Autophagy stimulation by genistein to cure Alzheimer disease: mechanisms and effects investigated using genetic (cellular and animal) models of the disease

Neurodegenerative diseases constitute a great medical and social problem. Most of them are incurable, and despite intense scientific work and many different research approaches, no method has been developed that can effectively help patients with the vast majority of these diseases. According to data from the World Health Organization (WHO), neurodegenerative diseases cause approximately 10% of human deaths worldwide. Neurodegenerative diseases are defined as diseases resulting from the progressive loss of nerve cells. Reducing the number and activity of neurons leads to severe dysfunctions in the nervous system, usually drastically affecting the biological functions of the entire body. In many neurodegenerative diseases, including the most common one, Alzheimer's disease, pathological processes depend on the formation of protein aggregates. Despite many years of research, there is currently no effective method of treating these diseases, and therapeutic activities are limited to ineffective attempts at symptomatic treatment. The results of recent studies suggest that increasing the efficiency of degradation of pathological forms of proteins may be the most effective method of treating these diseases. The work carried out by the research team of the Principal Investigator of this project showed stimulation of the lysosome biogenesis process by genistein (4',5,7-trihydroxyisoflavone). Moreover, as part of preliminary research for this project, the same team showed that genistein induces autophagy and corrects phenotypes in cellular and animal models of Alzheimer's disease. Therefore, this project will investigate the molecular mechanisms of autophagy activation by genistein in well-defined genetic, cellular and animal models of Alzheimer's disease. Thus, understanding the molecular mechanisms of autophagy activation by genistein may provide the opportunity to develop effective therapy for Alzheimer's disease, as well as potentially other neurodegenerative diseases in the future. The research planned in this project may therefore be a breakthrough in understanding the biological mechanisms of protection of cells and organisms against neurodegeneration.