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Protective role of vitamin-E over the acetamiprid toxicity in mice testis

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Statement of the Problem: Acetamiprid (ACMP) is an insecticide of the neonicotinoid class, widely used for combating insects in many areas of agricultural production. Neonicotinoids act as agonists of acetylcholine in the synaptic range and inhibit synaptic stimulation by binding to the nicotinic acetylcholine receptors in the central nervous system of insects. Since different nAChRs subspecies are expressed in human testes, prostate, mammalian nervous system, mouse testes and spermatozoa, these organs are the main targets of neonicotinoids and therefore acetamiprid. It has been reported that the insecticides cause structural and functional damage to spermatozoon, Sertoli cells and Leydig cells by oxidative stress in the testis. Vitamin-E is a cell membrane soluble vitamin and plays a protective role against harmful effects of free radicals in cells and tissues with antioxidant property. It is known that Vitamin-E is a potent lipophilic antioxidant that is vital for the protection of mammalian spermatogenesis and is present in high amounts in Sertoli and spermatogenic cells. We propose that the use of vitamin-E against acetamiprid testis toxicity may play protective role through oxidant-antioxidant mechanism.

Methodology & Theoretical Orientation: Thirty mice were divided into 5 groups (n=6 for each): water, corn oil, ACMP (25mg/kg/day), Vit-E (100mg/kg/day), ACMP+Vit-E (25mg/kg/day ACMP and 100mg/kg/day Vit-E). After 21 days, testis tissues were taken for histological, biochemical and intracellular ultrastructural evaluations.

Findings: In water, corn oil and Vit-E groups, testes tissues had normal testicular histomorphology, mature-healthy spermatogenic cells and seminiferous tubules. In ACMP group, degenerations in germ cells that accumulated in the lumen of the seminiferous tubule, seminiferous tubular atrophy and organization disorder of seminiferous tubule epithelium were observed. Histomorphological damage changes in the ACMP+Vit-E group were less than in ACMP group. However, histological scores showing the tissue improvement in ACMP+Vit-E were not very close to water, corn oil and Vit-E groups.

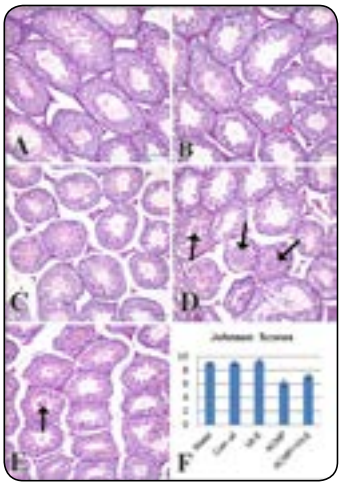

Figure 1. A, B, C, D, E: Hematoxylin-eosin (HE), 10x objective, scale bar: 100 µm. A: water, B: corn oil, C: Vit-E, D: ACMP, E: ACMP+Vit-E. Arrows: Acumulated spermatogenic cells at the lumen of seminiferous tubules. F: Comparison of Johnsen scores for each group.

Recent Publications:

1. Matsuda K et al. (2001) Neonicotinoids: insecticides acting on insect nicotinic acetylcholine receptors. Trends in Pharmacological Sciences. 22:573-580.

2. Shimomura M et al. (2006) Role in the selectivity of neonicotinoids of insect-specific basic residues in loop D of the nicotinic acetylcholine receptor agonist binding site. Mol. Pharmacol. 70(4):1255-1263.
3. Tomizawa M and Casida J E (2005) Neonicotinoid insecticide toxicology: mechanisms of selective action. Annual Review of Pharmacology and Toxicology. 45:247–268.
4. Mahat R K et al. (2015) Role of oxidative stress and antioxidants in male infertility. International Journal of Health Sciences and Research. 5(3):324-333.
5. Turner T T and Lysiak J J (2008) Oxidative stress: a common factor in testicular dysfunction. Journal of Andrology. 29(5):488-498.

Biography

Semir Gul is a PhD student in the Department of Histology and Embryology, Faculty of Medicine, Inonu University, Turkey and obtained his Master's Degree from the same university. He graduated from Molecular Biology and Genetics Department in 2010 from Izmir Institute of Technology, Turkey. His research interests are: toxicology, reproductive biology and developmental biology.

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