Blood and tissue levels of diazinon in rabbit following a subacute dermal exposure to incremental doses

Arab, H.A.1, Goudarzi, M.1, Koohi, M.K.2, Shams, G.R.1

1Department of Pharmacology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran
2Department of Basic Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

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Abstract:
BACKGROUND: Uncontrolled application of diazinon (DZN) can cause environmental contamination and adverse health effects on humans or animals. OBJECTIVES: This study aimed to investigate the toxic effects and the level of DZN in serum and tissues of rabbits following a sub acute dermal exposure to toxicant. METHODS: Different doses of DZN were applied daily to New Zealand rabbits through the ear skin in incremental doses for 4 weeks. Blood samples were collected at the beginning and the end of each dose-week period. Tissue samples were collected from brain, muscle, kidney and liver on day 28, after euthanizing the rabbits. DZN contents of the blood and tissue samples were measured using a reversed phase HPLC system. RESULTS: Clinical observations indicated signs of toxicity in the animals exposed to DZN as shown by diarrhea and body weight loss from day twenty. The level of DZN in the blood elevated with enhancing exposure time and reached the highest level at the end of the fourth week (0.620±0.26ppm). The highest level of DZN was found in the brain tissue (0.341±0.015 ppm). CONCLUSIONS: The results of this study revealed the tissue accumulation and subsequent toxic effects of DZN following the subacute dermal exposure to the toxicant. It suggests that the determination of the toxicant level in the serum or tissue can be a monitoring method for the detection of the contamination rate.

Introduction

Organophosphorus (OP) compounds are phosphate esters extensively used to control different pests, parasites and fungi in veterinary medicine or to kill weeds in agriculture. Diazinon (DZN) as an organophosphorus compound was first developed as an insecticide, acaricide, and nematicide, and is currently used as a wide spectrum contact pesticide in many countries against insects and other parasites living on the pets, farm animals, crops and ornamental plants (Cupta, 2006; Jeyaratnam & Marom, 1994). Extensive and uncontrolled application of toxicants may lead to the contamination of the environment and thus causes serious health problems. Noticeable accumulations of these compounds have been detected in marine and non-marine organisms, soil, fruits and vegetable field crops (Hayes, 1980; Larkin et al., 2000).

Diazinon exerts its toxic effects by the inhibition of acetylcholinesterase (AChE), an enzyme necessary for the function of the central and peripheral nervous systems. It irreversibly binds to AChE and inhibits the hydrolysis of the acetylcholine (ACh) in cholinergic synapses and neuromuscular junctions. This can result in the enhanced accumulation of ACh at cholinergic receptors leading to overstimulation of nerves and muscles. High level of DZN exposure can lead to neurotoxic effects manifested by broncho-constriction, increased secretion, diarrhea, hypoten-