МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ЛЬВІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ІМЕНІ ІВАНА ФРАНКА
МІНІСТЕРСТВО НАУКИ І ВИЩОЇ ОСВІТИ ПОЛЬЩІ
ПОМОРСЬКА АКАДЕМІЯ В СЛУПСЬКУ
ЗАХІДНИЙ НАУКОВИЙ ЦЕНТР НАН УКРАЇНИ ТА МОН УКРАЇНИ
FRIENDS OF LVIV UNIVERSITY, INC., USA

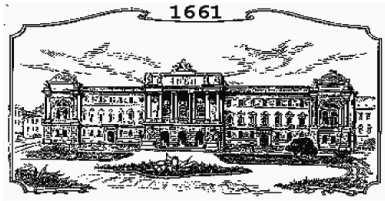
XIV МІЖНАРОДНА НАУКОВА КОНФЕРЕНЦІЯ
СТУДЕНТІВ І АСПІРАНТІВ

МОЛОДЬ І ПОСТУП БІОЛОГІЇ,

присвячена 185 річниці від дня народження Б. Дибовського

(ЛЬВІВ, 10 – 12 КВІТНЯ 2018)

ПРОГРАМА І ТЕЗИ ДОПОВІДЕЙ



ЛЬВІВ – 2018

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THE EFFECT OF FUEL POWER PLANTS INDUSTRY ON THE MOLECULAR RESPONSES OF STRESS AND DETOXIFICATION IN THE MUSSELS, BOTH RESIDENTIAL AND TRANSPLANTED

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Molecular responses of bivalve mollusks from the cooling reservoirs are studied extremely scant despite the combination of elevated temperature and industrial pollution in these freshwater bodies make them the excellent model systems for the study of the consequences of climate changing in the realistic environment [Falfushynska, 2018]. The goal of this study was to develop an integrated set of molecular and cellular biomarkers for assessment of the environmental impacts of the cooling ponds using transplanted mussels *Unio tumidus.* For that, male indigenous specimens of *Unio tumidus* from the cooling reservoirs of Burshtyn and Dobrotvir thermal power plants (BR- and DR-groups correspondingly) in Ukraine, pristine area (control) and mussels transplanted from pristine area to the cooling reservoirs for 14 days (BTr- and DTr-groups) were compared by their molecular responses of stress and activities of detoxification systems. Plural similarities between the indices of the residential and transplanted mussels, particularly in the highly polluted reservoir of Burshtyn plant, were shown.

All groups from the reservoirs, both residential and transplanted, were attested by the oxidative injury including downregulation of Cu, Zn-superoxide dismutase (SOD), lower levels of reduced glutathione and glutathione-*S*-transferase and elevated level of oxidized glutathion. Depletion of metallothionein protein was detected in most groups showing the deep depression of this stress-related and metal-buffering protein in the polluted environment and absence of its typical response (elevation) by the waterborne toxic metals abundant in these reservoirs (Cd, Cu). According to our experience [Falfushynska, 2014; 2018] we classify this down-regulation as a sign of an exhausting of the adequate response of stress and detoxification. Low activity of cholinesterase witnessed neurotoxicity in these groups. All groups from the cooling reservoirs had critically low lysosomal membrane stability determined by the Neutral Red Retention test. However, some differences distinguished the groups from Burschtyn and Dobrotvir. Particularly, Mn-SOD was up-regulated in the digestive gland in D-groups and down-regulated in B-groups. The similarity of responses of transplanted and residential mussels was confirmed by the Principal component analysis (PCA) for the mussels from Burstyn. However, PCA of the studied biological traits did not show such close similarity between two groups from Dobrotvir, DR and DTr, probably due to lesser level of impact in this pond, because some indexes did not change in the transplanted group compare to the control. Some differences attested the particular responses in the transplanted mussels (elevated levels of vitellogenin (a sign of endocrine disruption in males) and DNA-fragmentation).

Our findings indicate the limited capacity of cellular mechanisms to protect against multiple environmental insults. Importantly, a period of 14 days generally is optimal for adaptation of mussels in a new environment. Therefore this study has shown that transplanted mussels can serve as excellent bioindicators of environmental impact of the power plants.

This work has been granted by the Ministry of Education and Science of Ukraine (Projects ## 131B; M/70-2017; MV-1).

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