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Thesis Title: Effect of Intra-Testicular Injection of White Onion Juice-derived Carbon Quantum Dots on Spermatogonial Stem Cells Self-renewal and DNA and mRNA Damages in Testicular Tissue of Mature Rats

Abstract:

Non-invasive approaches of castration have gained significant attention due to the lower post-operative complications and costs compared to the invasive surgical ones. This study aimed to scrutinize the effect of intra-testicular injection of white onion juice-derived carbon quantum dots (CQDs) on spermatogonial stem cells self-renewal and DNA and mRNA damages in testicular tissue of mature rats. Fifteen mature male rats were allotted to three equal groups, including control, sham, and CQDs (40 mg/kg in 0.50 mL normal saline into each testicle) groups. The CQDs were synthesized from white onion (*Allium cepa*) juice using one-step hydrothermal carbonization method. On 60th day, the rats were euthanized and GDNF and 8-Oxo-dG, as well as mRNA damage levels in testicular tissue were analyzed through immunohistochemical and fluorescent staining analyses, respectively. Intra-testicular injection of CQDs resulted in a pronounced reduction in GDNF synthesis along with mRNA damage and 8-Oxo-dG levels escalation in testicular tissue compared to the control and sham groups. Intra-testicular injection of CQDs can cause infertility in mature male rats through spermatogonial stem cells self-renewal disruption, DNA oxidation, and mRNA damage induction, introducing CQDs as promising agents for *in situ* non-invasive castration.

Keywords: Carbon Quantum Dots, Chemical Castration, Rat, Spermatogonial Stem Cells, Testis