



THE DEPARTMENT OF BIOMEDICAL SCIENCES

2022 Year in Review



WELCOME TO THE DEPARTMENT OF BIOMEDICAL SCIENCES

Welcome to the Department of Biomedical Sciences at the UND School of Medicine & Health Sciences! Our faculty conduct internationally recognized research in areas of addiction, cancer, cardiovascular disease, epigenetics, host-pathogen interactions, lipid metabolism, neuroscience, and obesity. These efforts are supported by state-of-the-art core facilities and help foster collaborations with regional, national, and international entities with the goal of stimulating multi-disciplinary and increasingly translational research.

MESSAGE FROM THE CHAIR

The Department of Biomedical Sciences is an exciting setting for discovery that also provides the foundation of our active learning-based interdisciplinary graduate program with optional specialties. Our innovative graduate training is designed to offer not only the broad base of core competencies that students need to be successful, but also the practical experiences and skill set required for a career in



academic or industrial research and teaching. Moreover, our additional focus on educational research helps to ensure that our program is always improving to meet the changing needs of graduate training and workforce development for a 21st century economy. The Department also provides strong support for both undergraduate and medical student research opportunities and hosts a variety of programs throughout the academic year and summer. Explore our website at med.UND.edu/biomedical-sciences to learn about our faculty interests, meet our graduate students and post-doctoral fellows, read about the Department's recent events and accomplishments, consider our graduate program, or identify research opportunities.

Sincerely,

A handwritten signature in black ink, appearing to read 'Colin Combs'.

Colin Combs, Ph.D.
Chester Fritz Distinguished Professor & Chair

FACULTY & SPECIALIZATIONS

Colin Combs, Ph.D.

Chester Fritz Distinguished Professor and Chair

Neuroimmune interactions during aging and neurodegenerative diseases.

Marc Basson, M.D., Ph.D., M.B.A.

Joint/Adjunct Professor

General surgery, wound healing, cancer, signal transduction, intestinal epithelial biology.

David Bradley, Ph.D.

Associate Professor

Natural and inducible immune responses to viruses and bacteria and to cancers.

Catherine Brissette, Ph.D.

Associate Professor

Bacterial pathogenesis, host-pathogen interactions, Lyme disease, relapsing fever, spirochetes.

Holly Brown-Borg, Ph.D.

Chester Fritz Distinguished Professor Assistant Dean for Gender Equity

Contributions of the endocrine system and metabolism to mechanisms of biological aging, and age-related diseases.

Pat Carr, Ph.D.

Associate Professor, Assistant Dean for Medical Curriculum.

Tim Casselli, Ph.D.

Research Assistant Professor

Host-pathogen interactions during Lyme borreliosis; Neuroborreliosis; Meningeal immunity.

Xuesong Chen, Ph.D.

Associate Professor

Endolysosome dysfunction contributions to neurological disorders including HIV-associated neurocognitive disorders, Alzheimer's diseases, and COVID19-associated neurological problems.

Archana Dhasarathy, Ph.D.

Associate Professor

Chromatin, Epigenetics, Molecular biology, Breast cancer, Genomics.

Van Doze, Ph.D.

Associate Professor

Adrenergic modulation of behavior, Aging brain, Epilepsy, Alzheimer's disease.

Jane Dunlevy, Ph.D.

Associate Professor

Medical education, Cellular & molecular biology, Extracellular matrix, Cell adhesion, Cytoskeleton.

Susan Eliazer, Ph.D.

Assistant Professor

Skeletal muscle stem cells, Tissue regeneration, Aging, Cytoskeleton, Chromatin and epigenetics.

James Foster, Ph.D.

Assistant Professor

Regulation of the dopamine transporter via the post translational modifications, palmitoylation and phosphorylation and their role in health and disease.

Jonathan Geiger, Ph.D.

Chester Fritz Distinguished Professor

Neuroscience, Neuropharmacology, Neurochemistry, Neurodegenerative diseases, Purines.

Mikhail Golovko, Ph.D.

Associate Professor

Stroke research, Brain ischemia, Hypoxia, Angiogenesis, Neurochemistry, Lipid and purine metabolism, Mass spectrometry.

Bryon Grove, Ph.D.

Associate Professor

Vascular biology, Angiogenesis, Cellular signaling, A-kinase anchoring proteins, Microscopic imaging.

Amanda Haage, Ph.D.

Assistant Professor

A&P Coordinator, Diversity & equity in STEM, Cell migration & adhesion, Cancer metastasis.

Peter Halcrow, Ph.D.

Research Assistant Professor

Neurochemistry, Neuroscience, Neuropharmacology, and Neurodegenerative diseases.

L. Keith Henry, Ph.D.

Associate Professor

Molecular, pharmacological, epigenetic, and computational analysis of the serotonin and dopamine transporters and their role in human disease.

Junguk Hur, Ph.D.

Associate Professor

Bioinformatics, Systems pharmacology, Epigenomics, Diabetic peripheral neuropathy, literature mining.

Saobo Lei, Ph.D.

Professor

Neurotransmitters, Neuropeptides, Synaptic transmission and plasticity, Ion channels, Learning and memory, Epilepsy, Anxiety, Schizophrenia, Alzheimer's disease, Autism, Hippocampus, Entorhinal Cortex, Interneuron, Patch-clamp, Electrophysiology.

Masfique Mehedi, Ph.D.

Assistant Professor

Respiratory syncytial virus, Ebola virus, host-pathogen interactions, Cytoskeletal dynamics, Virus cell-to-cell spread, Ebola virus RNA editing, Antiviral therapeutics.

Santhosh Mukundan, Ph.D.

Research Assistant Professor

Bacterial pathogenesis.



Eric Murphy, Ph.D.

Associate Professor

Lipids biochemistry, Fatty acid binding proteins, N-3 fatty acids, Brain lipid metabolism, Higher education, Faculty governance.

Kumi Nagamoto-Combs, Ph.D.

Assistant Professor

Effect of peripheral inflammation on brain function and behavior, Neuroinflammation via gut-immune-brain communications, Allergy and behavioral disorders.

Sergei Nechaev, Ph.D.

Associate Professor

Gene regulation, Epigenetics, Transcription, Genomics.

Matthew Nilles, Ph.D.

Associate Professor

Microbiology, Bacterial pathogenesis, Roles of type III secretion systems in pathogenesis.

Suba Nookala, Ph.D.

Research Assistant Professor

HLA-Class II mediated immune responses to infections.

Monica Norby, Ph.D.

Teaching Instructor

James Porter, Ph.D.

Associate Professor

Pharmacology, Sympathetic nervous system, Innate immunity, G-protein coupled, Peptide and toll-like receptors, Receptor cross-talk, signal transduction, Molecular mechanisms of pharmacological action, Arrestins, G-protein coupled receptor kinases, Gq-G11 GTP-binding proteins, MAP kinase signaling.

Benjamin Roche, Ph.D.

Assistant Professor

Cellular quiescence, dormancy, G0 and non-dividing states; Epigenetics, Genomics, Epitranscriptomics; Fission yeast biology, yeast and fungal genetics.

Thad Rosenberger, Ph.D.

Associate Professor

Alzheimers disease, Multiple sclerosis, Spinal cord injury, Neurodegeneration, Neuroinflammation, Lipid metabolism, Brain energy metabolism, Lipid-mediated signal transduction, Acyl-CoA, Arachidonic acid, Eicosanoids, Ether phospholipid, Plasmalogen, Phospholipases, Analytical lipid techniques.

Kenneth Ruit, Ph.D.

Associate Professor

Anatomy, Neuroscience, Education, Curriculum innovation and program evaluation, Assessment of student learning, Faculty development.

John Shabb, Ph.D.

Associate Professor

Proteomics, Bio-markers, Discipline-based education research.

Shahram Solaymani-Mohammadi, Ph.D.

Assistant Professor

Immunology, Mucosal immunology, Gut immunology, Mucosal inflammation microbiome, Infectious diseases, Parasitology host-pathogen interaction, Vaccine development.

Motoki Takaku, Ph.D.

Assistant Professor

Epigenetics and chromatin regulation in cancer, Breast cancer reprogramming, Biochemistry, Cell biology, Genomics, Genome editing, cell free DNA.

Chernet Tessema, M.D., Ph.D.

Associate Professor

Human anatomical variation: a cadaver dissection-based study of human structure.

Alexei Tulin, Ph.D.

Professor

Epigenetics in normal development and pathogenesis, Chromatin regulation, Role of poly (ADP-ribose) metabolism in transcription regulation and oncogenesis, PARP-1 inhibitors in oncology, Drosophila and mammalian model organisms.

Roxanne Vaughan, Ph.D.

Chester Fritz Distinguished Professor

Dopamine transporter structure and function, Molecular mechanisms of cocaine and amphetamine, Protein post-translational modifications, Dopaminergic disorders.

John Watt, Ph.D.

Associate Professor

Neural regeneration, Neuron-glia interactions, Neuroinflammation, CNS response to injury.

Abraam Yakoub, Ph.D.

Assistant Professor

Neuroscience and neurovirology, Virus-brain interaction, Neurodevelopmental and neurodegenerative disorders (e.g. autism, intellectual and learning disorders, Alzheimer's and Parkinson Diseases, ALS); Gene therapy; Stem cell modeling of brain diseases.

WHERE ARE THEY NOW?

Positions that Department of Biomedical Sciences students have taken since completing their graduate training

Student	Degree	Advisor	Position Taken After Graduation
2022			
Zahra Afghah	Ph.D.	Geiger	Grant Writer/Biomedical Scientist, Center for Innovation, Grand Forks, N.D
Sayem Bhuyan	Ph.D.	Tulin	Field Application Scientist, Axion BioSystems, Seattle, Wash.
Chris Brown	Ph.D.	Foster	UND School of Medicine & Health Sciences, Grand Forks, N.D.
Sema Oncel	Ph.D.	Basson	Postdoctoral Fellow, USDA Human Nutrition Research Center, Grand Forks, N.D.
Jason Power	Ph.D.	Doze	INMED Program, UND School of Medicine & Health Sciences
Sattya Talukdar	Ph.D.	Mehedi	Postdoctoral Fellow, John Hopkins Bloomberg School of Public Health, Baltimore, Md.
Betsy Young	M.S.	Nilles	Laboratory Technician, Mayo Clinic, Rochester, Minn.
2021			
Temidayo Adeluwa	M.S.	Hur	Ph.D. Student, University of Chicago, Program in Genetics, Genomics and Systems Biology, Chicago, Ill.
Ashrifa Ali	Ph.D.	Grove	Postdoctoral Fellow, Department of Ophthalmology, University of Pittsburgh School of Medicine, Pittsburgh, Pa.
Sarmad Al-Marsoum	Ph.D.	Basson	Postdoctoral Fellow, Department of Pathology, UND School of Medicine & Health Sciences, Grand Forks, N.D.
Malak Alzidaneen	M.S.	Watt	Ph.D. Student, Bioinformatics Program, North Dakota State University (NDSU), Fargo, N.D.
Leo Lakpa	Ph.D.	Geiger	Medical Student, University of Wisconsin Madison, Madison, Wis.
Regan Lawrence	M.S.	Murphy	Medical Student, UND School of Medicine & Health Sciences, Grand Forks, N.D.
Nicole Miller	Ph.D.	Geiger/Chen	Medical Student, College of Osteopathic Medicine William Carey University, Hattiesburg, Miss.
Meghan Rodriguez	Ph.D.	Henry	Assistant Teaching Professor, Anatomy and Histology, University of Missouri-Kansas City (UMKC), Saint Joseph, Mass.
Smruthi Rudraraju	Ph.D.	Dhasarathy	Technology Specialist, Clark and Elbing Intellectual Patent law firm, Boston, Mass.
Taylor Schmit	Ph.D.	Khan	Teaching Faculty, University of Minnesota, Crookston, Minn.
2020			
Sayantani Ghosh Dastidar	Ph.D.	Wu/Nechaev	Postdoctoral Fellow, Oregon Health and Sciences, Portland, Ore.
Moriah Hovde	Ph.D.	Foster	Postdoctoral Fellow, Massachusetts General Hospital/Harvard Medical School, Boston Mass.
Mitchell Klomp	M.S.	Khan	Lead Testing Service Scientist, GT Molecular, Fort Collins, Colo.
Mona Sohrabi	Ph.D.	Combs	Clinical Project Scientist, SafetySpect, Grand Forks, N.D.
Derick Thompson	Ph.D.	Brissette	Postdoctoral Fellow, UND School of Medicine & Health Sciences, Grand Forks, N.D.

Updated version can be found: med.UND.edu/biomedical-sciences/former-students.html



FACILITIES AND CORES

Facilities

The UND School of Medicine and Health Sciences completed construction of a 325,000-square-foot, four-story, state-of-the-art building in August 2016. It is the only medical school in North Dakota and houses eight degree programs, including Athletic Training, Biomedical Sciences, Medicine, Medical Laboratory Sciences, Occupational Therapy, Physical Therapy, Physician Assistant Studies, and Public Health. Its entire west wing is devoted to biomedical research and includes open labs with office suites for researchers and students nearby.

The **Biomedical Sciences Department** was formed by combining the Departments of Pharmacology/Physiology/Therapeutics, Microbiology & Immunology, Anatomy & Cell Biology, and Biochemistry & Molecular Biology in 2013. This created a multi-discipline research environment and graduate/fellow training program, beneficial to all involved. The merging created an abundance of shared equipment resources available to faculty, students, fellows, and staff. Combined seminars, journal clubs, laboratory meetings, yearly retreats, and coursework produce an

integrated research environment with a collective expertise far beyond what was present in any single department. This vibrant atmosphere stimulates an ongoing variety of collaborative, cross-discipline projects.

The Biomedical Sciences Department occupies four floors of the research wing of the new UND School of Medicine & Health Sciences as well as the Neuroscience Research Facility and the first floor of the Edwin James Research Facility in Colombia Hall. The Department's space in the newly completed School of Medicine houses open design, state-of-the-art laboratories, and offices spanning all four floors, occupying approximately 42,000 sq. ft., as well as 5,500 sq. ft. in the Edwin C. James Research Facility, and 14,000 sq. ft. in the adjacent Neuroscience Research Facility. The Biomedical Sciences Department also maintains or has access to the Flow Cytometry Core (see below), Imaging Core (see below), Mass Spectrometry Core (see below), Histology Core (see below), Genomics Core (see below), and Behavioral Core (see below).



The **Edwin C. James Research Facility**, located in Columbia Hall, houses a portion of the Biomedical Sciences Department and is adjacent to the Center for Biomedical Research animal facility as well as the Neuroscience Research Facility. It provides all weather connections to the Center for Biomedical Research Facility and spacious, state-of-the-art laboratories and offices. The Facility contains five floors of research and office space occupying over 45,000 sq. ft. The building provides recently renovated space for those Departmental faculty whose interests include epigenetics. Its open lab design is conducive to increased collegial interaction.



The **Neuroscience Research Facility** was established at UND in 2004. The goal of the Facility is to help investigators develop expertise in multidisciplinary approaches toward the understanding of brain function. The Facility is research-oriented involving faculty from the Biomedical Sciences Department. The Facility building is located on the UND campus south of the new School of Medicine & Health Sciences building. This single story building is approximately 14,000 sq. ft. and provides ten laboratories and office space as well as a conference/seminar room, atrium, and dining area for UND researchers engaged in the study of neurological disease and treatment. It is a highly interactive environment with shared space, equipment, combined lab meetings/seminars and very collegial with abundant opportunities for collaborative projects.



The **Center for Biomedical Research** at UND is a state-of-the-art research AALAC approved animal facility. This 20,000 sq. ft. facility is equipped with a quarantine room, surgical suite (with separate prep, scrub, and surgery rooms), diagnostic laboratory, the North Dakota Behavioral Research Core Facility, barrier rooms, semi-barrier rooms, infectious disease rooms, isotope rooms, behavioral testing rooms, autopsy room, receiving area, two cage cleaning areas, and numerous other conventional animal rooms. Each room has an anteroom to prevent cross-contamination. The facility also is equipped with self-watering cages, a water purification system, a water acidification system and water flushing system, as well as a bedding and changing area within a hood in each room. Excellent part-time and 24hr on-call veterinary supervision and care is assured.

Satellite Vivarium: The Satellite vivarium at the University of North Dakota is designed to act as a complement to the main vivarium on campus. A garage space adjacent to the Satellite vivarium is available for animal transfer between the facilities. All food and water provided to the animals comes from the main vivarium to ensure continuity of care to the animals. All main doors into the Satellite Vivarium are secure card access only. It consists of two general holding rooms for mice, one general holding room for rats, two procedure rooms, a behavioral suite and an infection suite. Support spaces in the Satellite Vivarium include an office area for records, a rest room, an autoclave, a utility room, and several storage rooms for food, clean supplies, vivarium waste, and dirty cages waiting for pick up. Every sink in the satellite vivarium has an eye wash. There is an eye wash safety shower and fire extinguisher in the common corridor for emergency use.



Cores

Imaging Core

The Imaging Core is a 3350 sq. ft. facility housed in the UND School of Medicine and Health Sciences that provides investigators on the UND campus and within the surrounding region with access to both light and electron microscopy. Instrumentation available for light microscopy includes a Leica Stellaris 5 confocal microscope, an Olympus FV1000MPE basic multiphoton/single photon system on an upright microscope, an Olympus cellTIRF system on an IX83 fluorescence microscope and a Leica DMI8 Thunder Imager system for 3D imaging of fluorescently labeled cellular material. A Dell workstation equipped with imaging analysis tools is also available. The Leica Stellaris 5 system is a 4 laser, multichannel system equipped for superresolution and capable of imaging a wide variety of fluorochromes in fixed and live tissues and cells. The Olympus FV1000MPE system is configured for confocal and multiphoton microscopy of fixed samples, live cells and intravital microscopy using animal models. The Olympus cellTIRF microscope is a four laser system configured for multicolored TIRF

microscopy, ratiometric imaging of Fura2 and FRET biosensors, SRRF superresolution microscopy, and long term live cell imaging. Instrumentation in the electron microscopy suite includes a Hitachi 7500 TEM equipped with a high resolution SIA digital camera and a Hitachi 4700 field emission SEM. Additional instrumentation for sample preparation includes an ultramicrotome, a Denton sputter coater and a vacuum evaporator for SEM sample preparation. Applications supported by the imaging Core include multi-label fluorescence imaging of fixed and live material, FRET, FRAP, FLIP, 3D imaging, channel separation using spectral fingerprinting, ratiometric fluorescent imaging, TIRF microscopy, thin section transmission electron microscopy, and scanning electron microscopy. The Core director, Dr. Bryon Grove, and two Core staff maintain the facility, provide microscopy services, training on the equipment, and assistance with sample preparation and image analysis. (med.UND.edu/imaging/index.html).

North Dakota Flow Cytometry and Cell Sorting (ND-FCCS) Core

The North Dakota Flow Cytometry and Cell Sorting (ND-FCCS) core, located in the UND SMHS in the Janice I. Schuh Suite and is joint effort between the departments of Biomedical Sciences and Pathology, and the Host Pathogen COBRE (P20GM113123) and the North Dakota INBRE (P20GM103442) and the SMHS. The core staff, consisting of Dr. David Bradley (Director) who has 30+ years of flow cytometry experience, Dr. Suba Nookala (Assistant Director) who has 20 years of flow cytometry experience, and Steven Atkins (Core Technical Advisor) with 15 years of flow cytometry experience, provides training on the instrumentation and software as well as consultation for experimental design and data analysis. The ND-FCCS core contains 3 major instruments: a) BD FACS Aria II flow cytometer which has 3 lasers (UV (355 nm), Blue (488 nm), and Red (640 nm)) with simultaneous analysis of 9 colors in addition to FSC and SSC, first pass 4-way sorting, aseptic sorting, automated cell deposition, temperature control, and aerosol management capabilities; b) BD FACSymphony A3 equipped with 4 lasers [Blue (488nm), Violet (405 nm), and Yellow Green (561 nm), and Red (638 nm)], and filter sets to increase multicolor panel possibilities and enable the simultaneous measurement of more than 27 different markers on a single cell for phenotyping, apoptosis, proliferation or cell-cycle analysis, with capability to run a reliable high throughput acquisition platform; and c) Sony MA900 Cell Sorter that is equipped with 4 excitation lasers [Blue (488nm), Violet (405 nm), and Yellow Green (561 nm), and Red (638 nm) that is split into two laser beams]), a temperature controlled 4-way sorting with adjustable speeds into multiple tube types including multi-well and 96 well plate deposition system, with capabilities for automation, microfluidics chip-based design, and a user-friendly software for easy compensation of up to 12 fluorescence parameters. The ND-FCCS core also maintains the current release of BD FACS Diva and twelve licensed copies of FlowJo analytical software, all of which are available to all users for analysis. The ND-FCCS core is open to all users within the state of North Dakota, with the core providing both full service and self-service flowcytometric data and/or cell collection on for fee basis, as well as training, initial support and oversight of panel design, data analysis, and multiparameter aseptic for downstream applications.

Genomics Core

The Genomics Core at the University of North Dakota is a full-service resource providing genomics resources to investigators at UND, institutions across the northern Midwest, as well as external commercial clients. The core facility is a Center for Biomedical Research of Excellence (CoBRE) funded operation intended to help regional researchers utilize next generation sequencing technologies in basic and translational research, providing consultation, routine wet lab and bioinformatics services, as well custom technology implementation in collaboration with investigators. Core staff is available to help with design, analysis and visualize sequencing data based on needs of individual investigators and research projects. A particular emphasis of the Genomics Core is to enable investigators with little experience in genomics-based tools to design and prepare experiments utilizing NGS based technologies.

Examples of services offered by the Genomics Core include Illumina RNA-sequencing library preparation, both polyA selected and ribo-depleted, 16S microbiome profiling, single-cell RNA-sequencing, ATAC sequencing, and multiome using the 10x platform, and small genome sequencing such as amplicons, bacteriophages, and RNA viruses including covid . Automated DNA and RNA extraction from difficult tissues and samples are available. In addition to commercially available library preparation, the Core handles user-prepared libraries including those from ChIP, small RNA, ATAC, and custom methods in collaboration with investigators. Illumina and Nanopore long read sequencing is used depending on a specific project. The Genomics Core provides full service bioinformatics support including data storage and backup, database submission, and data analysis using routine and custom bioinformatics pipelines.

The Genomics Core lab has an Illumina MiSeq short-read sequencer and Nanopore Gridlon X5 long read sequencing platform along with a variety of instrumentation to support sequencing and QC needs for NGS based experiments. The 10X chromium system (10X genomics) for single cell genomics and optimized protocol for spatial transcriptomics. Quality control for sequencing is performed either on a Tapestation 4200 or on an Agilent Bioanalyzer 2100. The lab utilizes fluorescence-based readouts as well as a BioRad QX200 Droplet Digital PCR system for library quantification. Some of the instrumentation is available for shared use to Core-trained users. Patrons of the Core may sign up for access to a Covaris S220 Focused-ultrasonicator, a Bio-Rad CFX384 Touch Real-Time PCR Detection System, a Li-Cor. Biosciences' Odyssey Fc Dual-Mode

Imaging System, an Aplegen OmegaLum C imaging System, BioRad NGC Quest 10 Chromatography system, Thermo Scientific Sorvall MTX 150 micro Ultracentrifuge, and BluePippin DNA size selection instrument. The full list of Core and user-accessible equipment is available at the Core website.

Mass Spectrometry Core

The Mass Spectrometry Core facility is a state-of-the-art 1,500 sq. ft. facility and very well equipped to perform mass spectral analysis of small molecules and proteins, including accurate mass high resolution analysis and targeted quantification. The high-resolution analyzers include Q-TOF G2S (Waters) with UPLC inlet, and QExactive orbitrap (Thermo Scientific) with nano-UPLC inlet. A high sensitivity targeted analysis is performed on Xevo triple quad UPLC-MS system (Waters), API 3000 triple quad HPLC-MS system, and a Thermo Scientific TSQ 9000 triple quadrupole GC-MS/MS system. The ion sources include ESI, nano-ESI, APPI, APCI, and solid probe ion sources, EI, ECI. Waters UPLC and nano-UPLC, and Agilent and Beckman HPLC systems connected to MS analyzers consist of binary pumps, autosamplers, column heaters, and DDA detectors. Processing workstations include MarketLynx, MetaboLynx, Progenesis for small molecules and proteins, Lipid Search, and PLGS processing software. In addition, the MS Core is equipped with Beckman 2-D HPLC system to allow for protein fractionation. The core director, Dr. Mikhail Golovko, and full-time staff are available for help with project design, sample preparation, data analysis and interpretation, as well as data presentation.

Histology Core

Established in 2016 within the School of Medical and Health Sciences, the Histology Core provides routine histology, including tissue processing, embedding, sectioning, and slide digitization services to support clinical and basic science research at the University of North Dakota. The objective of the Core is to collaborate with, train, advise, and provide technical support for individuals in need of histology services for research, teaching, or clinical interests. The Core is designed for 24/7 access to instrumentation critical to high-quality preparation of tissue samples, and to assist with experimental design, specifically with application-specific sample preparation techniques, to identify appropriate analytical tools available, resolution restrictions, and quantitative morphological data analysis. The Core boasts an impressive array of conventional and state-of-the-art equipment: automatic tissue processor, Barnstead Smart2Pure Water Purification System, microtome, cryostats, antigen retrieval processor, Leica Autostainer XL, Leica automated cover-slipper, 48 Dako Autostainer IHC & PT Link, and high-resolution NanoZoomer Digital Pathology scanner. Under the directorship of Dr. Colin Combs, the Core is managed by Donna Laturnus, a full-time histology technician. The Core is supported by funding from the NIH/NIGMS and the UND SMHS.





COBREs

The **Center of Biomedical Research Excellence in the Epigenomics of Development and Disease** was established at UND in 2013. The Epigenetics Working Group at UND unites multiple research teams across disciplines and departments using different conceptual frameworks and experimental approaches to study epigenetic mechanisms regulating development and pathophysiology. Using a wide range of experimental systems, research teams are aiming to uncover the epigenetic basis for normal as well as disease states including muscle health, aging, cellular quiescence, cancer, infection, and neurodegenerative disorders. As a group, our investigators are targeting molecular mechanisms of local and reversible genome-wide reprogramming, cellular heritability of epigenetic changes, and fine-tuning of local gene activity that can be recruited for therapeutic applications.

The **Center of Biomedical Research Excellence in Host-Pathogen Interaction** was initiated at UND in 2016. The objective of the COBRE in Host-Pathogen interaction is to establish a highly interactive and dynamic group of junior investigators whose research focuses on the intersection between the host and microbial agents. These investigators with expertise in viral, bacterial, and parasitic infections are working in a cohesive and collaborative manner to uncover immune mechanisms regulating the pathogenesis of

these diverse infectious diseases, likely identifying novel treatment targets, and to identify microbial influences altering susceptibility and onset of disease. The cutting edge, critical research proposed in this grant will be accomplished by utilizing state-of-the-art infrastructure supported by core facilities equipped with modern instrumentation and technology (Flow Cytometry, Imaging, Histology, and Computational Data Analysis). A key facet of this COBRE, the Computational Data Analysis Core, which is consistent with our global, strategic mission to address the needs of North Dakota's aging, largely rural population that are prone to infectious diseases such as pulmonary infections, sepsis, neuroinflammation and vector-borne disease. This center nurtures a focused group of investigators working to establish a collaborative and sustainable Center of Excellence in Host-Pathogen Interactions capable of attracting the brightest and most talented faculty, students, and fellows to conduct world-class research in the field of infectious diseases, the significance of which has recently been demonstrated on the world's stage. UND is fully committed to ensuring the growth and sustainability of this group even after the COBRE grant ends, which will establish and maintain UND as an emerging infectious disease center in the U.S.

2022 PUBLICATIONS

Halcrow P, Kumar N, Hao E, Khan N, Meucci O, Geiger JD.

“Mu opioid receptor-mediated release of endolysosome iron increases levels of mitochondrial iron, reactive oxygen species, and cell death” *NeuroImmune Pharmacology and Therapeutics*, 2022. <https://doi.org/10.1515/nipt-2022-0013>

Ai J, Hong W, **Wu M**, Wei X. Pulmonary vascular system: A vulnerable target for COVID-19. *MedComm* (2020). 2021 Oct 17;2(4):531-547. doi: 10.1002/mco2.94. PMID: 34909758

Hovde MJ, Bolland DE, Armand A, Pitsch E, Bakker C, Kooiker AJ, Provost JJ, **Vaughan RA**, Wallert MA, Foster JD. Sodium hydrogen exchanger (NHE1) palmitoylation and potential functional regulation. *Life Sci*. 2022 Jan 1;288:120142. doi: 10.1016/j.lfs.2021.120142. Epub 2021 Nov 11. PMID: 34774621

Boison D, Masino SA, Lubin FD, Guo K, Lusardi T, Sanchez R, Ruskin DN, Ohm J, **Geiger JD, Hur J**. The impact of methodology on the reproducibility and rigor of DNA methylation data. *Sci Rep*. 2022 Jan 10;12(1):380. doi: 10.1038/s41598-021-04346-w. PMID: 35013473

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Color Code: **Faculty** – **PostDoc** – **Student** – **Staff**



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2022 BY THE NUMBERS

11

Graduate
Students
Accepted

7

Ph.D.
Degrees
Awarded

33

Active
Graduate
Students

47

Faculty &
Adjunct
Faculty

78

Active
Research
Projects

#2

Biomedical Science
Departments, Ranked
Nationally in terms
of NIH funding
(BlueRidge Ranking)

\$11.2

Million Awarded
in Grant Funding

83

Department
Publications

Publications Authorship:

104

Faculty/Adjunct Faculty

42

Postdoctoral Fellow

51

Student

41

Staff

75

Invited Presentations/
Seminars Delivered

32

Local/Regional

21

National

12

International

SPECIAL EVENTS

FRANK LOW RESEARCH DAY WINNERS

Best Graduate Student Poster:

- **Danielle Germundson** – “Involvement of histamine in depression-like behavior in a mouse model of non-anaphylactic cow’s milk allergy”
(co-authors Kumi Nagamoto-Combs)

Best Poster

- **Dilini Ekanayake** – “Food allergy increases a specific subset of B cells in mouse brain”
(co-authors Suba Nookala, Kumi Nagamoto-Combs)

Honorable Mention

Best Post-Doc Poster:

- **Afrina Brishti** – “Continuous allergen consumption sustains neuroinflammation and alters behavior in a mouse model of food allergy”
(co-authors Danielle L. Germundson, Angela E. Kearny, Kumi Nagamoto-Combs)

Honorable Mention

Best Undergraduate Poster:

- **Odele K. Rajpathy** – “Vil-Cre specific Slfn3KO mice exhibit sex-specific differences in lung, stomach, cecum, and proximal colon differentiation markers and Slfn family members expression levels”
(co-authors Emilie E. Vomhof-DeKrey, Elizabeth Pressler, and Marc D. Basson)

Best Poster

- **Ronak Kumar** – “Investigating food-allergy-induced chronic intestinal inflammation for its etiologic potential in a mouse model of Alzheimer’s disease”
(co-authors Afrina Brishti, Angela E. Kearny, Kumi Nagamoto-Combs)

Honorable Mention



SCHOOL OF MEDICINE & HEALTH SCIENCES TEACHING AWARDS:

Peer Teaching Award

Emily Hao

Dr. Philip H. Woutat Memorial Scholarship Award

Emily Hao

Outstanding Unified Session Instructor Award (Unified Session 4)

Portrait Award – Patrick Carr, Ph.D.

Golden Apple Awards

Nominated by Freshman Students: Jane Dunlevy, Ph.D.

Nominated by Class of 2026: Patrick Carr, Ph.D.

Outstanding Unit 4 Instructor Award

(Given by the medical class of 2025)

Chernet Tessema, Ph.D.

Outstanding Unit 2 Instructor

John Shabb, Ph.D.

Outstanding Unit 1 Instructor (Class of 2026)

Jane Dunlevy, Ph.D.

UND FOUNDER’S DAY HONORS/AWARDS

- **Min Wu**, Professor – Retirement
- **Margaret Smith**, Research Specialist – Retirement

HOST-PATHOGEN INTERACTIONS COBRE SYMPOSIUM POSTER WINNERS



Best Poster Presentation

- Geetika Verma – Post Doc Winner
- Dawn Cleveland – Grand Student Winner

Data Blitz

- Bijayani Sahu – Post Doc Winner
- Danielle Germundson-Hermanson – Grand Student Winner

SEVENTH ANNUAL HOST-PATHOGEN INTERACTIONS VIRTUAL SYMPOSIUM

On Tuesday, October 4, 2022, the Center for Biomedical Research Excellence (COBRE) for Host-Pathogen Interactions invited researchers and clinicians interested in infection, immunity, and inflammation to participate in the Seventh Annual Host-Pathogen COBRE Symposium. Both oral and poster presentations from local investigators were featured.

The Symposium aims to promote interaction and collaboration among researchers in the area and to provide opportunities to learn about cutting-edge tools, approaches, and resources to advance their research in broad areas of infection and inflammation.

Speakers

- Cathryn Nagler, Ph.D.
Bunning Family Professor in Biological Sciences Division,
The University of Chicago Pritzker School of Molecular
Engineering and The College
- Steven Varga, Ph.D.
Professor of Microbiology and Immunology,
University of Iowa Carver College of Medicine

BIOMEDICAL SCIENCES IN THE NEWS

Headlines featured on the Biomedical Sciences News Page in 2022:

- Nobel Laureate Dr. James P. Allison delivers seminar to Department of Biomedical Sciences
- New \$1.6 Million R01 Grant for Catherine Brissette
- Tim Casselli Awarded \$70,500 NIH Grant
- Nagamoto-Combs Awarded \$1.8 Million NIH Grant
- 5-Year Renewal of INMED NEUROscience Project



GUEST SPEAKER SEMINARS

January 26

Adam Scheidegger

Senior Design Engineer

Ginkgo Bioworks, Boston, Mass.

"Adventures in Industry: Targeting transcription and trying to grow everything"

Sponsored by the Epigenetics COBRE

February 23

James Allison

2017 Nobel Laureate

University of Texas MD Anderson Cancer Center

"Immune Checkpoint Blockade in Cancer Therapy: New insights into therapeutic mechanisms"

May 25

Erin Garcia

Assistant Professor

Department of Microbiology, Immunology & Molecular Genetics,
University of Kentucky

Sponsored by the Host-Pathogen COBRE



September 21

Maria Cristina Gambetta

Assistant Professor

Center for Integrative Genomics,
Université de Lausanne, Switzerland

"Wiring Regulatory Elements to their Target Genes in 3D"

Sponsored by the Epigenetics COBRE



November 2

Dr. Binglin Sui

Assistant Professor

Department of Chemistry, University of North Dakota

"Polymer-Based Smart Nanomedicine for Cancer Treatment"

November 30

Dr. Alan Underhill

Associate Professor

Department of Oncology, University of Alberta

"Preferred Protein Clients in Heterochromatin Condensates"

December 14

Edward Schmidt

Professor

Department of Microbiology & Cell Biology, Montana State University

"How Liver Sulfur Amino Acid Metabolism is Rewired to Survive Oxidative Stress"

BIOMEDICAL SCIENCES DEPARTMENT

2022 DISSERTATION DEFENSES



Sayem Bhuiyan

Advisor: Alexei Tulin, Ph.D.

April 21

"The Discovery and Investigation of Jig: A previously uncharacterized novel Drosophila melanogaster protein."



Jason Power

Advisor: Van Doze, Ph.D.

November 28

"The Effects on the Alpha1A Adrenergic Receptor in Modulating Psychiatric Symptoms"



Zahra Afghah

Advisor: Jonathan Geiger, Ph.D.

April 29

"Role of Aurora kinase A, Rab4a, and endolysosomes in the development of Alzheimer's disease-like pathology."



Sema Oncel

Advisor: Marc Basson, M.D., Ph.D.

November 30

"Effects of Small Molecule FAK Activators on Gastrointestinal Mucosal Healing"



Betsy Young

Advisors: Drs. Matthew Nilles, Ph.D.

July 21

"Translocation of Yops by Yersinia Pestis into Canine Cell Lines"



Sattya Talukdar

Advisor: Masfique Mehedi, Ph.D.

December 2

"RSV-induced actin modulation: contributes to bronchial wall thickening; does not induce EMT, and is CDC42-assisted"



Christopher Brown

Advisor: James Foster, Ph.D.

October 13

"Modulation of Monoamine Transporters by Palmitoylation in Human Health and Disease."



CONGRATULATIONS TO ALL 2022 BIOMEDICAL SCIENCES GRADUATES!



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