

Telomeres play a key role in protecting the ends of chromosomes maintaining genome stability, together with shelterin proteins they protect chromosomes from degradation, end to end fusion and activation of double strand breaks repair systems, as well as the loss of genetic information. Somatic cells lose a fragment of telomeric ends every time a cell replicates its DNA and divides. When the telomeres reach a critical length the cell passes to the resting state and cell degenerative process is accelerated. It is becoming increasingly evident that damage specific to the telomeric ends of chromosomes leads to cancer, cardiovascular diseases, premature aging, cognitive decline, and neurodegenerative diseases. Crucial question remains how can we prevent excessive telomere shortening and which malleable factor might promote telomere stability over time. Recent studies have reported possible effects of polyunsaturated fatty acids on the telomere length. Omega-6 and omega-3 polyunsaturated fatty acids modulate biological processes and molecular functions through interactions with nuclear receptors and regulation, as active lipids, level of gene expression. Although these fatty acids are essential for the proper organism functioning, they trigger opposite effect. It is recognized that the omega-6 are pro-inflammatory and increase oxidative stress, while omega-3 fatty acids are anti-inflammatory, adversely affect the oxidative stress and prevent many diseases, including cardiovascular diseases.

Consistent with these findings are identified by our preliminary study changes caused by omega-6 and omega-3 fatty acids supplementation. The Next Generation Sequencing indicated a change in the level of expression of several genes encoding proteins essential for telomere maintaining in muscle tissue as a result of supplementation with omega-6 and omega-3 fatty acids. These findings inspired us to undertake this subject and to formulate presented in this project hypothesis about impact of omega-6 and omega-3 fatty acids on telomere maintaining. We intend to examine the possible different effect of omega-3 and omega-6 polyunsaturated fatty acids contained in vegetable oils on telomere length in leukocytes and skeletal muscle and the level of selected proteins which are associated with the biology of telomeres. Among the proteins selected for further investigation are also those which demonstrated a change in the expression on the transcriptome level in our preliminary study. Studies will be carried out in vivo using *fat-1* transgenic mice, capable of synthesis of omega-3 and in-vitro using the murine C2C12 myoblasts.

Telomere biology and regulation of its length is still area with a lot of unexplored scopes. Understanding whether polyunsaturated omega-6 and omega-3 fatty acids affect the telomere length will bring significant and cognitive contribution to the discussed subject. What is more project concerns on not undertaken yet issue of the effect of omega-6 and omega-3 fatty acids on level of essential for telomere length maintaining proteins, revealed through preliminary studies. Established studies will determine whether these acids regulate the level of ones of the most important for the regulation of telomere length proteins, and whether the effects of omega-6 differs from the effect of omega-3 fatty acid. Moreover, knowledge of the role of polyunsaturated fatty acids in controlling the telomere length and interacting proteins will provide the basis for study of using omega-6 and omega-3 fatty acid in therapies against diseases associated with telomere dysfunctions - cancer diseases, cardiovascular diseases, premature aging, decreased cognitive ability and neurodegenerative diseases. The implementation of the presented project will provide the key answers concerning the impact of omega-6 and omega-3 on the telomeres functioning.