

CHALLENGES IN RARE DISEASES – THE EXAMPLE OF MITOCHONDRIAL DISEASES

Ivana Novaković,¹ Milena Janković,² Ana Marjanović,¹ Marija Branković,¹ Marina Svetel,^{1,2} Jasna Jančić,^{1,3}

¹*University of Belgrade, Faculty of Medicine, Belgrade, Serbia*

²*University Clinical Centre of Serbia, Neurology Clinic, Belgrade, Serbia*

³*Clinic of Neurology and Psychiatry for Children and Youth, Belgrade, Serbia*

DOI: 10.5937/BatutPHCO24114N

Background: Mitochondrial diseases are a group of disorders caused by dysfunction of mitochondria - the organelles that generate energy for the cell by converting the energy of food molecules into the ATP that powers most cell functions. Mitochondrial diseases are one of the most common groups of rare diseases with a minimum prevalence of greater than 1 in 5000 in adults. Clinical manifestations of mitochondrial diseases are heterogenous, mostly affecting nervous and muscle systems and sensory organs; symptoms can appear at birth or they may not appear until adulthood. These diseases have genetic basis, and could be caused by mutations in nuclear genes, as well as by mutations in mitochondrial DNA (mtDNA) – small, maternally inherited, DNA molecule. An additional aspect of their genetic complexity is given by phenomenon of mtDNA heteroplasmy. Having all this in mind, the detection of the causative gene mutation is of crucial importance for diagnostics and further management of mitochondrial diseases. In addition, development of new therapeutic strategies is based on best knowledge at genomic level.

Methods and objectives: Genetic analyses were performed at patients suspect with mitochondrial diseases in order to detect causative gene mutations. Applied methods were targeted sequencing of mtDNA and clinical exome analysis by next generation sequencing.

Results: In this report we will present our experience with genetic testing of mitochondrial diseases, challenges in genetic counselling, and possible new therapeutic options in mitochondrial diseases.

Conclusion: Modern management of mitochondrial diseases is based on their genetic diagnostics. Contemporary algorithms and guidelines should be applied in this field of rare diseases.

Keywords: mitochondrial diseases, nuclear genome, mtDNA, testing