

## **Assessment of sperm morphology, chromatin integrity and Catsper genes expression in hypothyroid mice**

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### **Abstract**

There is an obvious relationship between fertilizing capacity of sperm and with the normal morphology, quality chromatin and motility of sperm. It is well known that thyroid hormones are the major regulators of testicular function. A correlation was found between the hypothyroidism and sperm damages. We studied the effects of hypothyroidism on sperm morphology, chromatin quality and motility. In this study, 20 male mice were divided into the control and the hypothyroid group that received 0.05% 6-n-propyl-2-thiouracil (PTU) for 35 days. Sperm morphology with Papanicolaou staining and sperm chromatin quality with both Aniline Blue (AB) and Toluidine blue (TB) staining were assessed. As well as, immunohistochemistry and real-time PCR were done to evaluate the cation sperm channel (Catsper) genes changes. A significant increase in the sperm chromatin condensation was

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found in the hypothyroid mice comparison to the control mice ( $p<0.05$ ). Furthermore a significant decrease was observed in the morphology of normal sperm in hypothyroid mice compared to the controls ( $p<0.05$ ). Hypothyroidism could down-regulate the expression of CatSper genes. Immunohistochemical data confirmed the real time-PCR results. Our study suggested that hypothyroidism could adversely affect sperm morphology, as well as sperm chromatin condensation and Catsper gene expression in the mice and these abnormalities may be related to the excessive production of reactive oxygen species (ROS) in hypothyroid state.

**Running title: hypothyroidism and sperm chromatin, morphology and Catsper genes**

**Key words:** hypothyroidism, sperm, chromatin, Catsper, testis.

## **Introduction**

Infertility is a widespread problem that approximately affects 15-20% of young couples. About 30-40% of all infertility cases are attributed to the male factors (22, 32). Male infertility has many causes from hormonal imbalances to physical and psychological problems. Thyroid hormones are the important regulators of growth, development and metabolism in the most tissues of mammals (9, 28, 36, 40). For many years, male reproductive system was regarded as an unresponsive organ to the thyroid hormone. However, the studies of the two recent decades have demonstrated that testis responses to the thyroid hormones (5, 39, 40). Previous studies have revealed that thyroid dysfunction can lead to the morphological and functional abnormalities in the testis. Hypothyroidism as one the most common endocrine disorders has been reported to be associated with impairment in the percentage of live sperms, sperm numbers, sperm morphology, and sperm motility (8, 14, 15, 21, 36). Sperm motility is considered to be one of the best predictors of a man's fertilizing potential. However, appropriate form of motility which is termed the hyperactivated motility is required for sperm to penetrate the egg and deliver its genetic material (1, 2, 7, 11, 27, 33).