Effects of the phytoestrogen genistein on the development of the reproductive system of sprague dawley rats

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OBJECTIVES: Genistein is known to influence reproductive system development through its binding affinity for estrogen receptors. The present study aimed to further explore the effect of Genistein on the development of the reproductive system of experimental rats.

METHODS: Eighteen post-weaning female Sprague Dawley rats were divided into the following groups: (i) a control group that received vehicle (distilled water and Tween 80); (ii) a group treated with 10 mg/kg body weight (BW) of Genistein (Gen 10); and (iii) a group treated with a higher dose of Genistein (Gen 100). The rats were treated daily for three weeks from postnatal day 22 (P22) to P42. After the animals were sacrificed, blood samples were collected, and the uteri and ovaries were harvested and subjected to light microscopy and immunohistochemical study.

RESULTS: A reduction of the mean weekly BW gain and organ weights (uteri and ovaries) were observed in the Gen 10 group compared to the control group; these findings were reversed in the Gen 100 group. Follicle stimulating hormone and estrogen levels were increased in the Gen 10 group and reduced in the Gen 100 group. Luteinizing hormone was reduced in both groups of Genistein-treated animals, and there was a significant difference between the Gen 10 and control groups (p<0.05). This was consistent with increased atretic follicular count, a decreased number of corpus luteum and down-regulation of estrogen receptors-α in the uterine tissues of the Genistein-treated animals compared to the control animals.

CONCLUSION: Post-weaning exposure to Genistein could affect the development of the reproductive system of ovarian-intact experimental rats because of its action on the hypothalamic-pituitary-gonadal axis by regulating hormones and estrogen receptors.

KEYWORDS: Genistein; Reproductive; Anatomy; Development; Phytoestrogen.


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INTRODUCTION

The phytoestrogen Genistein belongs to a class of isoflavones found in soybeans, which forms the main dietary source of phytoestrogens for humans, cattle and rodents (1-3). Despite many positive effects that have been reported, questions are being raised regarding their role as endocrine disrupting chemicals (4-6). Some adverse effects have been observed in reproductive tract development and differentiation (7-9).

The action of Genistein varies according to the types of cells, the animal species and the treatment protocol, including the dosage and period of exposure (10-13). Genistein has been reported to exhibit estrogenic activity by causing myometrial hypertrophy in Genistein-treated rats (13). Its ability to suppress mammary cancer demonstrates its anti-estrogenic activity (14-16). Both estrogenic and anti-estrogenic actions of Genistein are associated with the phenolic ring observed in its chemical structure. This feature allows Genistein to bind to estrogen receptors (ER) (12,17-20).

The two types of ER are ER-alpha (α) and ER-beta (β). ER-β is found in brain, pituitary, and reproductive tissues, including the uterus and ovary (4,21-23). Genistein has the