

Plant Growth Regulator (4-Chlorophenoxy Acetic Acid) impairs on antioxidant system in testicular tissue of rats without changing body weight and hormonal levels

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Introduction and Purpose: 4-Chlorophenoxy Acetic Acid (4-CPA) is one of the Plant Growth Regulator Hormones (PGRH) that is commonly used in greenhouses, particularly in tomato production, to improve harvest and quality. However, remnants of PGRHs on plants may adversely affect human health if their dosing and timing is not strictly followed.

Material Method: Study included 40 male Wistar Albino rats that were 20 days old. The rats were randomized into 5 (untreated control, saline control and 25-50-100 mg/kg/day 4-CPA) groups. Each rat received intended dose of 4-CPA every day until 50 days of age. Rats in the untreated control group did not receive any substance for 30 days (between the 20th and 50th day). Saline control group received 0.5 saline solution for 30 days to simulate the stress caused by handling and administration of an oral drug. Rats in the 4-CPA groups received 25, 50 and 100 mg/kg/day doses of 4-CPA orally once a day for 30 days (between the 20th and 50th day) between 8-10 a.m. in the morning. During the study period body weights of the rats were measured and recorded. Doses of the drug were continuously recalculated according to the body weight. The study was terminated on the 50th day between 8-10 a.m. after administration of the last dose. Levels of malondialdehyde (MDA), nitric oxide (NO) and antioxidant glutathione (GSH) in testicular tissue were measured as indicators of lipid peroxidation using spectrophotometric methods.

Results: When weights of the male rats at the time of sacrifice (50th day) were assessed, animals in the level-25 group were heavier than those in the level-50 group, and animals in the level-50 group were lighter than those in the level-100 group. Body weight did not show significant difference between the other groups. Groups did not show difference in terms of testicular weight. No significant difference was observed between the MDA, GSH and NO levels of the control and saline groups. However, 4-CPA was found to cause dose-dependent increase in MDA and NO levels together with a decrease in GSH levels (0.001).

Discussion and Conclusion: Endocrine disruptors are known to cause various pathologies in reproductive systems, particularly in humans. Correspondingly exposure of prepubertal male and female rats to 4-CPA until puberty have been shown to adversely affect reproductive system and lead to apoptosis in reproductive organs in a dose-dependent manner. Apoptotic death of cells in gonads due to endocrine disruptors has been attributed to inhibition of antioxidant enzymes by various mechanisms and subsequent increase of reactive oxygen radicals in the tissue. Our results confirmed that 4-CPA increase the oxidative stress in a dose-dependent manner and suppress the antioxidant defense mechanisms. However, body weight did not show significant difference. We believe that our study will enlighten future studies since no study on this subject has been encountered in the literature. Our study also emphasizes the need for further studies to assess the effects of this commonly used substance in greenhouses on the reproductive systems of the children.

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