



Clinical mass spectrometry unit

A research infrastructure at the Clinical Research Laboratory at
Örebro University and Örebro University Hospital

Samira Salihovic, Associate Professor, Örebro University, Sub-unit leader

Jonas Appelberg, Deputy Director of Research and Education Örebro University Hospital, Unit-leader

About me



PhD in Analytical
Chemistry



UPPSALA
UNIVERSITET

Post-doctoral Fellow
in Molecular
Epidemiology



Colorado
State
University

Post-doctoral Fellow
in Environmental
Chemistry



Associate Senior
Lecturer in
Chemistry and now
lecturer

The background for our establishment

- In 2020, during the COVID-19 pandemic, the Clinical Research Laboratory applied for infrastructure investment funds to support research, including acute infection studies
- Funding was granted for the establishment of clinical massspectrometry unit
- Procurement efforts began at the end of 2021
- The infrastructure was installed in 2022
- Initial pilot projects were conducted during the first period
- The mass spectrometry infrastructure is now fully integrated into the Clinical Research Laboratory

Our current infrastructure

Sample handling robot



Liquid chromatography mass spectrometry



Staff in the unit

- We are currently 4 staff who are working in our sub unit at the Clinical Research Laboratory
 - Shared between Örebro University and Örebro University hospital
 - Collaborators and students every semester

Charlotta Ekblom, PhD



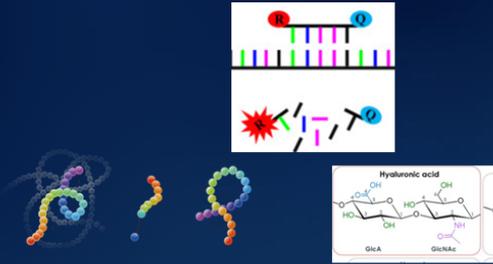
Tove Slettvoll, MsC



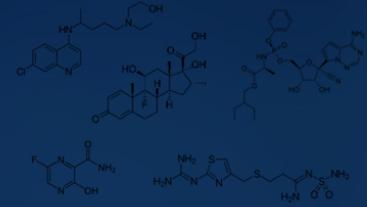
Maja Kullman, BsC



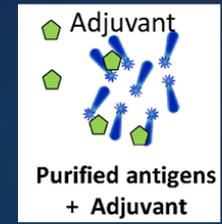
Research and development areas



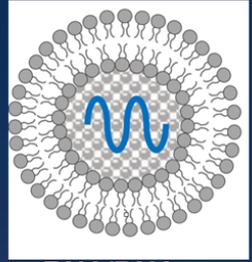
Oligonucleotides
Peptides
Glycans



Small Molecules
and Drugs



Protein Based
Vaccines



RNA/DNA



Biotherapeutics,
mAbs

Main approaches to study and measure molecules

Non-Targeted



Targeted





Non-targeted methodologies



Pros:

- Simultaneous measurements of 100-1000
 - Relies on mass-specific techniques such as mass spectrometry
- Analytical method for measuring the molecular weight of compounds
 - Unconditional - what is in the test?
 - Hypothesis generating

Cons:

- Relative concentrations
- Large amounts of data
- Not as sensitive as targeted
- Not as specific as targeted

Non-Targeted



Targeted methodologies

Pros:

- Simultaneous measurements of a predetermined list of metabolites
- Relies on mass-specific techniques such as mass spectrometry
 - Sensitive mass spectrometric technology
 - Selective and specific
 - Custom-made
 - Hypothesis testing

Cons:

- Molecules that are not targeted are not measured

Targeted



Our context



Explorative studies
Hypothesis generating
Non-targeted methods



National and international Infrastructure to run non-targeted analysis of proteins or metabolites are widely distributed

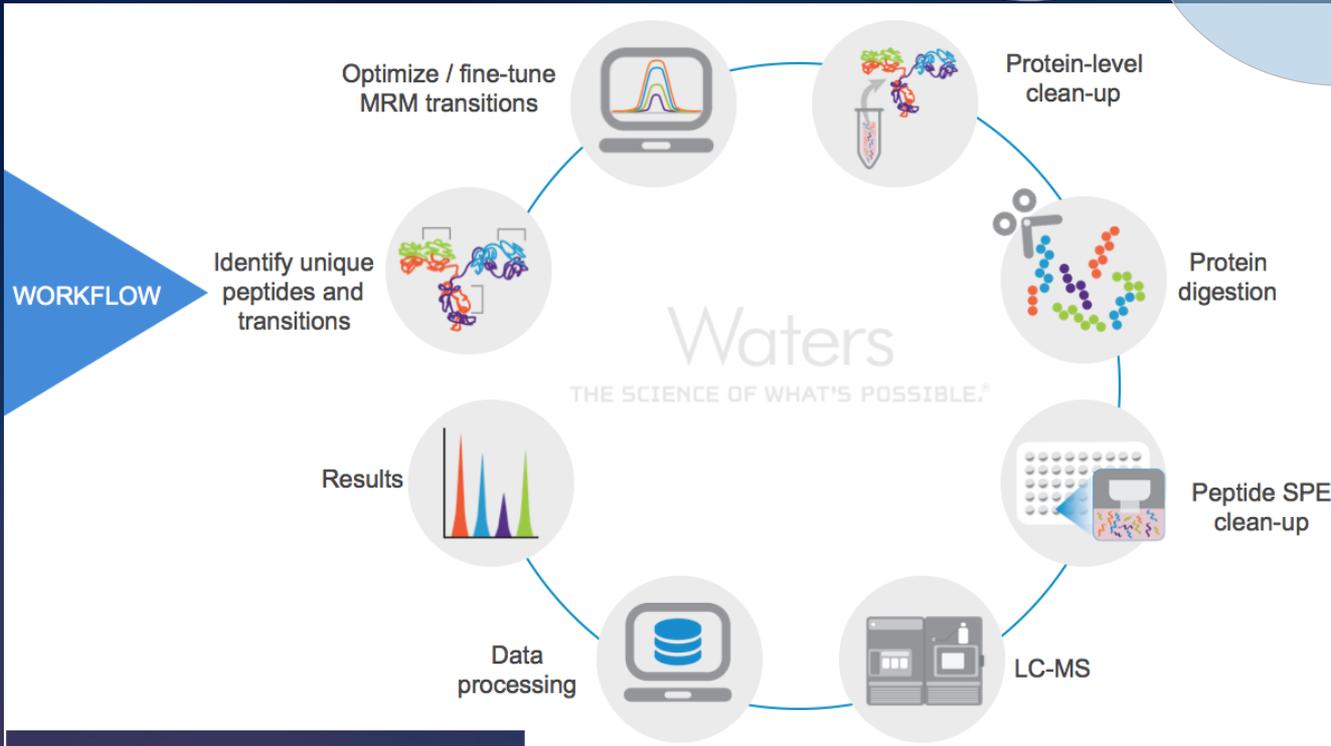


General methodology



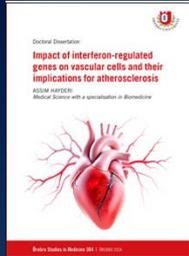
Targeted proteins

Targeted small molecules



Examples of projects

- Since 2023, several projects have been or are being processed at our unit
- Run as research projects with researcher involvement or as service



Collaboration with CVRC focusing on the neuropeptides proopiomelanocortins (POMCs) and glutaminase projects

- PhD thesis (Assim Hayderi)
- Manuscript

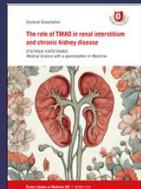
Collaboration with Endocrinology department regarding new Development of a High-Throughput 96-well Extraction and LC-MS/MS Method for Salivary Steroid Quantification
-Manuscript submitted

Installation of abs quant protein panel containing 125 human proteins. The panel is established by Clinical Proteomic Tumor Analysis Consortium (CPTAC)
-Ongoing development



Collaboration with Örebro University Hospital and Umeå University with a focus on the analytes COVID-19 and specialized pro-resolving mediators (SPMs)

- PhD theses (Frans Vincent, Tove Björnell)
- Manuscripts (Johan Normark, Alicia Edin, Sara Cajander)



Targeted analysis of microbiome derived molecules in projects related to CKD and CVD
-PhD thesis (Stefania Kapetanaki)
-Manuscript

Collaboration with Translational Gastroenterology unit with a focus on validating diagnostic markers using targeted methods
- Paper published

Concluding remarks

- Targeted mass spectrometry enables translational medical research and precision medicine, bridging exploratory/basic research and clinical applications
- Expanded international and national collaborations (**NEOLAIA**, bioMS, SciLife EMBL)
- Enhanced activity in life sciences and clinical research/innovation
- Supports pandemic preparedness and virology research
- Increased number and quality of publications



Thank you for attention! Questions?

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