Institute of Environmental Sciences

**Topic: Effects of chemical and physical factors on bank vole** *Myodes* (*Clethrionomys) glareolus*metabolism, DNA and detoxification processes.

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**Background information (max 200 words):**

The project concerns effect of three factors: temperature, benzo[a]pyreneand ibuprofen on bank vole *Myodes* (*Clethrionomys) glareolus* chosen as a model organism*.* The problems connected with environmental contamination with benzo[a]pyreneare manifested in several European countries.The main anthropogenic sources of benzo[a]pyrene are: an incomplete combustion oforganic material, gasoline and diesel exhaust, and tires. As a result, it is an ever-present environmental pollutant, especially in cities, harmful for living creature. The second chemical factor ibuprofen,commonly used by people as anonsteroidalanti-inflammatory drug is also present in the environmental samples (about μg L-1, ng L-1), due to continuing release with municipal treatment plants effluents.This chronic exposure may cause distant toxic effects in non-target organisms (Rainsford 2015). People living in the cities are exposed to both chemicals. There is no need explain the effects of temperature on metabolism, because it is evident. More interesting problem is how temperature can modify toxicity of both substances alone and in combination when another chemical stressor will be present.

**The main question to be addressed in the project (max 200 words):**

The mine question in the project is how temperature, outside the thermoneutral zone affect toxicity andmetabolism of ibuprofen and benzo[a]pyrene during organism intoxication. As is known, physical condition of environment plays crucialrole in metabolism of organisms itself and in biotransformation of toxic substances in the tissues ofanimals. The next question will be how one substance may influence metabolism and toxicity of another substances and vice versa. Observed going on environmental changes: global warming, temperature anomaly, city temperature islands, and on the other hand very low winter temperatures in some places, and also results of researches strongly support conclusion that temperature should be taken into account in all toxicological and ecotoxicological investigations, any time we suppose that studied processes may depend on temperature.

**Information on the methods/description of work (max 200 words):**

The study will be performed with bank voles *Myodes (=Clethrionomys) glareolus (*order Rodentia, family Cricetidae, subfamily Arvicolidae).

Animals will be trapped during August-November period using live trapping method, along trapping transects (standard method). The trapping will be performed in week series (I plan 6 series to get sufficient number of individuals for experiment). Then animals will be transported to laboratory and placed individually in the plastic cages. Acclimatization to the laboratory conditions will take 14 days.

The 30-day experiment will be performed on 270 bank voles. Voles will be randomly assigned to different treatment groups.The voles will be kept individually in standard breeding cages under a 16:8h light:dark regime, temperature about 20 °C and will be given food and water *ad libitum*. At the end of experiment, animals will be killed by decapitation and the tissues samples will be obtained from each individual and frozen at -80 °C or preserve in the *RNAlater* buffer for future analyses.

Chemical and genetic analysis which will be performed as follows: levels of chemicals in the collected tissues, levels of main detoxifying molecules, DNA structure changes, activities of some enzymes.

The statistical analyses will be done using STATISTICA 10.0 or/and Statgraphics software.

**Additional information (e.g. special requirements from the student) (200 words):**

**The project has character of field and laboratory work. Student/s will be involved in trapping of animals in the field, so should like field work and not to be afraid of handing animals.**

**Laboratory work: performing experiment, genetic and chemical analysis would be interesting, giving possibility to learn new technics, but requires systematicity, involvement in the project and basic knowledge of genetic and biochemistry.**

**Place/name of potential foreign collaborator:**

**Dr. Jelena V Blagojević, Research Professor**

**University of Belgrade, Belgrade, Serbia; Institute for Biological Research Sinisa Stankovic.**

**References (3):**

1. Rainsford K.D (2015). Pharmacology and toxicology of ibuprofen . In: Ibuprofen: Discovery,

Development and Therapeutics, First Edition. Ed. K.D. Rainsford. John Wiley & Sons, Ltd.

1. Moffat I., Chepelev N., Labib S., Bourdon-LacombeJ. et al. (2015). Comparison of toxicogenomics and traditional approaches to inform mode of action and points of departure in human health risk assessment of benzo[a]pyrene in drinking water. Crit Rev Toxicol. 2015 January ; 45(1): 1–43.
2. Moffat I., Chepelev N., Labib S., Bourdon-LacombeJ. et al. (2015). Comparison of toxicogenomics and traditional approaches to inform mode of action and points of departure in human health risk assessment of benzo[a]pyrene in drinking water. Crit Rev Toxicol. 2015 January ; 45(1): 1–43.