

Aging is a serious problem of the modern world, the ongoing dynamic process, created as a result of overlapping of two effects: decrease the number of births with simultaneous increase average life length. Growing tendency of older people to diseases and injuries, combined with a constant enlarging of this group, leads to an increase need for health services, rehabilitation and care. Societies are aging and we should look for ways to improve the quality of life, avoiding the development of age-related diseases.

Aging is a complex biological process, which can be considered at different levels. Many theories have been created, but none of them fully explains the issues of this process. According to one of the most popular theory, aging of the body depends on the efficiency of enzymatic and non-enzymatic antioxidant mechanisms and the amount of generated reactive form of oxygen. This is called the Oxidative Stress Theory.

The causes of the aging are still unknown, but it is believed that age-related pathologies can be caused by an imbalance of intracellular mechanisms that regulate homeostasis and modulate the body's response to stress. Among the factors affecting the life span, we can distinguish mitochondrial dysfunction, oxidative stress and genomic instability. Cells contain many antioxidant mechanisms that protect from the negative effects of oxidative stress. They are divided into three groups: antioxidants preventing the formation of free radicals, antioxidants that remove oxidative damage elements and antioxidants involved in the repair of damage caused by ROS, which are delivered with diet. Recently, the use of natural compounds, is considered to be an effective anti-aging strategy, because their influence on variety mechanisms, based on extending life span and preventing age-related disease, through protection against reactive oxygen species (ROS). Among these compounds, we can distinguish carotenoids, flavonoids, polyphenols and also cytokinins, which structure is based mainly on adenine, e.g. kinetin.

The object of our interest is 4-N-furfurylcytosine (FC), synthesized for the first time in the Institute of Bioorganic Chemistry PAS in Poznań. This analog of cytosine similarly to kinetin showed proliferative activity without any toxic effect on eukaryotic cells. FC in the presence of reactive oxygen species reduces its negative effects and may become an alternative to polyphenol compounds as antioxidant agent. We intend to reveal the mechanism of action of FC in a cellular model of human fibroblasts at different maturity stages, yeast as a well known model organism and mouse model of aging. Experiments on cells and budding yeasts will help us to reveal how FC decrease oxidative stress and activate mitochondria. Mouse model (14 months old C57BL/6 mice) will help us to understand the influence of FC on higher organisms and analyses on several level of organization: cellular and behavioral, will lead to information about distribution of the compound, oxidative stress and its role in delaying skeletal muscle loss with aging (sarcopenia).

We expect that supplementation with FC will help to reduce oxidative stress in old mice and gain of muscle mass. Our experiments include control compounds: kinetin and resveratrol, that are known to have anti-aging properties.