Unlocking the Genome

Nearly every human ailment has some basis in our genes.

Using data from human DNA, scientists and clinicians have many more powerful ways to study the role genetic factors play in complex illnesses, such as cancer, diabetes, and heart disease. Genomics can be used to solve many problems, and the genomic research at Northwestern just keeps getting better.

Northwestern’s state-of-the-art Genomics Core Facility originally resided inside two spaces on the Chicago campus—one in the Montgomery Ward Building and the other in the Tarry Building. Last year both spaces came together into a single laboratory in Tarry specifically designed to support genomics research. That space is sectioned into compartments to separate experiments.

“Before, we had two open floor plan labs in two different buildings and the experiments were done in two different locations,” says Nadereh Jafari, director of the facility. “Now most of our experiments and protocols are performed in separated areas in one large laboratory. This format minimizes the potential for impurities and increases quality. Having all of our core equipment in one location has increased staff cross training and communications.”

The quality is so high, in fact, that the core’s DNA extraction service recently received accreditation from the College of American Pathologists (CAP). With this accreditation, Genomics Core Facility joined an elite group of internationally recognized facilities that meet the highest standards in laboratory practices.

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The core serves approximately 260 principal investigators from both Northwestern campuses and outside institutions. "Being located right on campus allows investigators to drop their samples at any time and easily discuss their projects during working hours," Jafari says. "We offer the Northwestern investigators our experience, recommendations, and access to new technologies."

The Genomics Core has played a critical role in supporting a number of large studies. One example is the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study led by Boyd Metzger and William Lowe, both medicine: endocrinology. As part of the HAPO Study, the Genomics core extracted DNA from 25,000 samples recruited from 15 different field centers around the world. These DNA samples have provided critical infrastructure for a number of NIH grants examining genetic variants that impact maternal metabolism during pregnancy and fetal growth and adiposity. Currently, the Genomics Core is preparing DNA from 14,000 HAPO mothers and their HAPO children in a new NIH-funded follow-up study of the original HAPO Study.

Another ongoing collaboration at the core is a large methylation analysis on thousands of samples for Lifang Hou, preventive medicine, at the Lurie Cancer Center. This large study includes samples from different cohorts like Women’s Health Initiative clinical trial and MOBILIZE Boston, a cohort that studies the associations between particulate matter air pollution, DNA methylation, and cardiovascular disease.

The core has closely worked with different departments in Evanston campus as well, including the Physical Sciences-Oncology Center (PS-OC) and Proteomics Center for Excellence.

The Genomics Core has also worked with Northwestern student groups, including the award-winning International Genetically Engineered Machines (iGEM) synthetic biology team. In the last two years the team won a gold and a silver medal at the 2012 and 2013 iGEM Jamboree.

Housing an Ion Torrent (PGM), an Ion Proton system, a 3730 DNA sequencer, a Sequenom MassArray and an Illumina iScan enables the core to provide services for high, medium, and low throughput genome sequencing, genotyping, methylation and expression profiling, Ampliseq technology, and custom and fixed cancer panels.

In the next few months the Genomics core will roll out a new application to be used for Sanger sequencing. The core will begin using a GeneSifter Lab Edition system for traditional sequencing. This replaces the Corefac and will simplify the sample-submission process.

"The genomics-related technologies and industry moves very fast, but we work hard to stay on top of new advances in this field and provide the related services to our research community," Jafari says. "Our goal is to provide our investigators access to new instrumentation and technologies so that they can excel in their research."

The Genomics Core Facility is a part of Northwestern’s Center for Genetic Medicine. For more information about the core, visit www.cgm.northwestern.edu/cores/genomics/index.html.