

Neurodevelopmental diseases, including Autism Spectrum Disorder (ASD) affect more than 1% of the child population worldwide. To date, despite much research, scientists haven't been able to identify the exact causes of these diseases, and consequently, haven't managed to develop any effective treatments. There seems to be no single cause for neurodevelopmental disorders but rather a combination of environmental, genetic, neurological, and immunological factors. This project will concentrate on the latter.

Currently, it is considered that the most widespread metabolic disorder in children with ASD are mitochondrial dysfunctions. Research indicate that children diagnosed with ASD have a higher number of harmful mitochondrial DNA mutations than the healthy members of their families. There are several well-described reasons for this, namely elevated levels of Pro-Inflammatory Cytokines, Carnitine deficiency, and oxidative stress. However, there is a lack of comprehensive data on mitochondrial dysfunction, on their biogenesis, as well as on their dynamics and distribution—key phenomena for the proper functioning of nerve cells in the neurodevelopmental diseases. This project will focus on the question of mitochondrial function in animal brains, which at the time of fetal development were exposed to inflammation induced by bacterial infection simulation (Maternal Immune Activation, or MIA). The study will also evaluate the significance of the mitochondrial states, their metabolism, as well as their biogenesis and dynamics in the brain of animals whose mothers suffered an infection during pregnancy.

For the first time this pioneering project aims to uncover the molecular mechanisms of mitochondrial functions disorders which underlie the neurodevelopmental diseases caused by infections in the mother during pregnancy. The expected findings of this study should identify neuroprotective compounds that activate the “pro-life” strategies of the mitochondria. The obtained results will provide a solid basis for future work, and will advance the efforts in developing effective therapeutic strategies.