

High sensitivity proteomic and glycomic profiling of limited samples using electric field- and pressure-driven ultra-low flow separations coupled to mass spectrometry.

Deep proteomic profiling of limited samples (e.g., rare cells, micro-needle biopsies, extracellular vesicles (EVs) isolated from minute volumes of physiological fluids, i.e., liquid biopsies, or even single cells) and especially, characterization of post-translational modifications, e.g., glycosylation, of such specimens have been a major challenge because of very low abundance and high heterogeneity in biological matrices. With the advent of more powerful separation techniques coupled to more sensitive, higher duty cycle mass spectrometers, analysis of such limited samples is getting more feasible. However, each step of the analytical workflow, including sample preparation, separation, interfacing with MS, MS data acquisition, and data analysis, requires additional advancements and flawless integration to enable deep proteomic profiling of such scarce samples. In this presentation, I will overview our recent studies where we investigated alternative approaches to enhance the sensitivity and depth of glycomic and proteomic profiling of several types of limited biological specimens in comparison to conventional techniques.

Alexander R. Ivanov, Ph.D.

Associate Professor, Department of Chemistry & Chemical Biology

Faculty Fellow, Barnett Institute of Chemical & Biological Analysis

Northeastern University

360 Huntington Avenue, 412TF

Boston, MA, 02115, USA

Phone: (617) 373-6549

E-mail: a.ivanov@neu.edu www.northeastern.edu/ivanov www.northeastern.edu/cos/faculty/alexander-ivanov



Short Biography:

Professor Ivanov is an expert in the area of mass spectrometry-based proteomic research. Prof. Ivanov earned his Ph.D. in Bioorganic Chemistry at the Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry of the Russian Academy of Science, Moscow in 2000. He conducted his postdoctoral training at Northeastern University prior to joining the Harvard School of Public Health (HSPH) at Harvard University in 2003, where he served as Director of the HSPH Proteomics Resource. Dr. Ivanov re-joined Northeastern as Research Associate Professor at the Barnett Institute of Chemical & Biological Analysis in 2011. He has been actively involved in national and international initiatives enabled under the umbrella of the ABRF to develop standards for proteomics

research and standardize proteomic practices. For his work in the field of high sensitivity proteomics of limited samples, Prof. Ivanov was recognized with an ASMS Research Award in 2015. In 2017, he took a position of Associate Professor at the Department of Chemistry & Chemical Biology and Faculty Fellow at the Barnett Institute.

Major Research Interests

Prof. Ivanov has a long-standing interest in developing and applying analytical technologies to answer challenging biomedical questions and generate new knowledge through enabling biological and clinical studies that could not be possible before. Prof. Ivanov's current research focuses on the following areas: (1) technology development to enable deep proteomic profiling of limited availability samples and individual single cells for basic biology studies and personalized medicine applications; (2) comprehensive characterization of protein isoforms, proteoforms, and modifications (e.g. post-translational modifications, chemical modifications, sequence variants, charge variants), including detailed characterization of biopharmaceuticals; (3) characterization of non-covalent protein-protein and protein-ligand interactions using advanced separation techniques coupled to mass spectrometry under native non-denaturing conditions; (4) circulating extracellular micro-vesicles as a potential resource for cell biology and cell communication studies, clinical diagnostics, drug discovery and vaccine development.