The IDEa Program in North Dakota

The IDEa (Institutional Development Award) program has been instrumental in developing the scientific infrastructure necessary to provide statewide medical networks within ND that both serve the citizens of our state and contribute to the Nation’s global competitiveness. North Dakota has successfully utilized the IDEa program to grow strong, multi-institutional and interdisciplinary initiatives in biomedical and neurodegenerative research that leverage the resources that the state receives and takes advantage of the talented researchers across the state.

Communities within North Dakota have American Indian populations that suffer from health disparities. IDEa programs have increased the pipeline for minority and rural students within those arenas to enter medical careers.

The major components of IDEa in ND are the COBRE awards: Epigenomics of Development and Disease, Center for Protease Research, Center for Visual and Cognitive Neuroscience, and Pathophysiological Signaling in Neurodegenerative Disorders; and the North Dakota INBRE program. These programs provide a highly collaborative infrastructure of resources that are positioned to develop and more tightly link statewide multi-institutional networks in competitive research centers that strive to include traditionally under-represented groups.

**North Dakota COBRE (Centers of Biomedical Research Excellence):**

**Epigenomics of Development and Disease**
- Provides direct research project support for junior investigators working in RNA polymerase II pausing during developmental fate decisions, chromatin remodeling during tumor initiation and progression with an emphasis on epithelial to mesenchymal transition, neuroepigenetics, and trans-generational inheritance of epigenetic modifications.
- Supports an Epigenetics Bioinformatics Core Facility that provides researchers with access to advanced–omics platforms such as next-generation sequencing and state of the art bioinformatics/computational resources.
- Advances epigenetics research and career development via mentoring programs for junior investigators, pilot grant funding, an annual epigenetics symposium, research training and workshops, and a seminar series to bring nationally and internationally recognized experts to North Dakota.
- Investigators from three different University of North Dakota colleges support the Center. Other participants include a ND PUI (principally undergraduate institution) and the USDA Human Nutrition Research Lab.

**Center for Protease Research**
- Novel therapeutics that have the potential to treat the deadly and debilitating diseases of cancer, arthritis, autoimmune diseases, diabetes, and asthma are being investigated.
- Broad-based research programs to provide fundamental information on how proteases (key biological players) impact these diseases through the study of the biological role played by matrix metalloproteinases and histone deacetylases.
- Nine investigators from three different North Dakota State University colleges support the Center.
- Two central Core Facilities in biology and synthesis have been established.
- Outreach activities include workshops for faculty and students and a summer research program for undergraduates.

**Center for Visual and Cognitive Neuroscience**
- The center provides access to many advanced visual and cognitive resources to students, faculty, neuroscience researchers in the region, and COBRE investigators in other IDEa states.
- Five core facilities: 1) Driving Simulator Core (DSC) permits the collection of several performance measures; 2) High-Density Electroencephalography (EEG)/Neurostimulation Core (EEGC) applies geophysics techniques to make accurate inferences concerning the intracranial location of the generators of the voltages recorded at the scalp; 3) Electro-Optical Instrumentation Core (EOIC) consists of a collection of instruments required for the evaluation, design, and/or fabrication of custom electronic and mechanical devices, and/or for the routine measurement and calibration of visual, auditory, and haptic displays, and response collection devices; 4) Eyetracking Core is collection of 11 eyetracking devices that facilitates

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researchers’ ability to conduct cognitive, psychophysical and electrophysiological research; 5) Immersive Virtual Reality Core (IVRC) provides researchers with an immersive virtual reality (VR) facility with which to study social, cognitive, and visual processing, as well as audiovisual and visuo-haptic multisensory integration.

- Investigators from three different North Dakota State University colleges support the Center. The internal advisor for the project is from the University of North Dakota.

Pathophysiological Signaling in Neurodegenerative Disorders

- Probes deep into the microscopic and submicroscopic realm to answer questions about neurodegenerative diseases that loom large in health care, diseases such as Alzheimer’s and Parkinson’s disease, neurological complications associated with HIV-1 infection, multiple sclerosis and seizure disorders. Causes of these diseases are complex so the center’s team of investigators is drawn from all the medical research disciplines at UND’s School of Medicine and Health Sciences. Translating their discoveries into treatments—“from lab bench to bedside”—is a crucial part of the work.

- Two core facilities: 1) the Mass Spectrometry Center, where researchers use instruments to measure with great precision and accuracy small molecular weight compounds that might play roles in the pathogenesis of neurodegenerative disorders, and 2) the Edward C. Carlson Imaging and Image Analysis Core Facility, where investigators use a variety of light and electron microscopes to visualize pathological features of the diseases, were initiated under this COBRE.

North Dakota INBRE (IDeA Network for Biomedical Research Excellence):

- ND INBRE has coordinated an undergraduate research experience for over 400 undergraduate students. Over 600 posters and 100 peer reviewed papers and student projects have been generated. Combined with other ND INBRE programs located at Primarily Undergraduate Institutions (Minot State University, Dickinson State University, Valley City State University, Mayville State University) and two of the state’s five Tribal Colleges (Cankdeska Cikana Community College (CCCC) and Turtle Mountain Community College (TMCC)), ND INBRE is central to providing research experiences to well over 100 undergraduate students on a yearly basis.

- ND INBRE is committed to the development of the pipeline for the future generations of American Indian Health Professionals:
  - In 2013, Dr. Jacque Gray was awarded, following initial assistance from ND INBRE, the Seven Generations Center of Excellence in Native American Behavioral Health. This $3.5 million program has provided additional summer and academic year research and training opportunities to American Indian students at all colleges and universities in North Dakota.
  - In 2014, Dr. Cynthia Lindquist at CCCC (Fort Totten, ND) was awarded a Native American Research Center for Health (NARCH). This $2.4 million award, modeled on ND INBRE, now provides both summer and academic year research programs at each of the state’s five Tribal Colleges. Noteworthy is that support at each Tribal College is double what ND INBRE was previously able to offer. The ND INBRE continues to provide mentoring, capacity building and core facilities to this program and the ND INBRE PI is the program coordinator for the NARCH.

- ND INBRE impacts the K-12 initiative in STEM education by supporting the Science and Engineering Fair program at the local, regional and state level through registration fee payments to ensure that all students wishing to participate, can participate.

Funding

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<tr>
<th>Program</th>
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