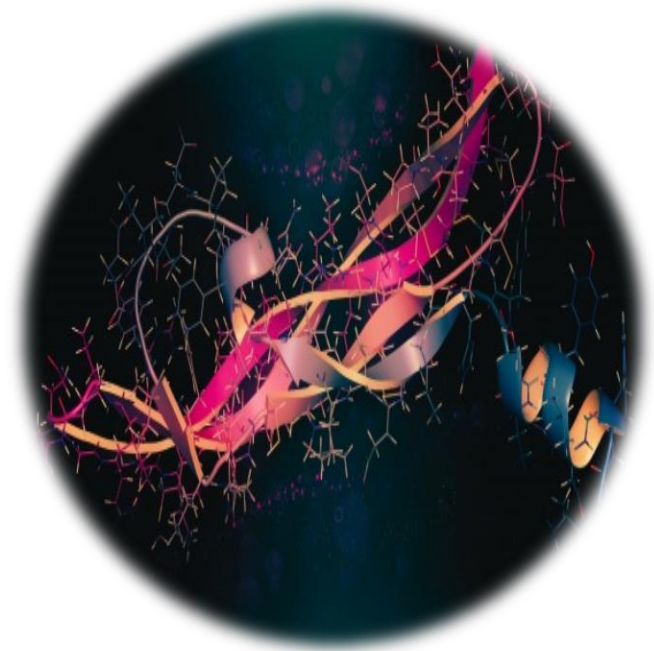


Beyond the Spotlight:

Navigating the Limits of Proteomic Analysis



Sureyya Ozcan

Korea-EU Horizon Europe Researchers
Networking Forum
03/07/2025

Middle East Technical University (METU)



5  **faculties**

currently enrolled students lie within **the 1% - 5%** of 2.000.000+ applicants

for more information:


5  **graduate schools**

for more information:


- Architecture
- Arts & Sciences
- Economics & Administrative Sciences
- Education
- Engineering

METU is the 1st university receiving ABET accreditation in Türkiye. All engineering programs have ABET accreditation.

- 3 Graduate School of Natural and Applied Sciences
- 10 Graduate School of Social Sciences
- 6 Graduate School of Informatics
- 10 Graduate School of Applied Mathematics
- 13 Institute of Marine Sciences

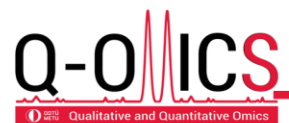
total undergraduate programs
 **ODTÜ METU**

42 total graduate programs

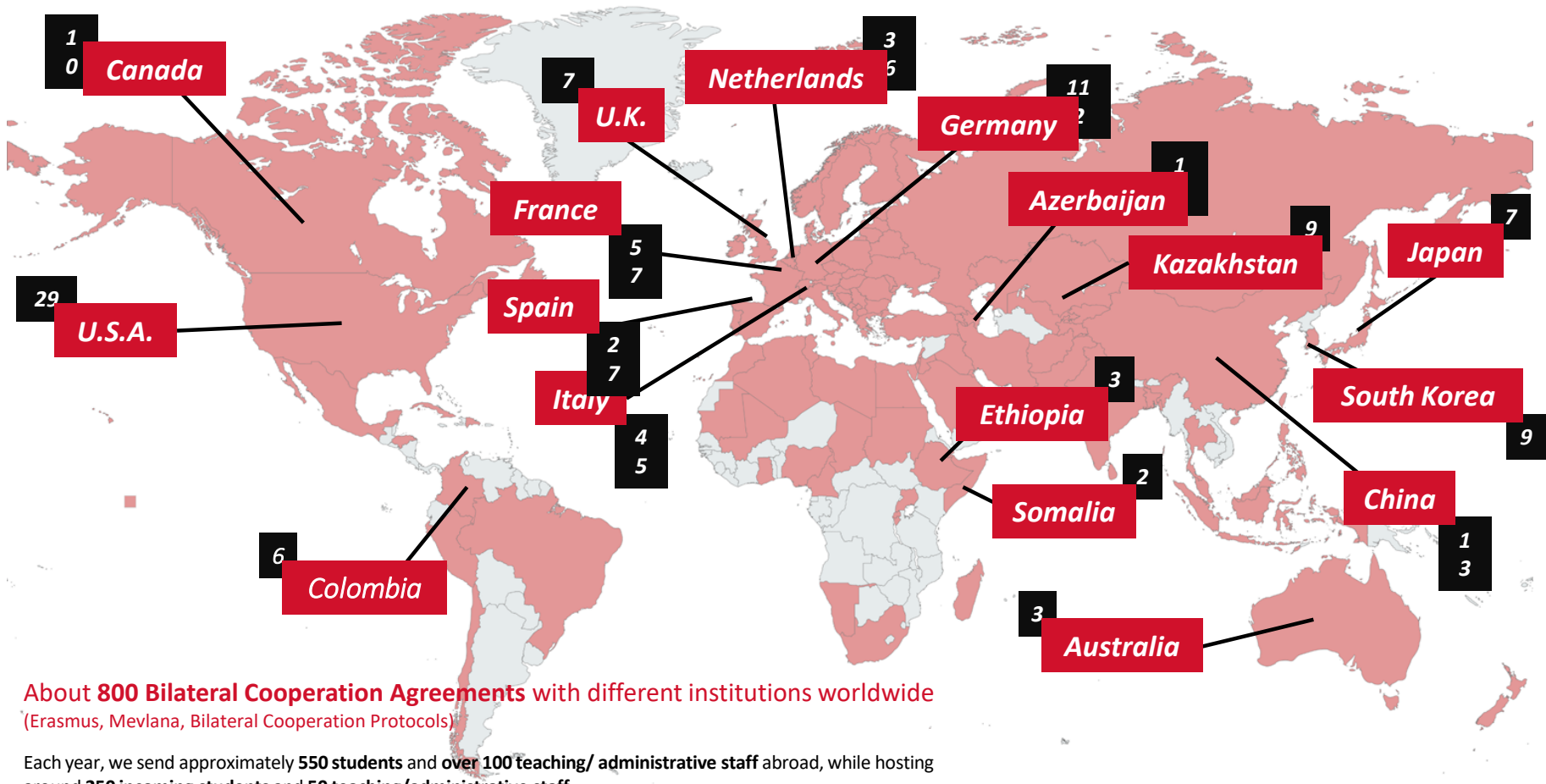
111



QS Europe: METU ranks 114th in Europe and first among Turkish universities



Middle East Technical University (METU)



About **800 Bilateral Cooperation Agreements** with different institutions worldwide
(Erasmus, Mevlana, Bilateral Cooperation Protocols)

Each year, we send approximately **550 students** and **over 100 teaching/ administrative staff** abroad, while hosting around **250 incoming students** and **50 teaching/administrative staff**
(an annual average of 1,000 participants in our mobility programs)

Created with mapchart.net



MIDDLE EAST TECHNICAL UNIVERSITY

Middle East Technical University (METU)

Horizon 2020

55 Projects

~18 M€ METU Budget

6 Coordinatorships

PRIMA Section I, MSCA & REA I&A

MSCA Co-fund –20 post doctoral researchers

Green & Blue Transition

Horizon Europe

37 Projects

~14.60 M€ METU Budget

<https://ufukavrupa.org.tr/tr/en-basarili-turk-arastirma-kuruluslari>

METU ranked 1st university in Horizon Europe with receiving the highest number of projects.



European Research Council

Established by the European Commission

*The ERC, set up by the European Union in 2007, is the **premier** European funding organisation for **excellent frontier research**. It funds creative researchers of any nationality and age, to run projects based across Europe.*

METU is the only public university in Türkiye with 6 European Research Council (ERC) projects.

Q-OmicS LAB

Qualitative and Quantitative Omics



University of Cambridge
(2013-2018) Research Associate

University of California,
Davis
(2008-2012) PhD



Gazi University
(2004) BSc Chemistry

Hacettepe University
(2008) MSc Food Engineering

The Scientific and Technological Council of
Turkiye TUBITAK (2004-2005) Researcher

Middle East Technical University
(2019-) Faculty



**ODTÜ
METU**



Chungnam National
University (2013)
Post-Doc



Q-OmicS LAB

Our vision is to become a global center of excellence in quantitative omics, driving innovation at the intersection of molecular biology, translational research and analytical science

Our mission is to develop standardized workflows that transform proteomics into a reliable platform for translational and systems-level research.

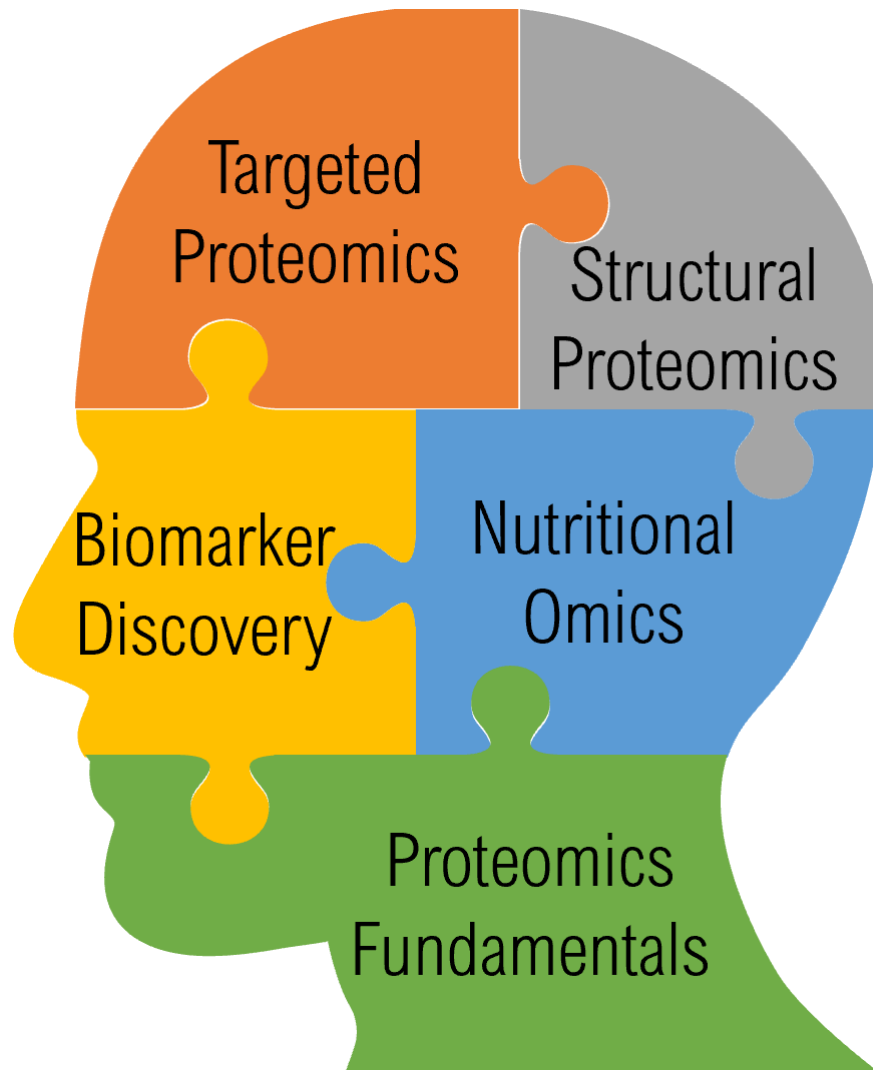
Keywords

- Analytical Chemistry
- Qualitative and Quantitative Analysis
- Mass Spectrometry
- Proteomics
- Clinical Research/Biomarker Discovery/Validation
- Glycomics
- Structural Proteomics

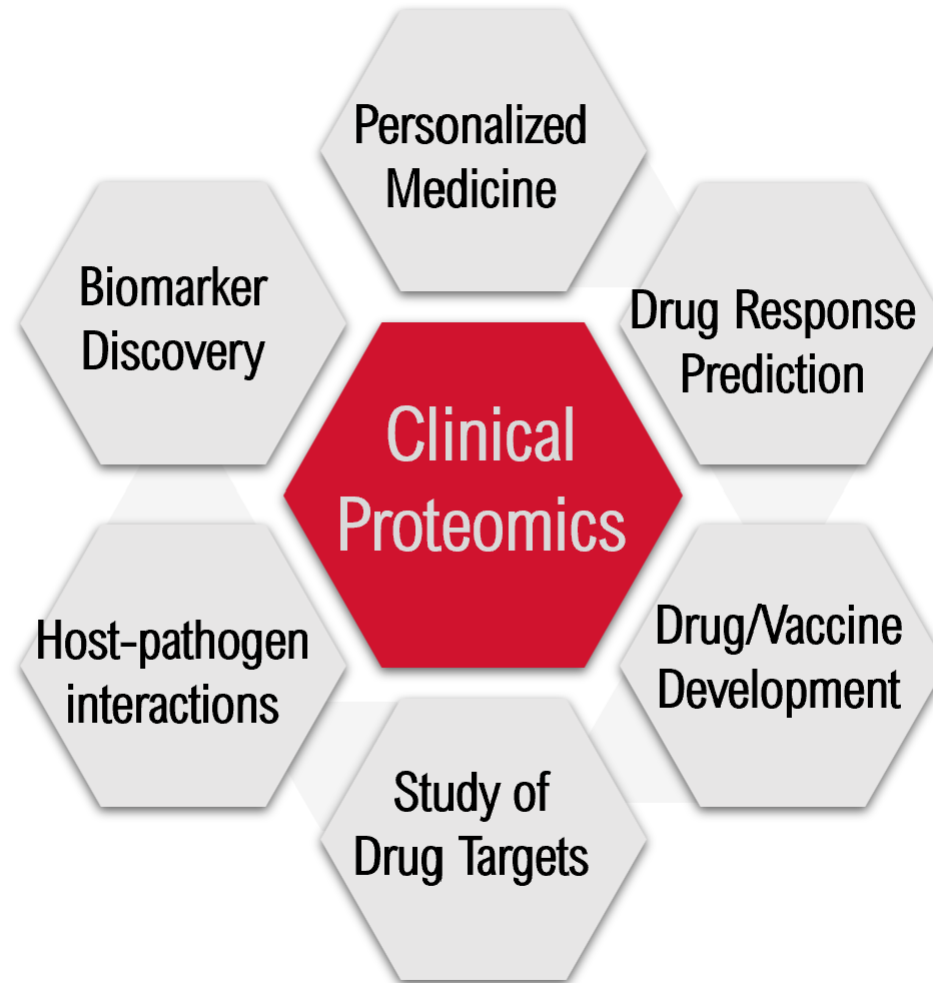


Q-OmicS LAB

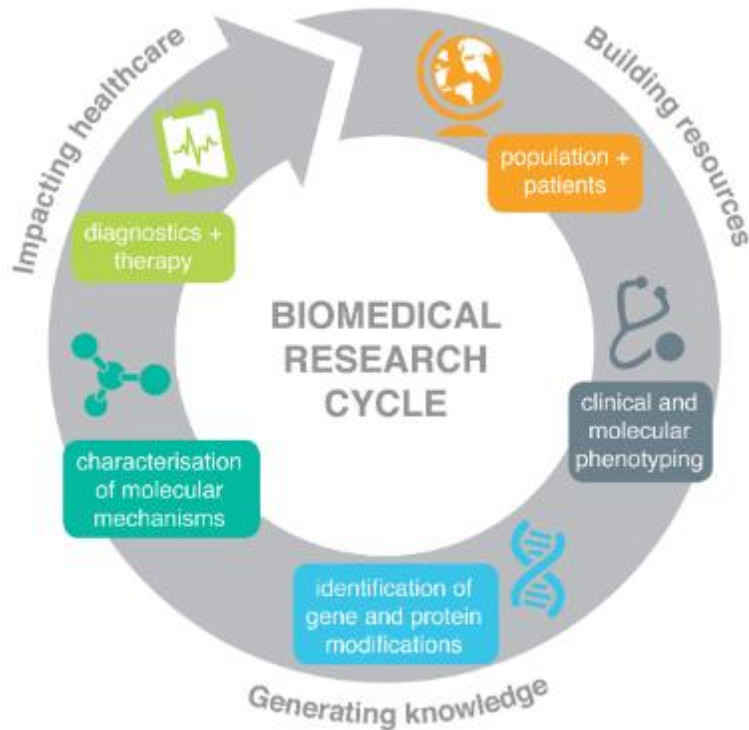
The Q-OmicS Lab turns analytical chemistry into a precision tool, using mass spectrometry to explore the proteome from discovery to validation—across disease, structure, and plant biology



Proteomics in Clinical Research



Proteomics in Clinical Research



Discover

Biomarkers, drug targets, treatments, side effects

Predict

Disease, mechanism, progression, drug response

Improve

Life, care efficiency and reduce cost

Research ➡ Biomarker ➡ Diagnostics

Biomarker Pipeline

Discovery phase

Identify biomarker candidates



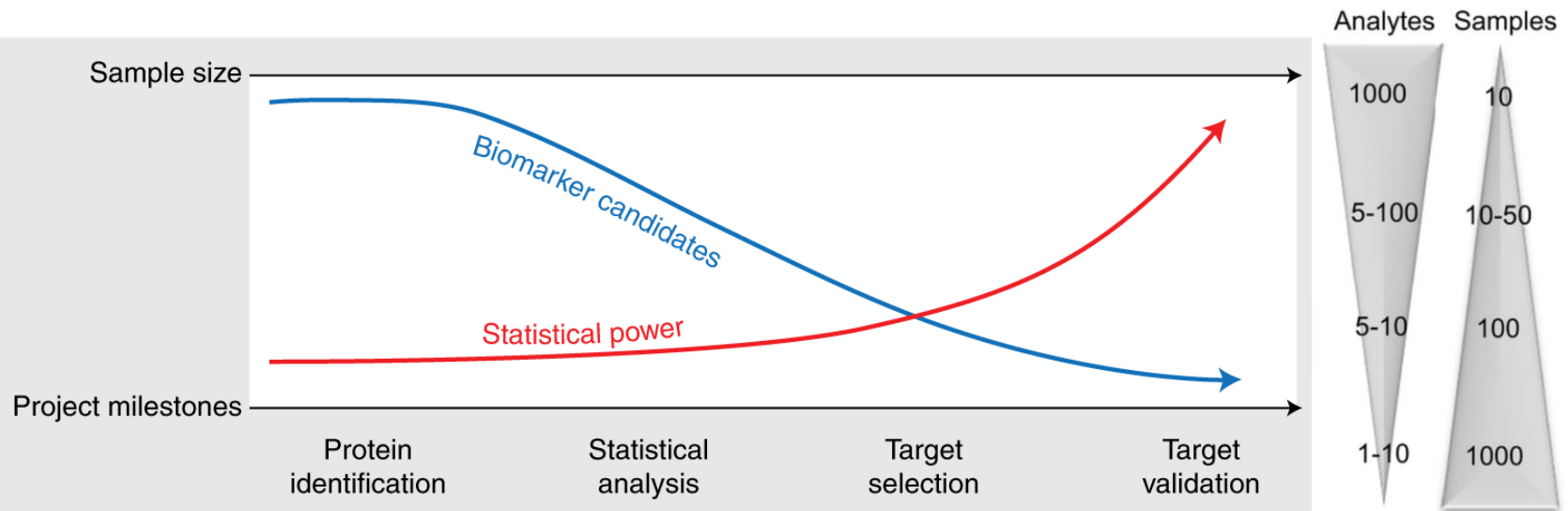
Verification phase

Confirm identify and differential expression of candidates



Validation phase

Validate biomarker performance in large cohorts

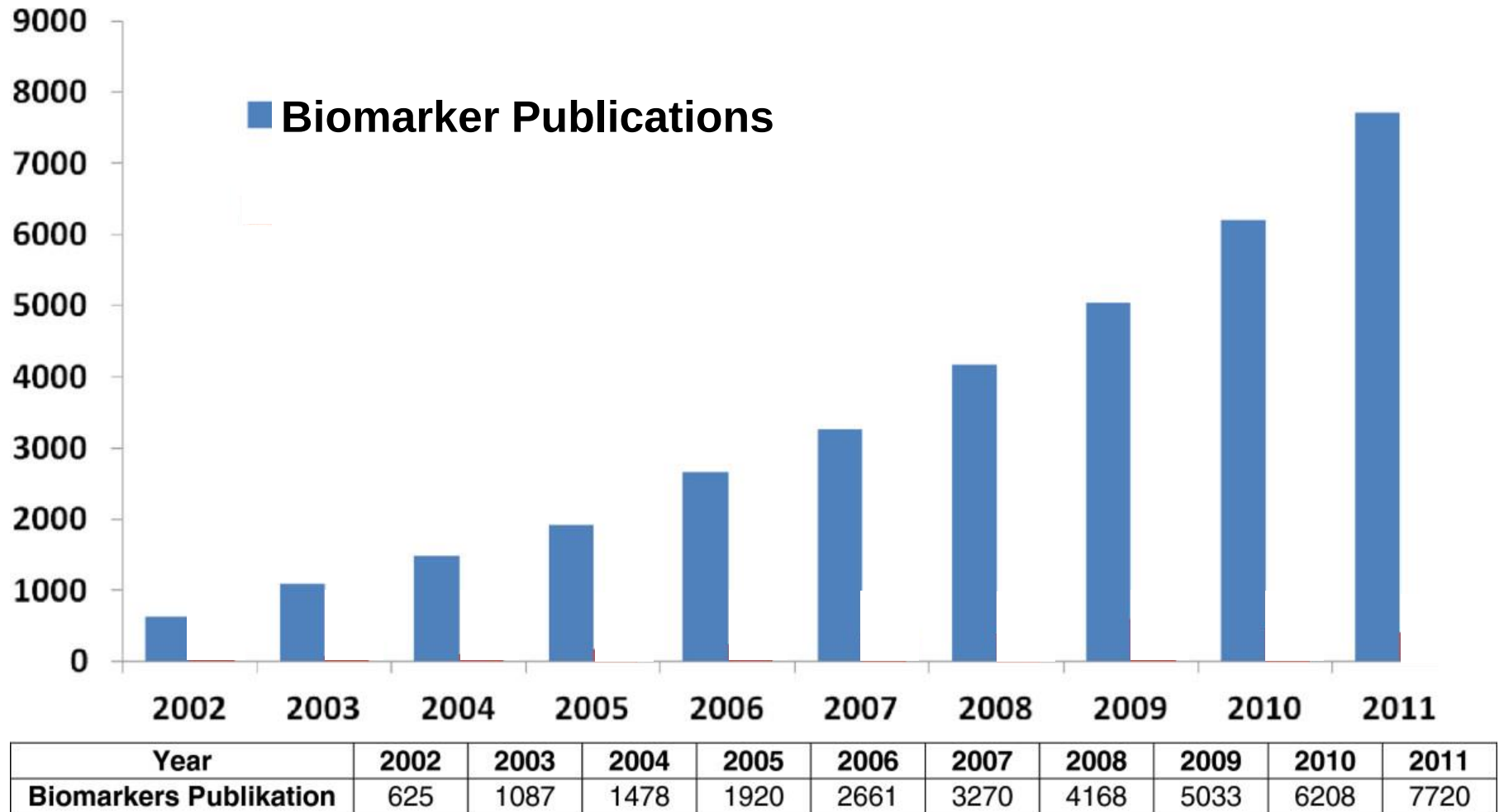


High Resolution MS

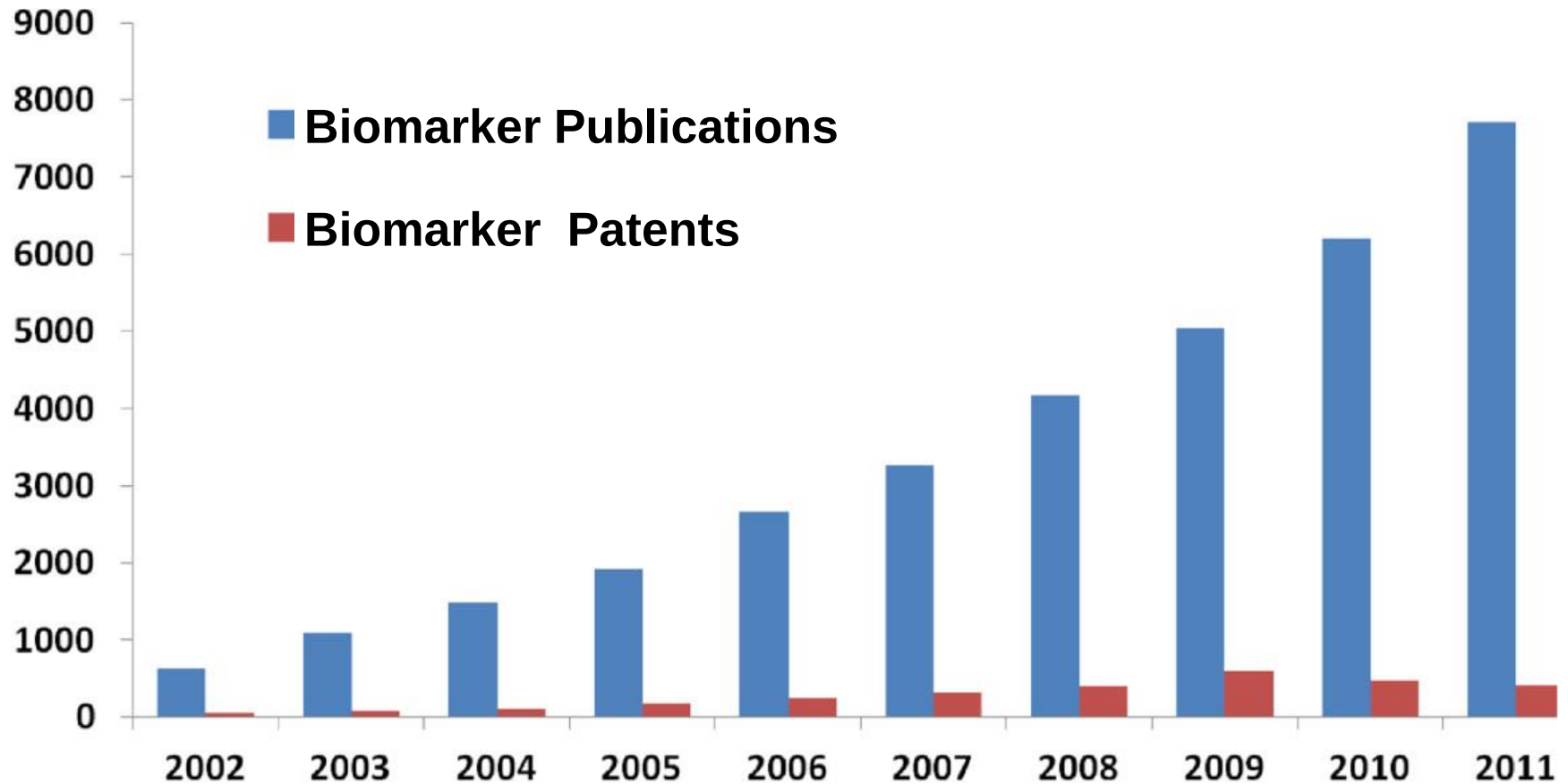
Targeted MS

ELISA

Clinical Proteomics- Challenges



Clinical Proteomics- Challenges



Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Biomarkers Publikation	625	1087	1478	1920	2661	3270	4168	5033	6208	7720
Biomarker Patents	50	74	95	180	238	320	396	593	471	407



Mass Spectrometry Proteomics in Clinical Research

Qualitative

Quantitative

Identify

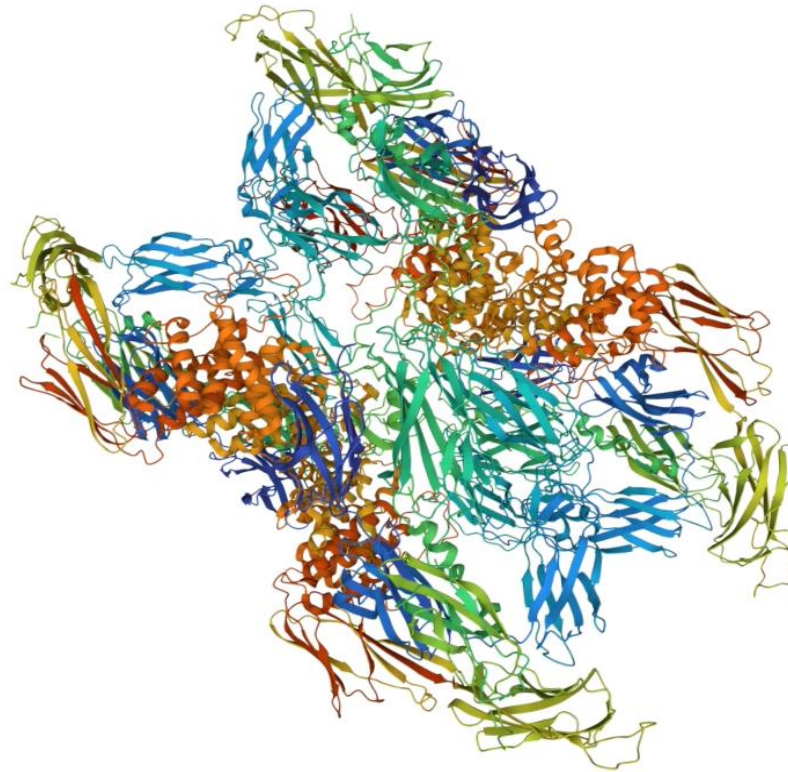
Quantify

Discovery

Targeted

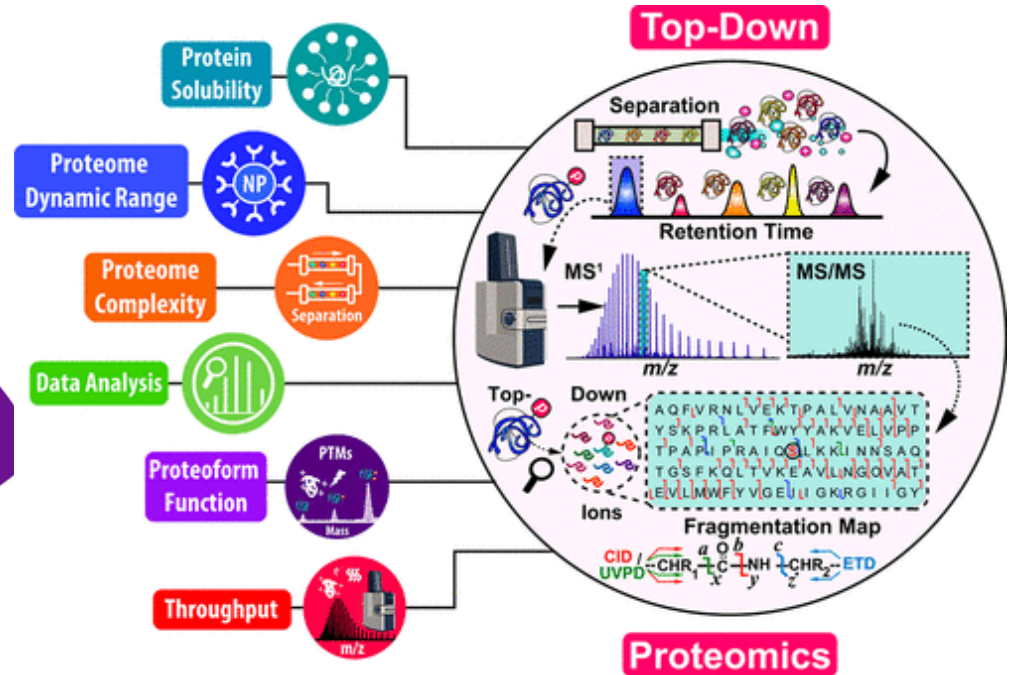
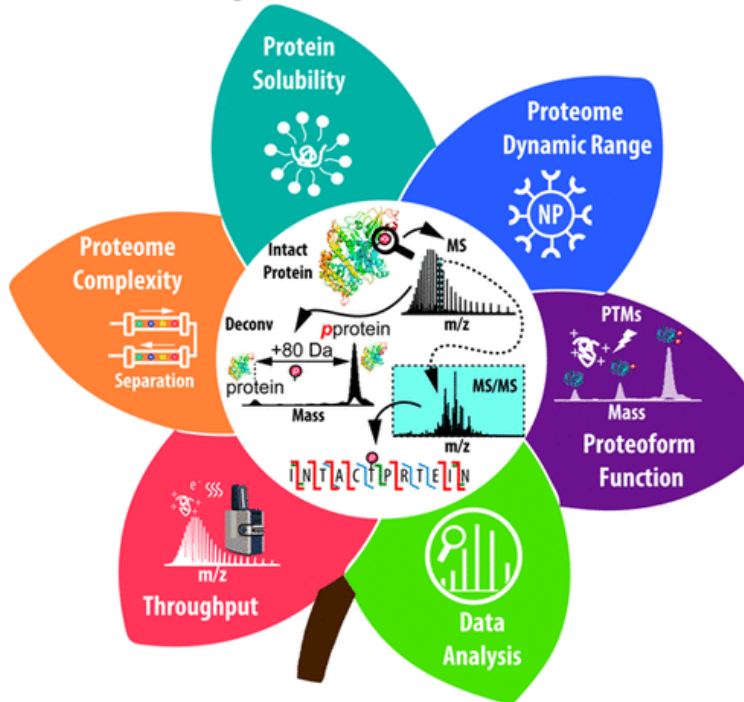
via HRMS

via QQQMS



Top-Down Proteomics

Top-Down Proteomics



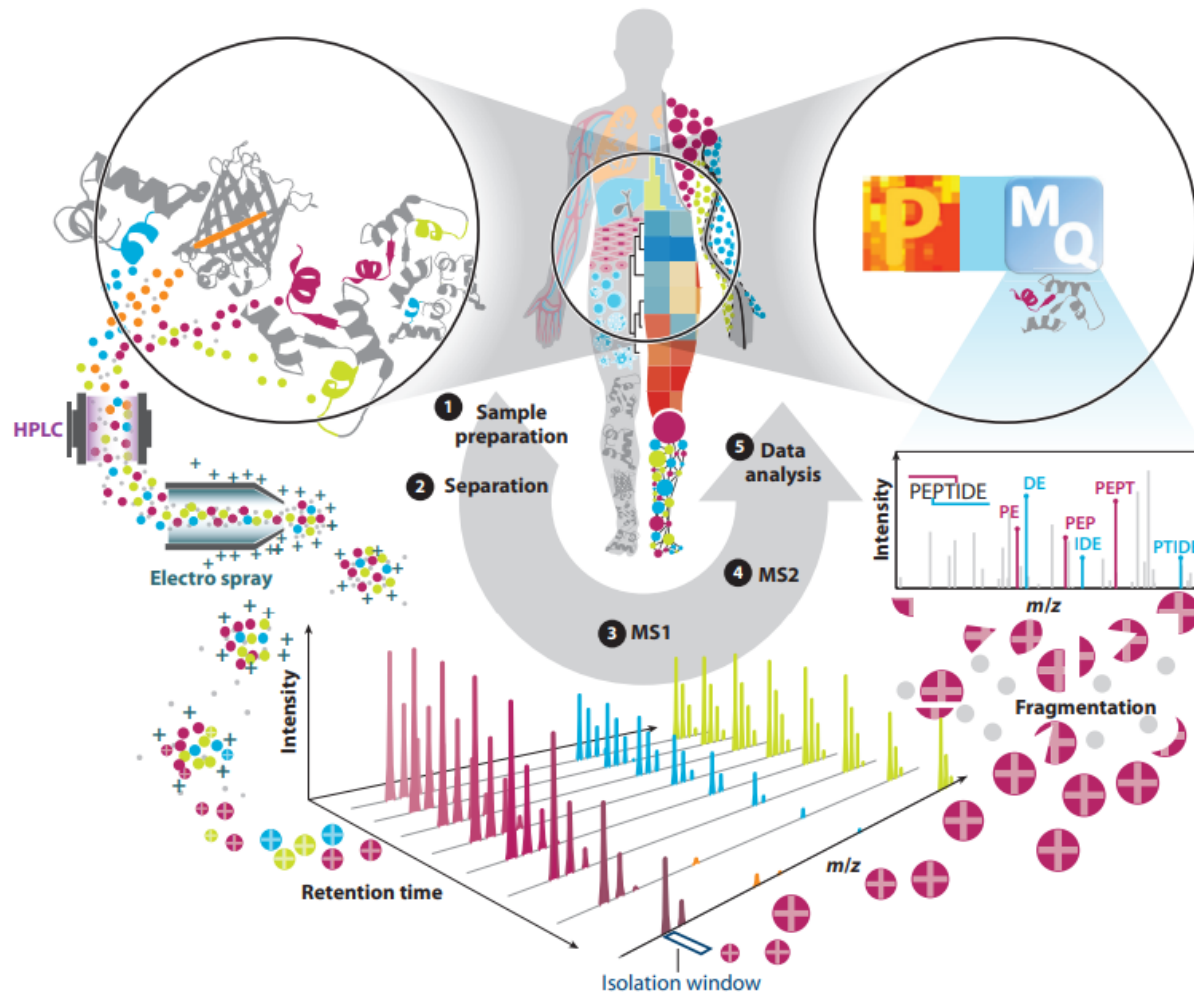
ODTÜ
METU

Novel Strategies to Address the Challenges in Top-Down Proteomics

Jake A. Melby, David S. Roberts, Eli J. Larson, Kyle A. Brown, Elizabeth F. Bayne, Song Jin, and Ying Ge

Journal of the American Society for Mass Spectrometry 2021 32 (6), 1278-1294

Bottom-up Proteomics



Computational methods for understanding mass spectrometry-based shotgun proteomics data.

Sinitcyn, P., Rudolph, J. D., & Cox, J. *Annual Review of Biomedical Data Science* 2018



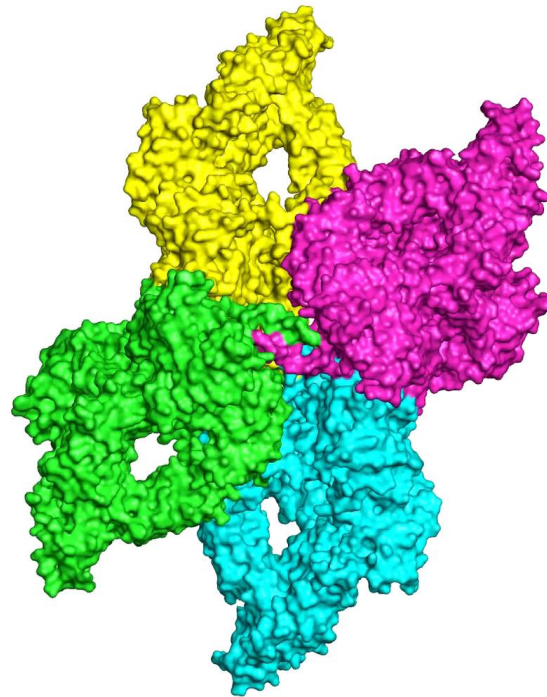
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A single protein to multiple peptides

Investigate the quantitative relationship between protein and protein products



Pelin Yıldız



Alpha 2 Macroglobulin

Protein – Peptide Correlation – Purified Protein

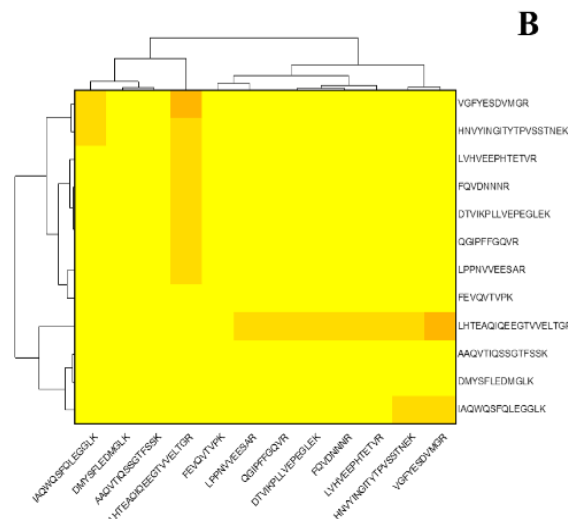
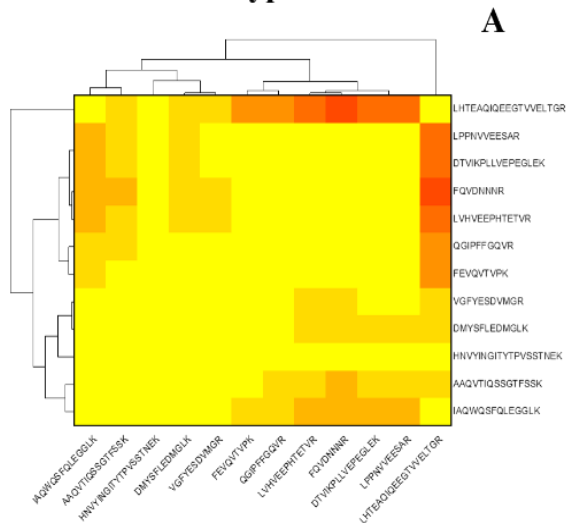
Standard A2MG Digestion Products

Trypsin

Trypsin/Lys-C mix

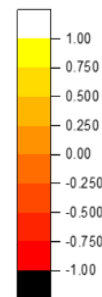
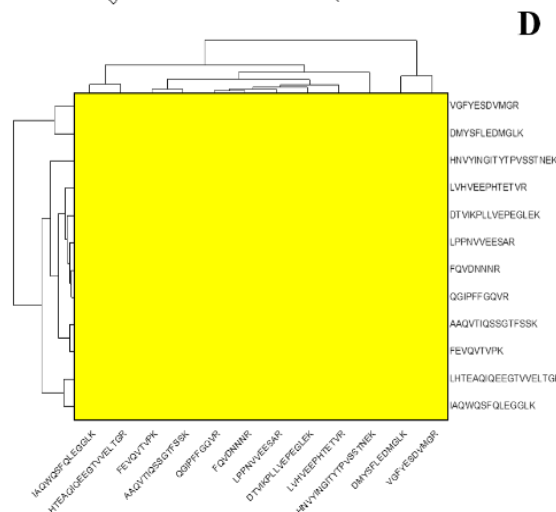
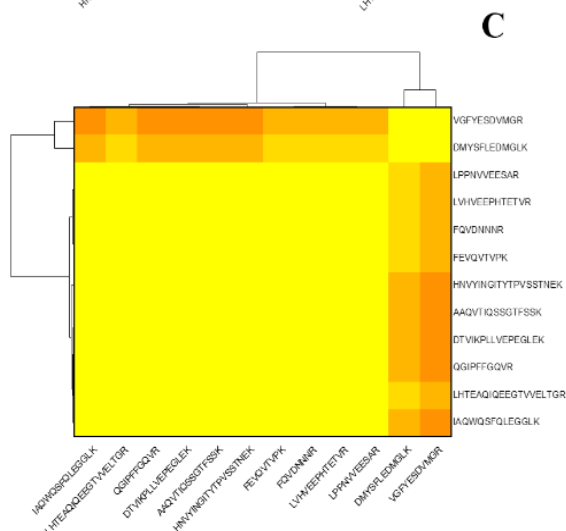
1-5 ng/mL
A2MG

Protein Standard
Low Levels



5-20 ng/mL
A2MG

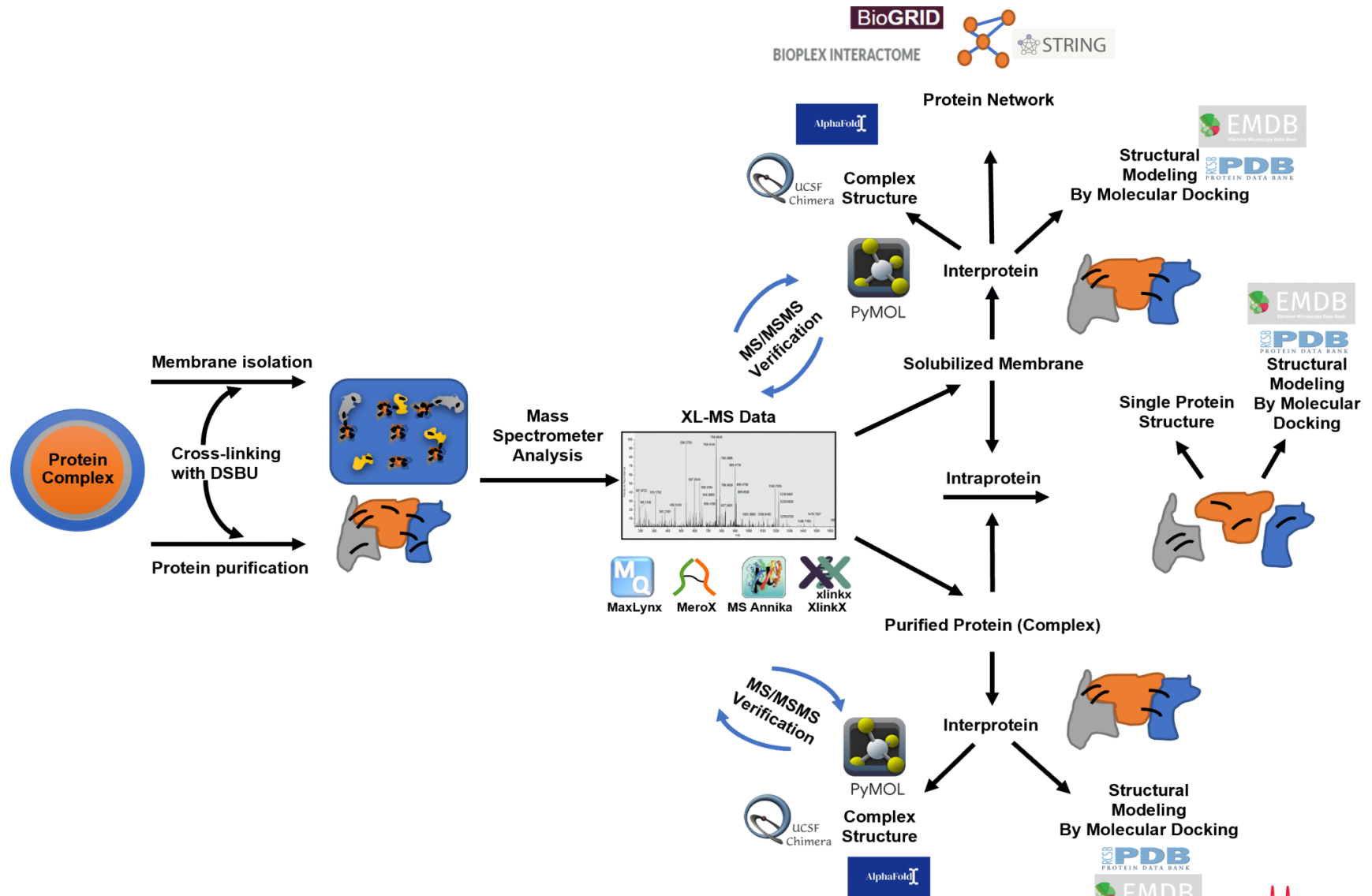
Protein Standard
High Levels



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METU

A single protein to multiple peptides: Investigation of protein-peptide correlations using targeted alpha-2-macroglobulin analysis. Yildiz P. & Ozcan S. *Talanta*. 2023

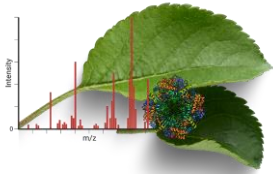
Q-OmicS LAB – Structural Proteomics



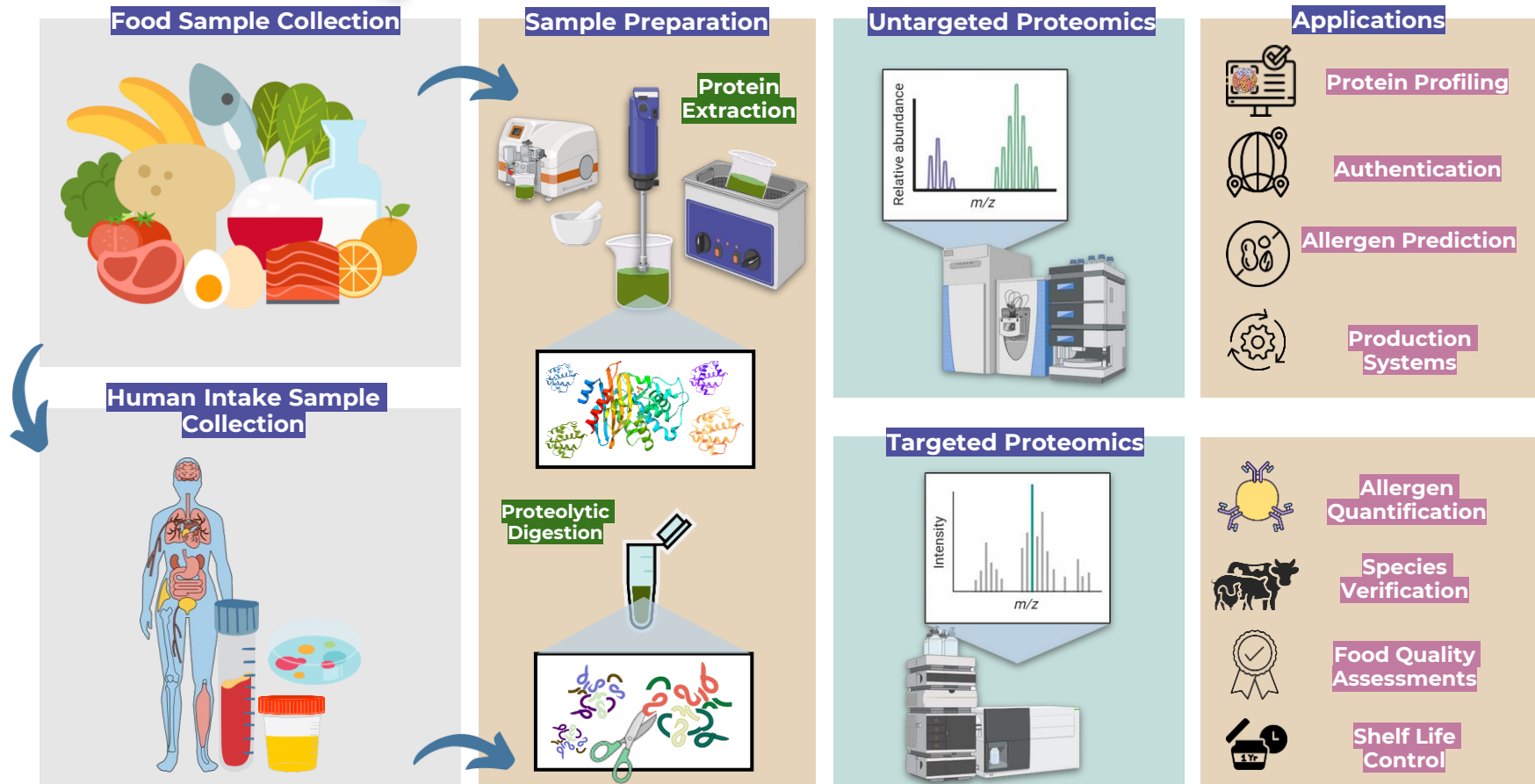
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Akkulak H, İnce HK, Goc G, Lebrilla CB, Kabasakal BV, Ozcan S. Structural proteomics of a bacterial mega membrane protein complex: FtsH-HflK-HflC. Int J Biol Macromol. 2024 Jun;269(Pt 1):131923

Nutritional Proteomics



From Mass Spectrometry to Our Plate:
What is Nutritional Omics?



Members



Graduate Students

Ataollah Nosratinia
Hatice Akkulak
Pelin Yıldız
Useyma Gülhan
Ceren Kul
Elif Akmermer
Gizem Biter
Gizem Demirci
Hayri Kerim Ince

Undergraduate Students

Useyma Gülhan
Enver Öztürk
Esin Şahin
Gaye Kaya
Lara Su Kartav
Rukiye Topbaş
Yağmur Tatar
Güzin Beyza Yıldız

Alumni

Dila Bilgen
Begüm Köysüren
Ece Göktayoğlu
Dila Bilgen
Nasim Allahyari
Mija Kastelic
Şevval Şahin

FUNDING



THE SCIENTIFIC AND TECHNOLOGICAL RESEARCH
COUNCIL OF TURKIYE



PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION
IN THE MEDITERRANEAN AREA



EUROPEAN UNION HORIZON 2020, EUROPE



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TURKISH COUNCIL OF HIGHER EDUCATION
RESEARCH GRANT