early clinical trial patients as well as procurement, processing, storage and delivery of research specimens.
- **Comparative Pathology and Digital Imaging Shared Resource (CPDISR)**
 - CPDISR provides support for preclinical efficacy and toxicity animal studies, as well as translational studies that utilize human tissues procured for research
- **Genomics Shared Resource (GSR)**
 - The GSR offers instrumentation and expertise for DNA and RNA analysis using sequencing, genotyping, real-time PCR, Affymetrix GeneChips, nCounter Analysis,

next-generation sequencing library generation, single cell genomics, nucleic acid extraction and QC for RNA/DNA/proteins.

- Gene Editing Share Resource (GESR)
 - GESR implements CRISPR-based approaches in a broad variety of primary and established cell lines, as well as other experimental models.
- Hematology Tissue Bank (HTBSR)
 - HTBSR helps scientists translate basic research to the clinical setting by providing central collection, processing and storage of tissue samples from patients with hematologic diseases
- Drug Discovery Shared Resource (DDSR)
 - DDSR provides medicinal chemistry and high throughput screening support to investigators. It integrates the expertise of multiple disciplines, including synthetic and process chemistry, instrumental analysis and molecular pharmacology utilizing automated high throughput screening methods. DDSR consists of the Medicinal Chemistry and High Throughput Screening branches.
- Microscopy Shared Resource (MSR)
 - MSR is comprised of the CMIF and the CEMAS facilities on Ohio State's campus and provide a range of state-of-the-art microscopy instruments.
- Preclinical Therapeutics and Mouse Modeling Shared Resource (PTMMSR)
 - PTMMSR supports drug development including high-throughput screens and pre-clinical model confirmation
- Recruitment, Intervention and Survey (RISSR)
 - RISSR supports cancer behavioral, epidemiological and non-therapeutic clinical cancer research.
- Pharmacanalytical Shared Resource (PhASR)
 - PhASR supports pre-clinical and clinical drug development at Ohio State by providing high quality and cost-effective bioanalytical method development, quantitative sample analysis and pharmacokinetic/pharmacodynamic experimental design, data analysis and modeling.
- Proteomics Shared Resource (PSR)
 - PSR provides OSUCCC – James investigators access to advanced mass spectrometry instrumentation and analysis for protein identification, characterization and quantification.
- Small Animal Imaging Shared Resource (SAISR)
 - SAISR houses high-resolution imaging equipment and offers assistance from professionals who are experts in operating each imaging modality, small animal handling and analytical software support for quantitative image analysis.

- PIIO Immune Modulatory and Discovery Platform (IMDP): For tumor: immune interface studies, the core offers single cell genomics and proteomics, mass cytometry, flow cytometry, multispectral cytometry, multispectral imaging, antibody development core, cellular therapy core and immune informatics.

Ohio State Diabetes and Metabolism Research Center

The Ohio State University Wexner Medical Center's Diabetes and Metabolism Research Center (DMRC) is a university-wide effort committed to conducting clinical trials and basic research that translate to managing, preventing and curing diabetes. Currently, the DMRC includes over 50 Principal Investigators, and their laboratories located within the Colleges of Medicine; Food, Agricultural and Environmental Sciences; Nursing; Public Health; Engineering; Dentistry; Veterinary Medicine; Department of Human Nutrition in the College of Education and Human Sciences; and Department of Chemistry and Biochemistry in the College of Arts and Sciences.

Ohio State Drug Development Institute (DDI)

The Ohio State Drug Development Institute (DDI) is a component of the OSUCCC – James, founded to address the translational development gap between discoveries made in the research lab and their conversion to innovative drug therapies and devices for patients. The DDI leverages world-class research and drug development resources at The Ohio State University to advance projects from early drug discovery through preclinical and clinical development. It coordinates and manages all the necessary early-stage drug development activities to ensure the seamless integration of project teams and timely progression of projects. When appropriate, they partner with external contract research organizations to obtain critical data. The team includes scientists and leaders with pharmaceutical industry experience and partners with the Technology Commercialization Office (TCO) to facilitate patenting and establish commercialization plans and partnerships to facilitate the drug and device pipeline to the clinic.

Ohio State Electron Paramagnetic Resonance (EPR) Core Lab

The Ohio State Electron Paramagnetic Resonance (EPR) Core Lab is a resource of Ohio State's Davis Heart and Lung Research Institute (DHLRI). The core offers magnetic resonance technology for detecting, quantifying and visualizing free radicals in biological systems. The method is routinely used to measure free radicals such as superoxide, hydroxyl and nitric oxide in chemical/biochemical biological systems. EPR also enables the measurement and imaging of physiologically pertinent tissue parameters such as tissue perfusion, oxygenation, metabolism, redox state, viability and pH using appropriate spin probes.

Ohio State Flow Cytometry Shared Resource

The Ohio State Flow Cytometry Shared Resource (FCSR) is a joint venture between the Comprehensive Cancer Center and the Davis Heart and Lung Research Institute. The FCSR provides support and access for all OSUCCC – James needs related to analytical cytometry (Cytex Northern Lights and Fortessa) and cell sorting (Cytex CS and BD FACSAriaII) on a 24/7/365 level. Current and developing technologies in the FCSR allow investigators to assess up to 28 biomarkers simultaneously using spectral cytometry analytical instrumentation and sort up to 64 biomarkers with equipment configured to meet the recommended guidelines of the International Society of Analytical Cytometry (ISAC) to meet BSL2+ conditions if needed. The FCSR also provides specialized services for imaging cytometry (Amnis ImageStream) that images single cells in flow to gain signal localization information while simultaneously performing traditional flow cytometry measurements. Several educational opportunities are available for researchers to learn to use and apply flow cytometry. These include scientific seminars, cancer-specific meetings, instrumentation overviews, application work-shops and full-day training sessions. OSUCCC – James members can receive lab focused training and troubleshooting upon request for personalized support as needed.

Gene Therapy Institute

Founded in April 2022, Ohio State's Gene Therapy Institute (GTI) coordinates existing strengths to accelerate the expansion of gene therapies. The GTI brings together more than 50 faculty across the colleges of Medicine, Arts and Sciences, Engineering, Pharmacy, Veterinary Medicine, Law and Business to an interdisciplinary institute that supports basic research innovation, translational science, clinical applications and commercialization of new technologies related to gene therapy. Ohio State holds one of the largest first-in-human clinical trial portfolios internationally with more than 10 active trials, more than \$20 million in active NIH support, including \$4.8 million for translational Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)-gene therapy research and collaborates with key industry partners including Battelle, Medtronic, Bayer and others. The founding leadership, including Institute Director and Chair of Neurological Surgery Dr. Russell Lonser, MD and Chief Scientific Officer Dr. Krystof Bankiewicz, MD, PhD, bring world-renowned expertise in AAV-based therapies for neurological disease, device development and gene therapy clinical trial success. Core GTI research faculty labs are in the recently opened Pelotonia Research Center, where the institute fills more than 13,000 square feet of wet laboratory bench space and support rooms, plus core facilities and office space.

Infectious Diseases Institute

The Infectious Diseases Institute at Ohio State will generate solutions to the detrimental effects of microbes on the health of humans, animals, plants and the environment for the benefit of society. Programmatic areas include Antimicrobial Resistance; Ecology, Epidemiology and

Population Health; Host Defense and Microbial Biology; Microbial Communities; and Viruses and Emerging Pathogens.

College of Nursing Research Centers

Faculty research and scholarly activities are organized around two research centers led by senior, NIH-funded researchers. PhD students are actively involved on faculty-led research teams either as student research assistants or in research residency experiences.

- **The Martha S. Pitzer Center for Women, Children and Youth (CWCY)**
 - Conducts cutting-edge intervention research and translates it into real world settings to optimize health and wellness outcomes in infants, children, adolescents and women through health promotion and risk reduction. The Center is led by Dr. Karen Patricia Williams Executive Director. The Center is comprised of 27 tenured/tenure track faculty with active programs of research and clinical scholarship. Faculty in the CWCY have programs of research in genomics/epigenetics of preterm birth and pre-eclampsia; childhood and adolescent health, wellness and obesity prevention; social determinants of health and emotional well-being in urban youth; weight loss and obesity prevention during post-partum; cancer prevention and control in women; symptom management and palliative care in pediatric cancer and end-stage illness; and maternal – infant attachment in neonatal ICU and following cardiac surgery for congenital heart disease. The Center hosts internal and external researchers (Visiting Scholars) who present ongoing research projects during monthly “Lean In” seminars. PhD students are invited to these seminars. Visiting Scholars provide networking opportunities and offer expert consultations to faculty and PhD students.

Ohio State Molecular Cytogenetics Shared Resource

The Molecular Cytogenetics Shared Resource provides molecular cytogenetic technology and classical banded metaphase cytogenetics. Services include metaphase karyotyping of human and mouse tissue, fluorescence in situ hybridization (FISH) using many different types of probes and tissues and multicolor spectral karyotyping (SKY).

Ohio State Neuroscience Core Facilities

The Department of Neuroscience Cores for preclinical neurological studies include the following:

- **The Behavior Core** provides expertise and services for comprehensive phenotyping of mouse models using a battery of standard behavioral paradigms. The Core centralizes

behavioral assessment facilities and expertise for neuroscience investigators, ensuring that behavioral testing is performed expertly and adheres to best practices in the field. Assessments provide range from sensorimotor, learning and memory, to motivated behavioral measures.

- **The Electrophysiology Core** expands the capabilities of neuroscience research on campus by making available specialized expertise, equipment and assistance to support electrophysiological analyses of signal transduction and synaptic function in cultured cells, tissue slices and zebrafish embryos.
- **The Main Campus Imaging Core** provides training, expertise and equipment to perform fluorescence confocal microscopy. This facility provides well-maintained point-scanning confocal and multiphoton microscopes and provides training to users to establish independent imaging experiments.
- **The West Campus Imaging Core** provides neuroscience researchers with the training, expertise and equipment that they need to perform fluorescence confocal microscopy of cells, tissues and zebrafish embryos in the living and fixed state. We provide access to well-maintained wide-field, point-scanning and spinning disk confocal microscopes, as well as expert consultation and assistance with design and execution of imaging experiments.
- **The Single Cell Omics Core** facilitates the generation and analyses of single cell libraries to produce publication quality data. Expertise with scRNA-seq, scATAC-seq and multi-omics.
- **The Circadian Timing Core** provides equipment and expertise for the examination of mammalian circadian timing systems. The core consists of equipment for behavioral-based profiling of mouse models using locomotor activity and/or core-body temperature as the clock read-out. Equipment is also available for luminometry-based profiling of tissues samples and dispersed cultures.

Ohio State Small Animal Imaging Core

This facility which is part of the Davis Heart and Lung Research Institute (DHLRI) includes high resolution imaging equipment (MRI, ultrasound, microCT and optical), X-ray irradiator, body composition analyzer and personnel trained in the operation of each imaging modality and small animal handling procedures, as well as analytical software support for quantitative image analysis. In addition to providing interim animal housing for serial imaging studies, the SAIC also offers on-site suites for surgical procedures and animal care provided by University Laboratory Animal Resources. Image reconstruction, multi-modality fusion, quantitative image analysis, high resolution graphics and networking to the facility's server are also available.

Ohio State Spine Research Institute

At the Spine Research Institute, we are dedicated to developing a better understanding of the causal pathways that lead to spine and other musculoskeletal disorders through research, education and the development of platform technologies. We maintain that if we can understand how these disorders develop, we can provide better solutions for preventing, evaluating and treating them.

Ohio State Veterinary Tissue Bank

The Tissue Bank (biospecimen repository) collects samples of tumors and normal tissue from companion animals and stores these tissues under controlled conditions for future use by multiple investigators. The Tissue Bank at Ohio State was selected by the Canine Comparative Oncology Genomics Consortium (CCOGC) as one of three veterinary institutions nationwide to participate in populating the Pfizer-CCOGC multi-institutional Tissue Bank. This National Cancer Institute-sponsored endeavor emphasizes the importance of comparative oncology research. Ohio State's Tissue Bank follows the guidelines established by the CCOGC for several specific types of tumors and similar established protocols for other tumors. Tissues are collected and archived only after receiving consent from the owners. This sample bank will serve as a tremendous resource with the goal of developing new prevention and treatment strategies for dogs with a variety of illnesses.

Ohio State Extension Program

The nation's land-grant universities have a mission to disseminate and teach new knowledge to the citizens living throughout the state. This mission is accomplished through outreach education and the Cooperative Extension System that was established by the Smith-Lever Act of 1914 as a federal-state-local partnership between the USDA, the land-grant university system and local county governments. As part of Ohio State's land grant mission, Ohio State Extension has an office located in each of Ohio's 88 counties. The Ohio State Extension Program focuses on four major program areas:

1. Agriculture and Natural Resources
2. 4-H Youth Development
3. Family and Consumer Sciences
4. Community Development

The system was developed to transfer and apply the latest scientific research to address local needs that are constantly changing. Dr. Eric Barrett is an associate professor and area leader for Ohio State Extension.

Core Facilities and Other Resources – Nationwide Children's Hospital

Nationwide Children's Hospital

Nationwide Children's Hospital (NCH) is among America's largest not-for-profit free-standing pediatric healthcare systems and is ranked #6 in U.S. News & World Report's 2023-24 "America's

Best Children's Hospitals Honor Roll" list. Nationwide Children's Hospital provides unique expertise in pediatric population health, behavioral health, genomics and health equity, as the next frontiers in pediatric medicine, leading to best outcomes for the health of the whole child. Integrated clinical and research programs, as well as prioritizing quality and safety, are part of what allows Nationwide Children's to advance its unique model of care. Nationwide Children's Hospitals the only tertiary care facility with pediatric subspecialty services in central Ohio. As home to the Department of Pediatrics of The Ohio State University College of Medicine, Nationwide Children's physicians train the next generation of pediatricians and pediatric specialists.

The Abigail Wexner Research Institute at Nationwide Children's Hospital

The Abigail Wexner Research Institute (**AWRI**) and The Ohio State University College of Medicine Department of Pediatrics are based on the Nationwide Children's Hospital campus in downtown Columbus, OH, within five miles of the Ohio State campus. The current research laboratories are in the Wexner Institute for Pediatric Research, Research Building II, Research Building III and Research Building IV, structures that are adjacent to clinical and educational facilities. Together, these state-of-the-art buildings have over 850,000 square feet of lab and office space dedicated to research. The lower levels are occupied by the animal facilities described below. These buildings house research laboratories, investigator offices and ample space for support personnel and functions, including grants administration, accounting, operations, information technology, purchasing, compliance, safety and research training. Additional research space can be found in the Near East Office Building and Faculty Office Building, housing non-laboratory-based clinical, epidemiological and biobehavioral research groups.

Facility Overview

Laboratory Facilities – The standard laboratory for principal investigators (**PIs**) is modular and averages ~1200 sq ft. These labs contain both fixed and movable benches, fume hoods with chemical storage cabinet, 208 V outlets for large equipment, 18 megohm Type I reagent grade deionized/reverse osmosis water and high-speed computer access to facilitate data capture and transfer. In addition, each laboratory floor contains adjacent hallway common equipment space that includes procedure rooms, tissue culture rooms with biological safety cabinets and centrally plumbed carbon dioxide in each, autoclaves, walk-in cold rooms, icemakers, darkrooms and microscopy suites. In addition, each floor has dedicated space for eating and conference rooms. Trainee and staff desk space is located directly adjacent to the laboratory space and next to exterior windows, which provide an additional source of natural light. Office space for each PI is generally found on the same floor as his/her laboratory and averages 120 sq ft. Each office is

provided with a desk, filing cabinets, shelves, computers and a printer. Administrative assistants are located outside of PIs' offices. Researchers are also supported by a collective of shared resources (scientific core facilities) that offer leading-edge analyses, processes and systems that offer an array of options for basic, clinical and translational investigation.

Major Equipment – All research laboratories and common equipment areas are equipped with standard items necessary for modern molecular biological research, including equipment for electrophoresis, cell culture, centrifugation (ultra, high speed, tabletop and micro centrifuges), thermal cyclers, speedvacs, microplate readers, pH meters, balances, shakers, ovens (microwave, high-temp, vacuum), refrigerators, freezers and a high-quality house water purification system.

The Steve and Cindy Rasmussen Institute for Genomic Medicine

The Steve and Cindy Rasmussen Institute for Genomic Medicine (SCRIGM) at Nationwide Children's Hospital (NCH) was created in 2016 as one of the first ventures into pediatric personalized genomic medicine for children's hospitals. Recognizing that the root cause of many childhood diseases can be traced directly to the genome, SCRIGM's vision is to integrate molecular genomics into the mainstream of pediatric patient diagnosis and treatment. The SCRIGM combines robust research and clinical laboratories with genome scientists, computational biologists and clinical geneticists to optimize discovery and patient care. Collaboration among basic science investigators, physician-scientists and clinicians is emphasized to quickly transition novel research results into advanced diagnostics using state-of-the-art technology.

Environment and Resources – Contribution to Success

The research environment of the Principal Investigator includes all the resources and equipment necessary for the successful completion of this project. The intellectual resources, in the form of extramurally funded investigators performing related work, provide a potent scientific resource. The facilities as described below will provide a scientific environment strongly supportive of the proposed work.

As a 501(c)(3) subsidiary of Nationwide Children's Hospital, Inc., the Institute is organized into 13 multidisciplinary Centers of Emphasis, *The Institute for Genomic Medicine*, The Institute for Mental and Behavioral Health Research, and leading-edge core resources that allow traditional academic boundaries to be crossed and merged. Scientific and clinical interests intersect in this model which encourages collaboration and the free flow of ideas. More than 220 faculty scientists focus on discoveries to improve child health, ranging from basic molecular biology to translational, patient-oriented and population health research.

Additional information regarding AWRI facilities can be found at the end of this document.

The Research Institute's Core Resources

The Research Institute has multiple core laboratories available to all Investigators. These include the: Andelyn Biosciences, Animal facilities (Animal Resource Core and imaging facilities), Biobehavioral Outcomes Core, Biologics Manufacturing Core, Biospecimen Processing and Banking Core, Clinical Research Services, Core resources at The Ohio State University (Ohio Supercomputing Center), Computational resources (IT Research and Innovation and the Biostatistics Resource at Nationwide Children's Hospital), CRISPR/Gene Editing Core, Flow Cytometry Core, Genomics Services Laboratory, Histopathology Core, Immune Monitoring Core and Microscopy Core. All cores are equipped with state-of-the-art equipment and staffed by highly qualified personnel.

Genomics Services Laboratory

The Genomics Services Laboratory (GSL, previously known as the Biomedical Genomics Core) has expertise in multiple aspects of genomics analysis, including consultation and assistance with experimental design, quality control of starting material (DNA or RNA), next-generation sequencing and basic data processing. The GSL provides service to both internal and external investigators and has over a decade of experience with next-generation sequencing data generation and analysis. The GSL can assist investigators with multiple aspects of next-generation sequencing, including library preparation, sequence generation and data analysis. Advanced bioinformatics support for analyzing complex datasets, including integrated DNA and RNA sequence data, is a demonstrated strength.

The GSL offers data generation using multiple Illumina NGS systems, including four NovaSeq 6000 instruments. The NovaSeq 6000 system provides high throughput, speed and flexibility in sequencing options with multiple flow cell types (SP, S1, S2 and S4) and various read lengths (50-250 base pairs). For example, sequencing on S4 NovaSeq 6000 flow cells generates over six Terabases (**Tb**) and 20 billion reads of sequence data, enabling the sequencing of up to 48 human genomes at 30X coverage in 2 days. Available Illumina benchtop systems include the Illumina NextSeq 2000 (two instruments), MiSeq (three instruments), MiniSeq (two instruments), I-Seq (one instrument) and two PacBio Sequel IIe long-read sequencers. Many of these instruments are housed and operated in our CLIA laboratory space.

Computational Genomics Group

The IGM Computational Genomics Group comprises a dynamic team of bioinformatics scientists, computational biologists, data scientists, software developers and software engineers with the substantial technical and bioinformatics expertise required to oversee the multiple platforms that acquire, store and analyze large and complex data sets generated by the IGM. Integrating this group within the IGM is critical to its success, ensuring that team members learn new methodologies and develop novel analysis approaches at pace with the technological growth that has become a primary driving force for biological discovery. Leveraging the flexibility of the cloud, the group continues to develop highly optimized solutions to address the substantial processing, networking and big data challenges arising from genomic science.

At present, the group is comprised of four highly integrated teams:

- **Research and Development Team:** The R&D Team is a group of bioinformatics scientists, responsible for advanced and cohort-level genomic research, machine learning applications and complex statistical analyses. The team focuses on several areas of research, leveraging IGM's large and growing genomic datasets, near-unlimited scalability with cloud computing resources, and strong bioinformatics algorithm and model development expertise, helping internal and external collaborators to ask and answer challenging genomic and transcriptomic questions.
- **Bioinformatics Services Team:** The Services Team provides essential support for the Genomics Service Lab, by analyzing and delivering data, as well as helping customers to understand their results. Team member responsibilities include analysis and interpretation of results interpretation by analyzing genomic sequencing data and interpreting results, as well as infrastructure and pipeline development to ensure availability of analytical workflows necessary for data analyses. Members also support the informatic needs of IGM's Technology Development Group on new instrumentation and laboratory procedures, IGM's growing number of translational research protocols and internal and external investigators on novel collaborative research projects.
- **Production Support and Development Team:** The Production Team supports the day-to-day computational needs of the clinical laboratory, insuring timely and accurate delivery of patient results. The team provides analytical support for clinical, technical development and research endeavors including validation of new tools and assays. Members work closely with clinical and research staff to troubleshoot production issues and collaborate closely with other computational groups to improve data workflows and pipelines in the clinical production environment. The team also develops and tests new software tools to constantly improve the efficiency and capabilities of IGM laboratories.
- **Systems and Data Integration Team:** The Integration Team supports the clinical laboratory's interpretation and sign-out processes through the development of

innovative, robust and efficient applications with a key focus on the integration between systems and databases. The team collaborates with global communities to bring the latest technologies and guidelines to IGM's clinical and research procedures, as well as developing strategies for leveraging the growing depth and breadth of -omics data produced by IGM.

Developing analytical pipelines for human exome and genome sequencing analysis, big data research and identifying disease-causing genetic variants, are key focus areas for the Computational Genomics Group. The group also evaluates and supports multiple software products for genomics applications to make data analysis tools accessible to biologists. Training and education in genomics and bioinformatics are essential components of our mission. IGM provides internship opportunities in genomics and bioinformatics to undergraduate and graduate students. We train and mentor our research faculty and junior scientists through one-on-one consultation, software training and relevant workshops.

Compute Infrastructure Using Amazon Web Service

We have established a secure and compliant cloud computing data center, built upon Amazon Web Services (**AWS**). Leveraging the AWS cloud allows IGM staff to focus on core competencies, increases computational agility, expands the set of computational tools that are available for addressing the computationally demanding bioinformatics challenges that are faced, and decreases costs compared to similar on-premises solutions.

IGM maintains an on-premises, one petabyte, network attached storage (**NAS**) that sequencing instruments write data to. This data is then automatically streamed to the cloud via a dedicated one gigabyte Direct Connect network connection.

Once the data is synced to the cloud a variety of cutting-edge AWS services are used to process the data in modern computing ways that go far beyond the traditional HPC computational model. Our Serverless approach not only reduces costs but it also allows us to integrate new AWS services and pipelines in a very rapid and flexible way.

Technology Development Lab

Technology and applications development is an essential component of the IGM vision. This group evaluates emerging, cutting-edge methods and instrumentation that improve current data production and analysis methods. A particular focus is improved sample processing, keeping up with the demands of increasing sample volumes while maintaining quality, reducing costs and facilitating short turnaround times. In addition, the team transitions updated methods and new protocols to our clinical laboratory and genomics services groups. Finally, the team

collaborates and supports research in the translational continuum to include protocol transition and clinical validation.

The Technology Development team works closely with Genomic Services and Clinical NGS and are experts in NGS applications. We have access to the following sequencing instruments: *Illumina NovaSeq 6000* (4), *MiSeq* (3), *MiniSeq* (2), *iSeq 100* (1) and two *Pacific Bioscience Sequel IIe* instruments. The Pacific Bioscience Sequel IIe allows the sequencing of large whole genome libraries (20kb) and full-length RNA (Iso-Seq) libraries. These sequence reads efficiently, resolve complex genomic aberrations, identify gene fusion partners and classify allele-specific isoforms. In addition, the methods developed for low quality, low yield and large molecule sequencing aid in resolving the clinical odyssey seen in patients.

Clinical Laboratory

The Institute for Genomic Medicine Clinical Laboratory at Nationwide Children's Hospital performs high complexity molecular genetic analysis, cytogenetic analysis and advanced genomic testing.

The laboratory is accredited by the *College of American Pathologists (CAP; #1637201 and #8162772)* and holds a *Clinical Laboratory Improvement Amendments (CLIA)* certificate (#36D0665271 and #36D2131848). Clinical and technical direction of the laboratory is provided faculty comprising eleven Clinical Directors and one Technical Director. The associated laboratory staff is composed of more than 80 individuals including technologists and technicians, order entry and quality assurance staff, laboratory managers and supervisors, clinical laboratory genetic counselors, clinical bioinformatics personnel, variant scientists and analysts and clinical laboratory fellows. The laboratory is fully equipped with instrumentation and computational resources to perform various molecular, cytogenetic and advanced genomic analyses. In addition, the laboratory includes facilities for sample accessioning, tissue culture, cytogenetic analysis, fluorescence in situ hybridization, nucleic acid extraction, nucleic acid amplification, microarray analysis, methylation analysis, next-generation sequencing and local freezer storage.

The clinical laboratory is well equipped with cutting-edge instrumentation and automation solutions. It houses multiple Illumina NGS sequencers, including four *NovaSeq 6000* instruments, three *MiSeq* instruments, one *MiniSeq* and capillary electrophoresis instruments. Automation capabilities include the *Agilent Bravo*, *Tecan*, *Hamilton STARlet* and the *Janus* liquid handling solutions. Additionally, the laboratory has extensive thermal cycling capability and real-time PCR instrumentation, as well as a variety of array-based platforms (Agilent, Affymetrix, and

Illumina). Automated capability for nucleic acid extractions includes the *Chemagic 360*, *EZ1* and *QIAcube Connect* systems.