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Sub-acute toxic effects of thiamethoxam on the pancreas and testes of adult male albino rats and the possible protective role of Coenzyme Q10

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Summary

Pesticide poisoning is an important public health problem worldwide as the inappropriate use of these chemical products can lead to adverse effects on humans and the environment (Khaldoun-Oularbi et al., 2017).Neonicotinoid pesticides are a class of nicotine-related neuroactive pesticides that act on nicotinic acetylcholine receptors (nAChRs) in the insect central nervous system and their surrounding nerves (Short et al., 2021).In Egypt, NNs are among the most widely used pesticides because they stronglytarget invertebrates over vertebrates (Abd-Allah et al., 2022). Recent studies indicate that NNs are widely detected in food and environmental media worldwide, posing potential risks to human health and ecosystems. However, the toxic effects and exposure risks of NNs to non-target organisms, including humans, have not received sufficient attention. (Li et al., 2025).Thiamethoxam (TMX) is a typical representative of the second-generation neonicotinoid insecticides. It was developed by Ciba Crop Protection in 1996 andmarketed as Cruiser® for seed and Actara® for foliar treatment since 1998 (Yi et al.,2023; Fouad, 2023).Clothianidin (CLO) is the main metabolite of TMX. It may impair the function of the nervous system, endocrine system and reproductive development (Thompson et al.,2020).Exposure to pesticides may lead to the intense formation of reactive oxygenspecies (ROS), which can induce tissue injury by triggering multiple oxidative mechanisms and lipid peroxidation (LPO) (Elhamalawy et al.,2022). The systematic understanding of NN toxicity remains limited, highlighting the need to investigate its toxic effects and health risks to protect non-target organisms, including humans (Li et al., 2025). Coenzyme Q10 (CoQ10) is a natural fat-soluble ubiquinone, located in the mitochondrial membrane, where it plays a crucial role in the electron transport chain, facilitating cellular respiration and ATP production (Hussein et al., 2021; Silva et al., 2023). The reduced form of CoQ10 (ubiquinol) serves as a scavenger for free radicals to reduce chain initiation and disrupt chain propagation events (Testai et al., 2021). Aim of the work: The aim of the present study is to #Assess the sub-acute oral toxicity of TMX on the pancreas and testes of adult male albino rats and the ameliorative effects of CoQ10 co-administration on TMX-induced pancreatic and testicular toxicity of adult male albino rats through the following:1- Histopathological examination by light microscopy. 2- Biochemical studies (hematological examination and semen analysis). 3-Immunehistochemical studies.

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