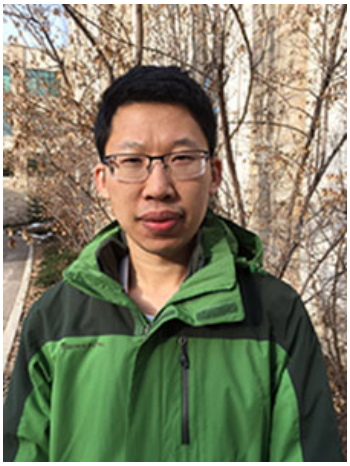
DEPARTMENT OF CHEMISTRY
Seminar Series

MARCH 9, 2018 - 12:00 Noon, H313

Global protein-chemical interactions: a key step towards assessing health risks of environmental chemicals



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ABSTRACT: Environmental matrices are incredibly complex mixtures of thousands of known and unknown chemicals. Assessing the risks of these mixtures is extremely challenging to traditional single-chemical risk assessment strategies. These challenges include an inability to cope with the immense number of unknown environmental chemicals and the limited information acquired regarding mechanisms of toxicity (i.e. protein targets). Thus, a shift from current investigatory practices is in urgent need to address the realities of environmental mixtures. My research combines techniques from the fields of chemistry and biology to investigate environmental chemical-protein interactions at chemical- and proteome-wide level. Herein, two case studies will be presented to underscore the impacts of chemical-protein interactions towards understanding the toxic mechanisms of environmental chemicals. Our first study focuses on natural brominated compounds and corresponding biosynthesis marine bacteria. Utilizing our chemical proteomics strategies, we identified FabI as the primary target of the antibacterial compound 6-OH-BDE-47. The identified toxic pathway was further elucidated as an adaption strategy of brominated compound synthesizing marine bacteria. In the second case study, we investigated the toxic mechanisms of oxidative stress induced by drinking water disinfection by-products (DBPs). Following our initial chemical proteomics investigations, we discovered that global protein alkylation was the primary toxic mechanism. Subsequently, we developed a biotinylated chemical probe to identify toxic DBPs components from real drinking water samples. These case studies showcase the potential to investigate environmental chemical-protein interactions for a more complete understanding of the risks posed by environmental chemical exposure.

BRIEF BIO: Prof. Peng is a new faculty member starting his independent research career in the Department of Chemistry and the School of the Environment, at the University of Toronto. Trained as an environmental scientist, Dr. Peng's research is in the fields of environmental chemistry and toxicology, with a focus on determining the environmental occurrence of pollutants and their potential health and ecological risks. His current focal interest is in the development of novel chemistry and biology techniques to pursue three research directions: untargeted identification of novel environmental chemicals; unbiased identification of protein targets by chemical proteomics; and development of high-throughput screening platform to assess toxicities of environmental chemicals.