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CONSTITUTIVE PROTEIN COALATION IN *DROSOPHILA MELANOGASTER*

Background/Aim. Protein CoAlation is a redox-sensitive post-translational modification that involves the covalent attachment of coenzyme A (CoA) to protein cysteine. The previous studies on mammalian cells have demonstrated the accumulation of CoAlated proteins in response to metabolic and oxidative stress and have suggested that this process plays a protective role against irreversible thiol overoxidation. The aim of this study was to characterise endogenous protein CoAlation in *Drosophila melanogaster* under physiological and oxidative stress conditions. **Methods.** Protein CoAlation was analysed in adult *D. melanogaster* and 3rd-instar larvae using Western blotting and fluorescence microscopy with monoclonal anti-CoA antibodies. Oxidative stress was induced using hydrogen peroxide and paraquat under optimised experimental conditions. **Results.** Distinct endogenous CoAlation patterns were detected in *Drosophila melanogaster* under physiological conditions. Fluorescence microscopy of 3rd-instar larvae revealed tissue-specific distribution of CoAlated proteins, with the strongest signals observed in the nervous system, particularly in the brain and peripheral nerves. These findings suggest a potential association of protein CoAlation with neuronal redox regulation *in vivo*. Comparative analysis showed no substantial differences in CoAlation profiles between male and female adults or between 3rd-instar larvae and imagoes, indicating that the modification is maintained across developmental stages and sexes. To investigate the effect of oxidative stress, flies were exposed to hydrogen peroxide and paraquat under experimentally optimized conditions. However, despite confirmed stress induction, no increase in the protein CoAlation levels was detected. **Conclusions.** This study provides the first evidence of endogenous protein CoAlation in the multicellular model organism *Drosophila melanogaster* across developmental stages and sexes, with prominent localization in the larval nervous system. In contrast to observations in mammalian cell models, oxidative stress induced by hydrogen peroxide or paraquat did not result in increased CoAlation levels. Together, these findings identify protein CoAlation as a stable *in vivo* feature of *D. melanogaster* physiology and suggest that its regulation may differ substantially from that reported in mammalian systems. **Funding.** This work was supported by the National Academy of Sciences of Ukraine within the framework of the "Projects for Young Scientists 2025–2026" (No. 38/10–2025).

Keywords: protein CoAlation, CoA, oxidative stress, *Drosophila melanogaster*, redox regulation, PTM.

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