



CHEMISTRY OF LIFE PROCESSES INSTITUTE

Northwestern University's Chemistry of Life Processes Institute (CLP) is spearheading the greatest wave of biomedical innovation since the Human Genome Project opened the door for individualized medicine two decades ago. Known as proteomics, this fast-growing field identifies and measures proteins and their various forms (proteoforms) that link genes and disease in order to diagnose and treat threats to human health.

UNLOCKING THE POWER OF PROTEINS

Proteins are found throughout our bodies. When something goes wrong and we develop cancer, heart disease, Alzheimer's, and other disorders, the problem is almost always manifested through proteins. Despite their pivotal role, 99.9% of the body's proteoforms remain undiscovered. This lack of information about proteins limits progress in detecting and treating disease. CLP is uniquely equipped to close this gap by detecting and measuring "unknown" proteins with speed and accuracy.

PROTEOMICS USHERS IN A NEW ERA OF PERSONALIZED MEDICINE

Proteomics is poised to become the next genomics by 2030. At the head of the field, CLP houses the premier center for proteomics under the leadership of Neil Kelleher. Leveraging an unsurpassed capability to analyze proteins, the Institute is ready to launch the next era of precision medicine by:

- ✓ Discovering the changes in proteoforms that underlie disease
- ✓ Creating sensitive diagnostics to catch disease early
- ✓ Identifying new targets for drug development and delivery

The Institute has developed a series of **Convergence Research Initiatives**, which bring together teams of Northwestern chemists, life scientists, and engineers, with clinicians in Northwestern's Feinberg School of Medicine (FSM), to provide a holistic approach to critical clinical problems that stretch from the lab bench to the patient bedside. Working together, these teams are transforming how we diagnose, treat and, someday, cure devastating diseases that have eluded effective treatments, such as liver and pancreatic cancers, and Alzheimer's disease and amyotrophic lateral sclerosis (ALS)

PROTEIN-INFORMED DISCOVERIES DELIVER GAME-CHANGING RESULTS

Today's efforts build on a legacy of developing life-changing treatments. CLP is the home of Lyrica®, a blockbuster drug that has helped millions of patients manage fibromyalgia, seizures and nerve pain. The Institute is already demonstrating the potential of proteomics to address compelling medical needs. Protein-informed discoveries made by convergence research teams include:

- A first-ever therapy, now in pre-clinical studies for potential treatment of ALS
- A compound that shows promise against Alzheimer's and Parkinson's disease
- New drugs targeting proteins involved in liver and pancreatic cancers
- Isolation of the proteins that protect against heart disease
- Identification of a protein signature in blood that signals the onset of liver transplant rejection

ACCELERATING TEAM SCIENCE

The Institute's Convergence Initiatives propel CLP towards clinical impact by enabling team members to jointly conceptualize how protein-based discovery can be applied to unresolved medical challenges. For example:

Multidisciplinary push toward treatment of ALS

- A CLP-paired chemist and neurologist identified the first drug-like compound to improve the health of upper neurons, the movement-initiating nerve cells in the brain.
- NU-9 was invented based on chemistry findings that showed how some protein behaviors are toxic to the upper motor neurons, which leads to degeneration of nerve cells in people with ALS.

Using proteoform signatures in blood to predict organ transplant rejection

- CLP partnered with FSM transplant surgeons to leverage proteoform and organ transplant expertise to identify a panel of clinically significant proteoforms in immune cells.
- They found that these proteoform indicators may help liver specialists identify patients in early stages of transplant rejection and enable fine-tuning of rejection-blocking medications.

To support the Chemistry of Life Processes Institute, please contact

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GALVANIZING OUR BOLD PLAN

CLP has set aggressive goals to conquer diseases that have a compelling clinical need.

In the next two years, CLP will address two devastating neurodegenerative diseases: Alzheimer's and ALS. Building on its success advanced proteomic platforms, CLP will identify accurate biomarkers for both diseases to create new diagnostics and standards for assessing potential therapies. In addition, CLP will work with neurologists to identify more precise targets that might potential treatment.

Over the next five years, CLP will expand its focus to include on kidney disease, transplant rejection and prostate cancer.

CREATING A HEALTHIER WORLD TOGETHER

CLP's continued progress in proteomics offers hope to the millions of people living with disease. Funding is critical to carrying out the Institute's bold, five-year plan to conquer diseases of the brain and heart, cancer and other threats to societal health.

MAJOR GIFTS SUSTAIN THE CLP MISSION

- Increase the pace of proteomics technology development
- Enable testing of blue-sky ideas to produce preliminary data needed to obtain federal and foundation funding
- Expand CLP's ability to apply proteomics approaches to multiple diseases
- Draw national attention to the critical need for proteomic research
- Support access to interdisciplinary research training for a diverse cohort of undergraduate and graduate students who represent the next generation of scientific leaders

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