Summary of the Ph.D thesis No., **24634** Faculty of Veterinary Medicine, Surgery, Urmia University.
The academic year: 2024-2025

Author: Mohammad Hossein Farjah

Title: Evaluation of chemical castration through intratesticular injection Zinc-doped carbon dots in rats

Summary:

Castration in animals is performed for various purposes, including behavior control, performance improvement, and population control. There are various methods for sterilization. Surgical sterilization, chemical sterilization, and immunological sterilization are among these methods. The present study was conducted for chemical sterilization. 25 rats were divided into five groups of five. The grouping included the control group without injection, the sham group receiving 0.5 ml of distilled water, and the third to fifth groups were injected 0.5, 2, and 8 mg/kg of carbon dot zinc into both testicle. After 60 days, the testicles were separated and tests including sperm count, viability, membrane function, DNA damage, and sperm motility indices including BCF, STR, LIN, VAP VSL, VCL, and ALH were performed. Total oxidative stress, antioxidant capacity, spermatogenesis and sperm maturation, biopsy indices and testicular histological evaluation were also performed. It was observed that membrane function and sperm viability decreased depending on the dose of zinc carbon dots. DNA damage also increased depending on the dose of zinc carbon dots. Sperm concentration in the group receiving Zn CDs 8 mg/kg had the lowest value. In fact, sperm concentration decreased among the groups depending on the concentration of carbon dots. Overall sperm motility also decreased depending on the treatment concentration. Progressive motility is also similar to overall motility, and with increasing treatment concentration, the rate of forward motility was decreased siginificantly. Average speed, actual speed, and speed in the curved and straight paths also decreased sharply with increasing concentration in the treatments. Speed in the straight path, straightness criterion, straightness criterion, and frequency of lateral movements in the control and sham groups did not differ significantly. In the other groups receiving treatment, the speed decreased significantly with increasing concentration. Total oxidative stress in the 2.00 mg/kg Zn CDs group was the highest. Total antioxidant capacity, percentage of seminiferous tubule maturation, biopsy indices, testosterone production, and spermatogenesis decreased with increasing treatment concentration. Tissue damage to the testis also showed severe damage in histological observations at the highest concentration of zinc dot carbon. The results of this study showed that intratesticular injection of zinc-doped carbon dots at a dose of 8 mg/kg can lead to impaired fertility and sterilization in male rats without causing side effects.

Keywords: Zinc-doped carbon dots, Spermatogenesis, rat, Testosterone