Institute of Molecular Biology and Genetics
NAS of Ukraine

ALL-UKRAINIAN CONFERENCE ON MOLECULAR AND CELL BIOLOGY WITH INTERNATIONAL PARTICIPATION

dedicated to the heroic struggle
of the Ukrainian people against russian invadors

June 15-17, 2022

CONFERENCE PROCEEDINGS

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24 th February 2022 Russia invaded Ukraine and this terrible war with destruction of civil infrastructure, including cultural, educational, and scientific objects interrupted the scientific work in our country. A lot of scientists were displaced within Ukraine or abroad. Our foreign colleagues immediately demonstrated great support and created a lot of opportunities for Ukrainian scientists in their countries. Despite this, most scientists stayed in Ukraine, some of them even in temporary occupied territories. Therefore, Young Scientist Council and in the Scientific Council of the Institute of Molecular Biology and Genetics NAS of Ukraine created the idea of All-Ukrainian conference with international participation with the aims to encourage Ukrainian scientists, to give the opportunity to colleagues from abroad to demonstrate their staunch support to Ukraine and to keep scientific process ongoing even on the background of the war.

The All-Ukrainian Conference on Molecular and Cell Biology with international participation was held as an online event on Zoom platform, from 15 th to 17 th of June 2022.

KEYNOTE SPEAKERS

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And **Vitaly Kordium (*Institute of Molecular Biology and Genetics, NAS of Ukraine, Kyiv, Ukraine) with special lecture***

LYSOSOMAL ALTERATIONS IN ORGANOPHOSPHATE-EXPOSED (ROUNDUP, CHLORPYRIFOS AND THEIR MIXTURES) ZEBRAFISH

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Background. General occurrence of organophosphate residues and their metabolites in water bodies worldwide due to the increasing use of organophosphates in agriculture raises concerns about their toxic effects on freshwater biota including fish, as well as human exposures through water and seafood.

The **aim** of the study was to study the individual and mixture toxicities of common pesticides Roundup and chlorpyrifos in environmentally relevant concentrations to the lysosomes of the zebrafish *Danio rerio* using molecular and biochemical methods.

Methods. Adult zebrafish were exposed to organophosphate pesticides Roundup [15 µg/L (RL) and 500 µg/L (RH)], chlorpyrifos [0.1 µg/L (CL) and 3 µg/L (CH)], and their mixtures (RH+CL and RL+CH) for 14 days. The comprehensive analysis of the markers of cytotoxicity (active cathepsin D and neutral red retention (NRR)) in lysosomes was carried out.

Results. NRR of lysosomes isolated from zebrafish liver tissue (as an index of the lysosomal membrane integrity) decreased by ~48% in all pesticide-exposed groups of fish. The total activity of cathepsin D, the key lysosomal protease, also increased in the zebrafish liver of in all treated groups. The maximum deviation of the cathepsin D activity from the control (by ~27%) was found in the fish exposed with 3 µg/L of chlorpyrifos.

Conclusions. Lysosomal dysfunction is commonly associated with pesticide-induced cytotoxicity in vertebrates including zebrafish (Bodnar et al., 2021). Our present study provides evidence that organophosphate pesticides are able to induce lysosomal membrane destabilization. As the consequence of lysosomal destabilization, the activity of cathepsin D increased in all organophosphate-exposed groups except for the fish exposed with 15 µg/L of Roundup. The effects of Roundup and chlorpyrifos on the lysosomal membrane stability were not concentration-dependent and similar in significance between the groups exposed to individual pesticide and their mixtures. Upregulation of cathepsin activity can induce transition from autophagy to apoptosis (Zhao et al., 2019), which partially explain our findings of apoptosis upregulation in the fish exposed to the high concentrations of Roundup and chlorpyrifos. These findings indicate that unlike the oxidative stress, which was increased consistent value in the all pesticide- and mixture-exposed groups (Falfushynska et al. 2022), lysosomal damage in zebrafish is a less sensitive marker of the pesticide-induced stress under the environmentally relevant Roundup and chlorpyrifos concentrations.

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