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EMSL In Brief

Environmental Molecular Sciences Laboratory

EMSL Mass Spectrometers Aid Neurodegenerative Disease Studies

Use of state-of-the-art mass spectrometry capabilities housed at the Environmental Molecular Sciences Laboratory (EMSL) have allowed researchers from the Pacific Northwest National Laboratory and their collaborators to research the precise connection between oxidative stress—cell damage caused during metabolism when the oxygen in the body assumes ever more chemically reactive forms—and neurodegenerative diseases such as Parkinson's, Alzheimer's, and Lou Gehrig's diseases.



EMSL mass spectrometry capabilities provided unprecedented sensitivity that researchers needed to study the connection between cellular oxidative stress and devastating neurodegenerative diseases.

The instrumentation, which provides protein identification and separation with unprecedented sensitivity, allowed the researchers from PNNL and the University of California-Los Angeles' David Geffen School of Medicine to conduct this important study based on the largest and most detailed proteomic analysis of a mammalian brain generated to date—nearly 8,000 different, detectable proteins in the brain of a mouse. Results of the study suggest that many neurodegenerative diseases leave the biomarker nitrotyrosine, which could be used to predict the earliest stage of brain impairment and perhaps lead to detection of disease states before symptoms occur.

“This study demonstrates the sensitivity to define endogenous levels of protein nitration as well as to identify the proteins and the precise sites of modification within each protein in the young, healthy animal,” said Diana Bigelow, one of the primary researchers involved in the study. “With the exquisite sensitivity afforded by EMSL’s mass spectrometry capabilities, we can expect to be able to detect changes at early stages of the progression of disease—as opposed to existing technologies that are limited to examination of the late stages of these chronic pathologies.”

The researchers, who are funded by the National Institutes of Health and PNNL, will continue their study using tissues with neurodegenerative diseases. This research is described in detail in *Biochemistry* [45(26):8009-8022].

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