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Searching on aging markers of the tardigrade *Paramacrobiotus experimentalis*

Summary

The complex process of biological aging is an intrinsic feature of living organisms. It is assumed that aging is inevitable, irreversible, and progressive. Even for tardigrades, known as one of the toughest animals on Earth, aging can be observed due to changes in their survival rate and fitness. However, available data indicate that tardigrade aging might be delayed by cryptobiosis that denotes ability to withstand environmental extremes. Anhydrobiosis appears to be the most known form of cryptobiosis (also in tardigrades) and is described as the ability to resume activity after complete dehydration (desiccation). The possibility is addressed by the Sleeping Beauty hypothesis. The hypothesis verification, which could have important applicative consequences, requires multilevel markers of tardigrade aging. However, the markers are not available. Therefore, the aim of the thesis was to indicate potential tardigrade aging markers.

To implement the aim available relevant papers were searched for the putative markers which resulted in selection of the vitality rate, average number of laid eggs per female, survival of the extreme conditions (i.e., anhydrobiosis or hypomagnetic field – HMF), the level of the mitochondrial inner membrane potential ($\Delta\psi$) and the level of intracellular reactive oxygen species (ROS). For experimental validation of the markers a suitable model was developed due to application of the dioecious tardigrade *Paramacrobiotus experimentalis* characterized by long average lifespan and high anhydrobiosis capability. The model consists of reproducing females and males of different age, classified to five different age classes. In the studies, for the first time the effect of different number and duration of anhydrobiosis episodes on survival was performed for five age classes of females and males, dehydrated and rehydrated as single individuals or in the presence of other individuals, i.e., in groups. In addition, the effect of exposure to HMF on

survival and mitochondria functionality was studied for females and males of different age as well as the level of intracellular ROS for females and males of different age was detected.

Verification of usability of the mentioned tardigrade aging markers could open the opportunity for tardigrades to be also a model organism for aging biology, applicable for testing of aging theories. Together with verification of the Sleeping Beauty hypothesis, this might contribute to developing of anti-aging strategies and efficient approaches for preservation of biological materials. Nevertheless, the obtained results should be further verified for other dioecious tardigrade species which will allow for a better understanding of the observed differences between the sexes.