Pawel Ciborowski

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Title: Mass Spectrometry Based Proteomics: Principles and Analytics

This course is designed to offer students an opportunity to learn fundamentals of the status, methodology and practical applications of mass spectrometry based analysis of proteins and peptides. Thus, this course is designed to offer students a comprehensive overview of the status of full unbiased and targeted experimental approaches in quantitative profiling with emphasis on label free techniques.

In the first part, we will discuss fundamentals of proteins and peptides ionization, fragmentation and analysis. It will include Matrix Assisted Laser Desorption Ionization (MALDI) and positive and negative mode of Electrospray Ionization (ESI) which will include an overview of instrumentation i.e. mass spectrometers, nano-flow liquid chromatography and UHPLC interfaced with various ion traps (IT), quadropole time of flight (qTOF), triple quadropoles (QQQ) analyzers. We will discuss principles of Collision Induced Dissociation (CID), Higher Energy Collision Dissociation (HCD) and Electron Transfer Dissociation (ETD).

In the second part the focus of proposed course will be on mass spectrometry based identification and quantification of post-translational modifications (PTMs) of proteins and peptides. During last few decades it has been shown that, the human proteome is immensely more complex than the human genome. Such increase in complexity is facilitated by protein PTMs, chemical modifications playing a key role in regulation of activity, localization and interaction with other cellular molecules such as proteins, nucleic acids, lipids, and cofactors. These modifications include but are not limited to phosphorylation, glycosylation, ubiquitination, nitrosylation, methylation, acetylation, lipidation and proteolysis. Identification and quantification of these PTMs is not trivial and in many instances requires a combination of analytical approaches.

Third part will be devoted to link analytics of proteomics with bioinformatics with emphasis on systems biology experimental design and execution. In this part, we will discuss software and bioinformatics tools used for high throughput (OMICS) mass spectrometry data analysis.

This figure shows a cycle of high throughput proteomic experiment starting from initial hypothesis, through experimental design, execution, data analysis to generation new hypothesis. During the proposed course we will discuss all elements depicted here.

Termin	Dzień tygodnia	Godzina	Miejsce
14.05.2018	Poniedziałek	**12.30 – 15.30**	Minicentrum Konferencyjne (Luwr)
15.05.2018	Wtorek	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
16.05.2018	Środa	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
17.05.2018	Czwartek	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
18.05.2018	Piątek	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
21.05.2018	Poniedziałek	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
22.05.2018	Wtorek	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
23.05.2018	Środa	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
24.05.2018	Czwartek	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)
25.05.2018	Piątek	12.15 – 15.00	Minicentrum Konferencyjne (Luwr)

Proposed plan for Visiting Professor (3 weeks) in Gdansk
May 5th to May 26th, 2018
Visiting Faculty: Dr. Pawel Ciborowski, UNMC, Omaha, NE, USA

Day	Proposed Scientific Activities	Detailed description
May 5th – arrival in Gdansk[1]		
May 7th	First week begins	
May 7th to May 11th	Proteomics workshop.	Location at GUMED and workshop is open to all participants from Gdansk area.
May 14th	Second week begins	
May 14th to May 18th	Course for graduate students begins[2]	Lecturer: Dr. Pawel Ciborowski, UNMC, Omaha, USA. Title "*Mass Spectrometry Based Proteomics: Principles and Analytics.*" Test at the completion of the course (Friday)
May 21st	Third week begins	
TBD[3]	Seminar lecture	*"Critical steps of experimental design of high throughput experiments"*
TBD[3]	Seminar lecture	*"Data management and visualization"*
	Consultations entire week based on demand	Individual discussions
May 25th	Third week ends	
May 26th – departure from Gdansk		

[1] – Right now airfares for May 4th are lower than for May 5th.

[2] – Five lectures days can be spread over two weeks. First week should be excluded to prevent interference with Proteomics Workshop.

[3] – Exact time depends on PG schedule