

DESCRIPTION FOR THE GENERAL PUBLIC

The obesity is classified as a disease of civilization and it is an urgent social problem amongst the twenty-first century. It is not only the cause of numerous health problems in obese people, but also, what emphasize results from recent studies, the offspring exposed to the unbalanced mother's diet during the pregnancy and lactation. The increase in the prevalence of the obesity is associated with the consumption of excessive amounts of a high-fat and/or high-sugar food and a significant reduction in physical activity, however, it is noted that diet is the most important. This alarming data from the World Health Organization report the prevalence of the overweight or obesity even in about 70% of adults in the United States and from 25% to 65% in European countries. Excessive weight gain affects young people hence a significant number of born infants, especially in developed countries, is exposed during prenatal development on their mothers' obesity caused by unbalanced diet with high content of saturated fatty acids and/or sugars. Both epidemiological data and scientific evidence from studies in animal models indicate a relationship between obesity and maternal weight gain during pregnancy and the probability of occurrence of numerous disorders in the offspring, not only during adolescence but also of further, adult life. During the pregnancy and lactation young organism is particularly sensitive to an improper diet, hormonal changes or inflammatory pending in the mother's body, which can in a sustainable manner and, as indicated by a recent study, hereditary, to disturb it the development and functioning. This phenomenon has been called "fetal programming" or "fetal origins of adult disease". The most commonly reported types of diseases include not only obesity, diabetes, cardiovascular diseases or hormonal disruption but also neuropsychiatric disorders such as depression, anxiety, schizophrenia and cognitive disturbances as impaired learning and memory. Molecular basis of observed diseases is currently being tested. An important role in the development of neuropsychiatric disorders is attributed to pathological changes in the neurotransmission in the central nervous system.

The main role in the pathogenesis of mentioned neuropsychiatric disorders, especially impairment in learning and memory is attributed to ionotropic glutamatergic receptors NMDA. Their proper functioning is the basis of synaptic plasticity phenomena. The variety in the subunit composition of these receptors determines the different characteristics of its excitability, therefore disturbances in the membrane expression of the NMDA receptors on neuron surface and regulation of their activity, especially in the prenatal and the early postnatal period may be the basis for the development of pathological changes observed later in life.

The purpose of this study is to investigate the molecular mechanisms of the influence of maternal nutrition (a high-fat diet and a high-sugar diet) during the pregnancy and breast feeding on the development of disturbances of NMDA receptor expression, subunit composition and their regulation in offspring in the memory impairment context.

In order to evaluate cognitive functions, offspring of mothers feed with a high-fat or a high-sugar diet during pregnancy and lactation will be subjected to the procedure of behavioral test, novel object recognition. After there, on collected tissues will be conducted a comprehensive study of molecular NMDA receptors. The results obtained will be compared to the study on the offspring of mothers fed with a standard balanced diet. Analysis at the receptors, cellular and structural brain level will be performed using modern and considered experimental procedures and analytical techniques. The receptor subunits composition, their location in various brain structures, as well as extracellular concentration of the NMDA receptor agonist, glutamic acid will be examined. Also a thorough analysis of the proteins stabilizing receptors in the cell membrane as well as signaling pathways specific for individual subunits of the receptor will be done.

The effect of the proposed research project will be an innovative knowledge about the effects of maternal diet during pregnancy and suckling on the development of NMDA receptor changes in offspring brain structures involved in memory and learning processes. Moreover, taking into account the implication of NMDA receptors in other neuropsychiatric disturbances observed in offspring of obese mothers, the results may indicate the therapeutic target for new drugs.

The results of the study will enhance our knowledge about the etiology and role of glutamate system in these disorders in the early stages of ontogenetic development. This study may demonstrate the significant role of maternal diet on offspring development and can contribute to increasing public awareness, especially among women of childbearing age and pregnant, on importance of the properly balanced nutrition.