Summary of the PhD thesis No……, Faculty of Veterinary Medicine, Urmia University. The academic year 2025-2024

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Title of thesis:

The role of peripheral and central alpha-2 adrenergic receptors on the action of N-acetylcysteine in urethane-induced hyperglycemia in rats.

Summary:

N-acetylcysteine, a synthetic compound of the amino acid cysteine, is used to treat respiratory, neurodegenerative, and metabolic disorders (diabetes mellitus) due to its antioxidant, anti-inflammatory, and anti-apoptotic properties. Urethane is a chemical used to induce anesthesia in laboratory animals, and one of its effects is to increase blood glucose levels (hyperglycemia). In the present study, the effect of N-acetylcysteine on acute urethane-induced hyperglycemia in rats was investigated and its possible mechanisms of action were investigated by intraperitoneal and intraventricular injections of yohimbine (alpha 2-adrenergic receptor antagonist) and measurement of insulin, malondialdehyde (an indicator of oxidative stress), and total antioxidant capacity (an indicator of the intrinsic antioxidant system) in serum.N-acetylcysteine was injected intraperitoneally at 12.5, 25, and 50 mg/g body weight. Yohimbine was administered intraperitoneally at 0.25 and 1 mg/g body weight and intraventricularly at 2.5 and 10 μg/g to rats. Blood glucose levels were measured from the blood before and at 30, 60, 90, 120, 150 minutes after intraperitoneal injection of normal saline and urethane using a glucometer, and cardiac blood samples were taken to determine serum insulin concentration using an ELISA kit. N-acetylcysteine (25 and 50 mg/kg body weight), peripheral urethane (0.25 mg/kg body weight), central urethane (10 μg/rat), peripheral N-acetylcysteine (12.5 mg/kg body weight) with peripheral yohimbine (0.25 mg/kg body weight) and with central yohimbine (2.5 μg/rat) prevented urethane-induced hyperglycemia. Urethane did not change serum insulin levels but N-acetylcysteine and yohimbine increased serum insulin levels. N-acetylcysteine reversed the increased malondialdehyde levels and decreased total antioxidant capacity in serum. The methods of drug administration did not affect blood glucose levels. N-acetylcysteine and yohimbine (peripheral and central) and their combined use did not cause significant changes in blood glucose and serum insulin levels in rats receiving normal saline. Based on the results, it can be suggested that N-acetylcysteine has the ability to prevent urethane-induced hyperglycemia. Peripheral and central alpha-2-adrenergic receptors, stimulation of insulin secretion, suppression of oxidative stress, and increased activity of the endogenous antioxidant system may be involved in these effects of N-acetylcysteine.

Keywords: Alpha-2 adrenergic receptors, acute hyperglycemia, insulin, N-acetylcysteine, oxidative stress, rat .