

## **Title: Advancing Research with Liquid Chromatography Mass Spectrometry (LC-MS): Establishing a State-of-the-Art Facility at Tampere University supported by the Research Council of Finland (FIRI 2024 – 2026)**

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### **Abstract**

With the support of the Research Council of Finland, the Environmental Health Research Group has established a state-of-the-art liquid chromatography-tandem mass spectrometry (LC-MS) facility, creating various opportunities for cutting-edge research. LC-MS offers exceptional sensitivity and specificity, enabling multidimensional analysis of complex biological and environmental samples. Our research focuses on four major applications: (1) Analysis of pharmaceuticals in hospital and municipal wastewater. (2) Detection of organic persistent contaminants such as polyfluoroalkyl substances (PFAS) and pesticides in hospital and municipal wastewater. (3) Profiling of metabolites (Metabolomics) such as polar (amino acids and sugars) and apolar (lipids). (4) Analysis of protein (Proteomics). Our LC-MS enables the analysis of various samples in wastewater, urine, blood, tissue, and cells. We aim to identify biomarkers associated with exposure, diseases, or infections and generate a fingerprint database that can provide relevant information for further research and regulatory purposes. Our preliminary results show that the established LC-MS facility is robust and detects various substances, including pharmaceuticals (steroids, anti-inflammatories, antidepressants, antipsychotics, high blood pressure, psychoactive, and antibiotics), Perfluoroalkyl substances (PFAS) (PFOS, PFHxS, PFBS, PFOA, PFNA), and pesticides (mepiquat, Fenpropidin, maleic hydrazide) in wastewater, including the analysis of lipids (glycerophospholipid, glycerolipid, sphingolipid, and sterol lipid) and proteins involved in lipid metabolism, immune system, glycolysis, and cell adhesion. These outcomes demonstrate that our facility can analyze any sample type, emphasizing its importance in public health, environmental health, toxicology, precision medicine, and molecular biology. We invite collaboration from researchers and stakeholders interested in leveraging LC-MS technology to advance their research.