

Institute: Institute of Environmental Sciences

Topic: The thermoregulation - oxidative stress nexus as driver for avian senescence

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Background information:

Aging can be defined as a time-dependent persistent decline in reproductivity and functionality. While we do know that all higher organisms age we do not understand the cause for this process. The thermoregulatory capacity of animals are also impaired by progressing age as normothermic levels change with age, and many mammals and birds may become torpid or drop their body temperature during the night by a few °C. Even small drops in temperature may have profound effects on enzymatic activity, which also applies to enzymes that act as antioxidants against free radicals. They protect against the negative effects of oxidative stress through free radical scavenging and if this protective enzymatic action is reduced in its rate, free radicals may remain unchecked and lead to oxidative damage of biomolecules. Such oxidative damage risks functional integrity of biomolecules and is currently one of the most frequently forwarded driver of aging.

The main question to be addressed in the project:

Is avian body temperature regulation linked to oxidative stress?

Information on the methods/description of work:

Measurements of the avian metabolism will be performed on the whole organism level through open-flow respirometry and accompanying measurements of body temperature. The project entails determination and estimation of oxidative stress through measurements of plasma antioxidative capacity and markers for oxidative damage in blood plasma. Experimental manipulations of environmental condition will be performed to test hypothesis for a link between body temperature regulation and the risk to encounter oxidative stress.

Additional information:

The research is funded through an OPUS grant from the National Science Foundation in Poland (NCN) that covers also an additional science stipend. Student must be fluent in English, willing to learn new methods, interested in experimental work. Experience with energy metabolism, biochemistry, oxidative stress biology and/or work with birds are an asset but not necessary.

Place/name of potential foreign collaborator:

Prof. Scott R. McWilliams (University of Rhode Island, US)

References:

Zagkle, E., M. Grosiak, U. Bauchinger, and E. T. Sadowska. 2020. Rest-Phase Hypothermia Reveals a Link Between Aging and Oxidative Stress: A Novel Hypothesis. *Frontiers in Physiology* 11.

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Skrip, M. M., and S. R. McWilliams. 2016. Oxidative balance in birds: an atoms-to-organisms-to-ecology primer for ornithologists. *Journal of Field Ornithology* 87:1-20.

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