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Department of Chemistry

Student Seminar Series

9:45 a.m. Tuesday, April 9, 2013 • 331 Smith Hall

Professor

Lingjun Li

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Department of Chemistry
University of Wisconsin-Madison

Probing Neurochemical Signaling with a Multi-Faceted MS-Based Platform

Website:

<http://apps.pharmacy.wisc.edu/sopdir/70>

Abstract

All nervous systems employ a large number of amines, amino acids and neuropeptides as neurotransmitters and neuromodulators. Comprehensive characterization of all signaling molecules in a nervous system with chemical, spatial and temporal information is often critical to deciphering the functionality of a neural circuit yet it presents a daunting challenge. We have chosen to work with a simpler and well-defined crustacean nervous system to both facilitate technology development and address fundamental neuroscience problems related to neuromodulation and network plasticity.

In this talk, I will present our progress on the development of a multi-faceted mass spectrometry-based analytical platform to probe neuronal signaling with enhanced sensitivity and selectivity. By combining chemical labeling, micro-scale separation, and tandem mass spectrometry sequencing techniques, we have discovered a large number of novel neuropeptides in crustacean nervous systems. Moreover, both mass spectrometric imaging technology and in vivo microdialysis sampling tools have been developed and implemented to follow neuropeptide distribution and secretion with unprecedented details. Furthermore, isotopic and novel tandem mass tagging reagents based on dimethylated amino acids have been developed and employed to produce differential display of neuropeptidomes under different physiological conditions. The novel use of ion mobility mass spectrometry to improve peptide identification and quantitation will be discussed as well. While the technology is developed using crustacean model system as a test-bed, we also extend such multi-faceted MS platform to biomarker discovery in various neurological disorders. Several on-going efforts and future perspectives will be highlighted.

Lingjun Li is a professor of Pharmaceutical Sciences and Chemistry at the University of Wisconsin-Madison.



Li received her Bachelor of Engineering degree in Environmental Analytical Chemistry from Beijing University of Technology, China and her doctorate in Analytical Chemistry/Biomolecular Chemistry from the University of Illinois at Urbana-Champaign (UIUC) in 2000 under the supervision of Professor Jonathan Sweedler. She then did a three-way postdoctoral research at the Pacific Northwest National Laboratory, Brandeis University, and the University of Illinois before starting her independent career at the University of Wisconsin in December 2002.

Professor Li has established a highly productive research program and published more than 140 peer-reviewed research journal papers. She has been recognized with numerous awards, including the National Science Foundation CAREER Award, Alfred P. Sloan Foundation Research Fellowship, American Society for Mass Spectrometry (ASMS) Research Award, H.I. Romnes Faculty Fellowship, and 2011 Pittsburgh Conference Achievement Award.

She has served on the American Society for Mass Spectrometry Education Committee during 2010-2012. She also served on the Board of Directors of the Chinese American Society for Mass Spectrometry (CASMS) since 2010 and is the president-elect in 2013.

Her research interest is focused on the development of novel mass spectrometry (MS)-based tools including new chemical labeling strategies, microscale separations, microdialysis and imaging MS for functional discovery of neuropeptides and protein biomarkers in neurodegenerative diseases.

Host:
Amy Hogerton