

Institute: Institute of Environmental Sciences

Topic: Correlated responses to multidirectional artificial selection in the bank vole

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Background information:

One of the main challenges in biology is to understand the evolution of complex adaptations allowing realization of the astonishing variety of "lifestyles." A powerful tool in the research area, which is a basis of the research program of our team, is an experimental evolution approach. In a laboratory colony of a wild rodent, the bank vole *Myodes glareolus*, we have applied artificial selection to mimic evolution towards high aerobic exercise metabolism, predatory behavior, and ability to cope with a herbivorous diet. Therefore, we created a laboratory model of adaptive radiation that provides a unique model for testing hypotheses concerning the correlated evolution of complex traits. Specific projects based on the model concern both studying correlated responses to the selection in organismal-level traits and analyses of molecular and biochemical background of the selection differences.

The main questions to be addressed in the project:

The specific project is focused on questions concerning behavior:

- 1) Does rearing by the mother (maternal postnatal environment) determine the behavior of voles, and especially the propensity towards predatory behavior and the predatory performance?
- 2) Does the multidirectional selection modify food preference?

Information on the methods/description of work:

- 1) We will combine the experimental evolution with cross-fostering into a "nature vs nurture" scheme to determine the relative contribution of genetic and maternal postnatal environment on the predatory behavior. Samples of tissues will be preserved for follow-up project focused on investigation of the molecular background of the behaviour (gene expression level).
- 2) We will perform standard "cafeteria" tests, in which the animals are offered simultaneously alternative diets.

In addition, the student will have an opportunity to participate in other running projects within the framework of the same experimental evolution model system, and will get support in applying for his/her own project, especially to investigate neurobiological and molecular mechanisms of the selection differences.

Additional information:

Merit expectations:

- The prospective candidate should show good communication in English and have organizational and collaboration skills.
- Experience of research with small mammals, in the areas of evolutionary biology or neurosciences, and experience in physiological or molecular laboratory work, are considered advantageous.

Place/name of potential foreign collaborator:

Jennifer Hoy (University of Nevada, Reno); Theodore Garland (University of California); Tappio Mappes and Phillip Watts (University of Jyväskylä, Finland)

References:

Sadowska, E. T., K. Baliga-Klimczyk, K. M. Chrząścik, and P. Koteja. 2008. Laboratory model of adaptive radiation: A selection experiment in the bank vole. *Physiological and Biochemical Zoology* 81:627-640.

Konczal, M., Koteja, P., Orłowska-Feuer, P., Radwan, J., Sadowska, E.T., Babik, W. 2016. Genomic response to selection for predatory behavior in a mammalian model of adaptive radiation. *Molecular Biology and Evolution* 33(9):2429–2440.

Maiti, U., E. T. Sadowska., K. M. Chrzascik, and P. Koteja. 2018. Experimental evolution of personality traits: open-field exploration in bank voles from a multidirectional selection experiment. *Current Zoology* 65(4): 375–384.