

The increasing prevalence of neurodevelopmental disorders, especially autism spectrum disorders (ASD) and attention deficit hyperactivity disorder (ADHD), calls for more research into the identification of their etiologic and risk factors. Both ASD and ADHD can be linked to different risk factors, which can be either genetic or environmental. Recent human epidemiologic and animal studies underlie environmental contribution to ASD and ADHD with a significance of imbalanced maternal diet (Western diet) during pre-pregnancy, pregnancy, or lactation on the proper brain development in offspring. At the same time, maternal obesity is associated with increased vascular events in both mother and offspring. More recent epidemiologic evidence showed also the impact of increased blood pressure in utero on the development of ASD and ADHD, which points out that exposure to hypertension may be associated with the risk of these neurodevelopmental disorders.

Given the increasing prevalence of child hypertension, partially owing to increasing levels of maternal obesity, and collating the existing evidence of the association of hypertension with the neurodevelopmental outcome, this interdisciplinary project is aimed to identify a prodrome to ASD and ADHD target within the vascular network in a rat model of maternal obesity. By using a combining in vivo and ex vivo functional assays (behavioral, molecular, neurochemical, electrophysiological, and cardiovascular parameters) in the rat brain and peripheral organs this project will address pre-pregnancy, pregnancy, and lactation maternal Western diet leading to changes in the offspring vascular functions followed by the development of ASD or ADHD phenotype. Secondly, we will explain the relationship between sex, hypertension, and neurodevelopmental disorders. Finally, by using a pharmacological strategy (a drug targeting developed vascular marker(s) in the brain) we will try to protect from the development of behavioral phenotype and dysfunction in brain synaptic plasticity in rat offspring following exposure to pre-pregnancy until lactation maternal Western diet.

Focusing on the coupling between blood flow and neural activity, this project will support a conceptual shift in the mechanisms of neurodevelopment based on the impact on the entire cardiovascular network in a highly orchestrated manner. The results of this project will identify an ASD or ADHD prodrome target within the vascular network and based on such discovery may propose a novel treatment strategy for these disorders. There is no doubt that this project will bring a better understanding of the obesity epidemic for pregnant women, not only just in terms of pregnancy outcome, but also in terms of the potential impact on the cardiovascular health of the next generation. Additionally, the project will have implications for the development of the research field.