Illumina Protein Prep Uncovers Molecular Signatures in Parkinson's Patients

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Targeted proteomics in patients with Parkinson's disease

Assoc prof. RNDr. Martin Kolísek Dr.rer.nat.(Genet.) is head of laboratory of proteomics and mitochondriopathies at Biomedical Centre of Jessenius Faculty of Medicine in Martin. One of the priority research areas of this laboratory is proteinological and proteomic analysis of various Parkinson's disease model systems and biological materials obtained from patients with Parkinson's disease, Miyoshi syndrome/myopathy, or MIDD (maternally inherited diabetes and deafness) – MELAS (Mitochondrial Encephalopathy, Lactic Acidosis, Stroke-like episodes) spectrum syndrome.

Due to the fact that these are disorders associated with systemic, metabolic and/or nerve degeneration, which is directly related to damaged mitochondrial homeostasis and cell energy profile, another priority area of research in our laboratory is focused on the etiopathogenesis of primary and secondary mitochondriopathies.

Illumina Protein Prep: New Era of Proteomics

Illumina Protein Prep (IPP) workflow, provides a high-throughput, NGS-based solution for proteomics. This technology enables the simultaneous measurement of 7000 protein targets (now up to 9 500 proteins) from a single plasma or serum sample, delivering deep proteomic insights with high accuracy and scalability.

Interview questions:

Why did you decide to use IPP technology specifically on samples from patients with Parkinson's disease?

„IPP has enormous potential to find its place in applied research and clinical practice."

The idiopathic form of PD has a multifactorial complicated etiopathogenesis, which, in addition to the brain, also affects the periphery and other organ systems. Early detection of molecular changes related to the onset and progression of PD is crucial not only from the point of view of diagnosis, but also from the point of view of prognosis of disease progression. Since it is primarily a neurodegenerative disease of the CNS, many molecular markers of changes associated with PD have so far been detectable only in cerebrospinal fluid. This is a procedure that patients usually fear and are incomparably more afraid of compared to blood sampling. As it turns out, identical markers are also found in the blood, but in lower concentrations, which complicated their detection. From our point of view, IPP technology represents an ideal solution to this problem and for study and possible diagnostic applications in the field of neuroscience and clinical neurology. There are several reasons for this. Not only does the detection threshold of IPP technology range at the level of pg/mL of a specific peptide in the sample and overall, in blood plasma we can profile the proteome, which consists of more than 7000 proteins, at the same time, IPP technology is objectively less demanding in terms of operational requirements for

professional personnel personnel compared to mass spectrometry (MS), which is the gold standard in proteomic analyses so far. Simply put, MS and its analytical robustness meet the requirements of basic research, IPP has enormous potential to find its place in applied research and clinical practice.

What were your expectations before using this technology? And were they ultimately met?

IPP technology was used in our study focused on adjuvant therapy of PD in an unnamed Slovak spa setting. To be honest, I didn't have any expectations, although I was just as excited about IPP technology then as I am now. After evaluating the study, I have to say that the results are fantastic. The adjuvant therapy was focused on neuromuscular regeneration of PD patients, and IPP precisely identified a group of proteins that are involved in muscle regeneration and neuromuscular coupling.

Is there anything that surprised you about this analysis, something you didn't expect (accuracy, coefficient of variability)?

Clearly, accuracy and specificity. Medicine today faces a phenomenon where we often cannot reproducibly transfer procedures that work in experimental laboratories to diagnostics and clinics. From this perspective, IPP can be and I hope will be a "game-changer".

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How will these results help you in practice and what is the direct impact on patients?

Diagnostic accuracy, diagnostic speed! Accurately diagnosing and properly treating a patient, there is nothing better a person working in medicine or biomedicine could wish for.

Are you interested in incorporating this technology into other projects? If so, where would you like to use this technology further?

Certainly yes. Improving diagnostic algorithms for neurodegenerative (and other) diseases is a long-distance race and believe me, the way we diagnose today may be a thing of the past tomorrow. Take DNA technologies, ten years ago they were only marginally used in medicine due to their price. Today, DNA sequencing is a diagnostic routine. I think that in ten years, creating proteomic profiles of patients will be routine and integrative omics will become the key to even more precise diagnostics and truly personalized medicine. I hope that IPP will play a significant role on the way to this goal, and I am honored that we are the first workplace in Slovakia that had the opportunity to work with IPP.

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