Effect of Subacute Exposure to Bisphenol A on Thyroid Function in Male Rats During Puberty: Evaluation of the Simultaneous Effect of Berberine Silver Nanoparticles

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ABSTRACT

Introduction: Bisphenol A (BPA), used in producing polycarbonate plastics and epoxy resins, is found in baby bottles, food can linings, and packaging, with human exposure mainly through contaminated food. Berberine, a natural flavonoid, exhibits antioxidant, anti-inflammatory, antimicrobial, antidiabetic, anxiolytic, analgesic, and anticancer properties. This study investigates the effects of berberine nanoparticles, enhanced for solubility via antisolvent precipitation, on BPA-induced changes in thyroid tissue, histopathological alterations, and berberine's potential as a protective agent against oxidative damage in the thyroid of male rats during sexual maturation.

Methods and Materials: This study divided 36 male Wistar rats into six groups (n = 6). For 30 days, rats in the BPA group received 200 mg/kg of BPA, while the control group received 5 ml of olive oil. Two groups received BPA and berberine nanoparticles at different doses (5 and 10 mg/kg), and two other groups received only berberine nanoparticles at the same doses via gavage. Thyroid tissues were evaluated for antioxidant enzyme activity and histopathological changes, and serum samples were assessed for other markers. Statistical calculations will be performed using SPSS software. Data will be presented as mean ± SEM. All charts will be prepared and presented using Prism software.

Results: No significant differences in serum concentrations of T3 and T4 were observed in the intervention groups compared to the control group (p 0.05). Additionally, no significant changes in serum TSH levels were observed in any of the groups (p 0.05). BPA does not cause oxidative damage in the thyroid tissue of male rats. Treatment with BPA and berberine nanocrystals, either alone or in combination, did not affect the levels of oxidative biomarkers (GSH, MDA) in thyroid tissue.

Conclusion and Discussion: This study investigated BPA and berberine nanocrystals on thyroid tissue and oxidative biomarkers in male Wistar rats. BPA exposure (200 mg/kg for 30 days) did not induce thyroid tissue damage or oxidative effects. Co-administration with berberine nanocrystals (5 and 10 mg/kg) also showed no significant changes in oxidative biomarkers (GSH and MDA) or thyroid hormone levels (T3, T4, TSH) compared to controls. BPA at this dose did not cause measurable oxidative stress or thyroid dysfunction in male rats, and berberine nanocrystals did not mitigate BPA-induced effects. Future research should explore different dosages and exposure durations to understand these interactions better.

Keywords: Berberine, Nanoparticles, Wistar rats

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