

EFFECT OF ZnO NPs ON THYROID FUNCTION AND EVALUATION OF THE LEVELS OF TSH RECEPTOR GENE IN THYROID TISSUE OF FEMALE RAT

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ABSTRACT : Nanoparticles are an increasingly used material at present, due to their unique properties that enable them to increase their effectiveness. one of these materials used in many fields, especially medical and cosmetic products is ZnO NPs. The frequent use of these particles makes them in direct contact with human bodies. The thyroid gland is one of the most important organs responsible for all activities that take place inside the body. The thyroid gland expresses on its surface receptor called thyroid-stimulating hormone receptor (TSHR). This receptor is an important aspect of the thyroid gland that interaction with the thyroid stimulates hormone on the follicular cells of the thyroid gland, through which it regulating the function of the gland. Consequently, TSHR is a part of the system that responsible for the development and metabolism processes in the human body. Aim of study: the purpose of this study was to find out the effect of the ZnO NP on the levels of T₃, T₄ and TSH hormones in addition to estimate the expression of TSHR-gene that present in the thyroid gland tissues of female rats. Fifty-four adult female rats at randomly classified into three main groups, one of them used as a control and the others as treatment groups, each group was subdivided into three subgroups, and every one consist of 6 rats. The control groups had been injected with 1ml of distilled water, while the treatment groups injected with 1 ml of ZnO NPs at two different doses (50 and 200) mg/kg, in duration (1, 2 and 4) weeks at a rate of three doses per week through intra-peritoneal route. Statistical analysis: The data were calculated to compare between the means of treatment and control groups. The results of this study indicated a highly significant increase in the levels of T₃ and T₄ hormones in all treated animals at different period of times, in contrast, demonstrated a significant decrease in the serum level of TSH hormone in animals that received high and low doses in duration 4 weeks, the results as well indicate clearly reduction in the expression level of TSHR genes in treated animals at different periods of time in comparison with the control groups.

Key words : ZnO NPs, thyroid gland, TSHR gene, T₃, T₄, TSH.

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INTRODUCTION

Nanoparticles (NPs) are a wide class of materials that present on a nanometre scale, which have at least one dimension with a size less than 100 nm (Laurent *et al*, 2008). They are known to have completely different Physico-chemical properties from those of larger particles due to their relatively larger surface area (Ryu *et al*, 2014). Due to the wide application of nanomaterials in different fields and products, these particles have gained a great deal of public interest (Pasupuleti *et al*, 2012). Zinc oxide nanoparticles (ZnO NPs) consider the important metal oxide nanoparticles commonly used in various fields, like industry products and foods due to their distinctive physical and chemical properties (Jiang *et al*, 2018). In addition to its strong UV absorbing

properties, so the ZnO is increasingly used in personal care products, such as cosmetics and sunscreen (Newman *et al*, 2009).

The thyroid gland is a section of the endocrine system which consists of cells that produce, storage, and release hormones into the bloodstream (Hiller-Sturmhöfel and Bartke, 1998). The thyroid gland and its hormones play multiple roles in the development of the body and their organs and in the homeostatic regulation of basic physiological processes such as body growth and energy expenditure in the vertebrates (Nilsson and Fagman, 2017). There are receptors expressed on the cell surface of the thyroid follicular membrane that plays an essential role in the regulation growth and function of the thyroid gland (Borel and Sabliov, 2014). It is consists of 764 amino acids