DESCRIPTION FOR THE GENERAL PUBLIC (*State the objective of the project, describe the research to be carried out, and present reasons for choosing the research topic - max. 1 standard type-written page*)

Aging is a natural part of the cycle of life. Civilization development increased the life expectancy way beyond the reproduction age. However this has also a dark side. Aging people live in declining physical and mental health for decades. They are suffering and their physical and mental state is an increasing burden for the society. Thus, effective and clinically relevant interventions to prolong healthspan will become essentially important in the future.

To achieve this goal we need to gain mechanistic understanding of the process of aging, its molecular causes and consequences. This project aims to discover mechanisms, which modulate the function of the cells during aging. Finding ways to strengthen and extend the protective mechanisms could lead to expand the healthspan. Based on the recent findings we propose that one such mechanism could be the modulation of cellular protein synthesis (translation). The protein synthesis declines during aging. However, interventions that reduce protein synthesis early in life of model organisms can be beneficial for longevity. Signals and resulting molecular changes that are involved in the modulation of the protein synthesis are unknown during stress conditions and in aging. Our unpublished results show that the proteins involved in the protein synthesis machinery can be regulated by a protein modification, called oxidation. We will determine how the oxidative modifications influence the function of the proteins involved in the translation and whether they affect cellular and organismal health.

Reactive oxygen species (ROS) facilitate oxidative modification of proteins. The main cellular source of ROS is the cellular compartment called mitochondrion. Mitochondria are the powerhouse of the cell and essentially important for life. Mitochondrial function declines during aging. We recently found that mitochondrial dysfunction results in robust translation attenuation. We will determine the links between mitochondrial function, ROS production and cytoplasmic translation. The goal of our research is to provide the fundamental knowledge about the molecular processes in the cell to plan strategies to maintain and prolong the healthspan in humans in the future.