Research Journal of Recent Sciences _____ ISSN 2277-2502
Vol. **1(6),** 55-57, June **(2012)** *Res.J.Recent Sci.*

Short Communication

The Effects of Induced Hyperthyroidism on Plasma FSH and LH Concentrations in Female of Wistar Rats

Idris M.A.[1], Idris O.F.[2] and Sabahelkhier M.K.[2]
[1]Department of Biochemistry, Faculty of Medicine and Health Sciences, University of Dongola, SUDAN
[2]Department of Biochemistry and Molecular Biology, Faculty of Science and technology EL-Neelain University, SUDAN

Available online at: www.isca.in
(Received 22nd February 2012, revised 26th February 2012, accepted 20th March 2012)

Abstract

Thyroxine and triodothyroine are essential for the normal growth, development and functions for normal organs. These hormones regulate the basal metabolic rate (BMR) of all cells and play a critical role in the development of several organ systems such as reproduction system. Our objectives are to investigate the effects of experimental induced hyperthyroidism on plasma FSH and LH concentrations in female Wistar rats and answer specific question what was worse to have excess thyroid hormones. The experimental study was located at the University of Kwa-Zulu Natal (UKZN), Faculty of Science and Agriculture, School of Biochemistry, Genetics and Microbiology, Westville Campus South Africa, from October 2009 - May 2010. Twenty four adults female Wistar rats divided into two main groups, twelve rats in each were used. Thyroxine was administered orally. The dose was 100 µg/ kg body weights for three weeks daily at 9:00 am; Euthyroid rats received three ml of deionizer water. The results of thyroid hormones concentration (TSH, T_3 and T4) and gonadtrophins (FSH and LH) were determined by using enzyme immunoassay kits from TOSOH, Corporation Japan. By Hitachi 906 analyzer. Rats body weight and food, water consumption were record every third day of experimental. The results of rats body weight showed significant decreased ($P \leq o.o5$) in hyperthyroid rats compared to control group. Thyroid hormones showed significant ($P \leq o.o5$) increased in hyperthyroid, but FSH and LH showed conflict results.

Keywords: Hyperthyroidism, thyroxine and reproductive.

Introduction

No other hormone affects such wide range of cells and tissues as thyroid hormones. Thyroid hormones are responsible for regulation of oxygen consumption, thermogenesis and lipogenesis[1]. The primary functions of T3 are to regulate carbohydrate and protein metabolism in all cells. Thus, changes in T3 can affect all organ systems of the body with profound effects on the cardiovascular, nervous, immune, and reproductive systems. In the developing animal and human, the thyroid regulates growth and metabolism and plays a critical role in tissue development and differentiation. For example, T3 affects perinatal development of a-adrenergic receptors and is important for cardiac b-adrenergic receptor development[2]. T3 also may interact with and modulate the action of other hormonal systems such as growth hormones and steroids. Thyroid disorders are common worldwide. In Africa dietary iodine deficiency is the major determine of thyroid pathology resulting in iodine deficiency disorders (IDD), including goitre and mental retardation[3]. In Sudan iodine deficiency is widespread and severe particularly in States of Darfour and Blue Nile, where goitre prevalence rate as high as 87% and 75% respectively[4]. Normal thyroid hormones blood levels are essential for growth and development of tissues. Changes in thyroid hormones levels can adversely affects fertility pregnancy out come and postnatal development in humans and animals with major effects in reproductive system development[5]. Hyperthyroidism or thyrotoxicosis is characterized by an increase in serum TSH[6]. Hyperthyroidism induced alteration in the reproductive system such as altered levels of LH and FSH and also altered steroids ratio in laboratory animals and humans[7]. Hyperthyroidism in adult's female humans and rats is associated with altered levels of LH. Hyperthyroidism in adult female humans and rats is associated with altered levels of LH. Alteration in sex steroid metabolism and increased incidences of oliogomenorrhea and amenorrhea also are noted in humans[8].

Results of studies in the effects of hyperthyroidism in prepubertal female humans and rats are conflicting[9]. The objectives of this study were assessing the effects of induced hyperthyroidism on plasma FSH and LH concentrations in female of wistar rat.

Material and Methods

Experimental Animals: Twenty four Female Wistar rats weight (250-300 gm) were used in the experimental and provided with standard laboratory rats chow food and water when they were put out of metabolic cage. They were bred and housed in Biomedical Resource Unit (BRU) in UKZN. The animals were maintained under standard laboratory conditions of constant temperature (22±20 ^{o}C), CO_2 content of < 5000

ppm, relative humidity of 55±50 % and the noise level of > 65 decibels. The animals had free access to standard rats chow food and water when they were out of the metabolic cages (E pol. Diet. 4700. Epol South Africa). All the procedures were performed from UKZN animal's ethic codes. And we approved the UKZN animal ethics sub-committee reference (045/10/A) date: 11.12.2009.

Experimental Protocol: The rats were initially acclimatized for three days acclimated period and then every third day of experimental were put in the metabolic cage for 24 hours. Rats body weight, food and water consumption were record every third day of experimental period. The experimental model of hyperthyroidism was induced by oral administered of thyroxine tablets dissolved in distilled water. The dose was 100 µg/kg body weights for three weeks at 9:00 am[10]. Rats were sacrificed after anesthetized by halothane on day twenty three. Blood was drawn directly from the right atrium of the heart. Separation of plasma was achieved by centrifugation.

Methods: Rat's body weight, food and water consumption were measured and recorded every third day of experimental period. Thyroid hormones concentrations were measured by using enzyme immunoassay kits from TOSOH corporation shiba-koen First Bldg, 3-8-2, Shiba, Minato-ku, Tokyo 105-8623, Japan, through Hitachi 906 analyzer[11]. Gonadtrophins hormones concentrations were measured by using Enzyme Immunoassay kits from TOSOH Corporation Shiba-Koen First Bldg, 3-8-2, Shiba, Minato-ku, Tokyo 105-8623, Japan, through Hitachi 906 analyzer[12].

Statistical analysis: All values were express as means ± SD. The students-t test was used for the evaluation of differences between two female Wistar rats groups. The differences were considered significant if *a P.* value was less than 0.05.

Results and Discussion

The results (table 1) indicate mean value of body weight in hyperthyroid female Wistar rats were significantly (P ≤ o.o5) decreased as compared to control group. This decreased in body weight was associated with reduction in food and water consumption.

These findings are showed that thyroxine depletion did induce a loss in body weight. These results are confirmed findings those given by Venditti *et al.*[13], and Pamplona *et al.*[14].

Table-1
Mean values of rats body weight, food consumption and water consumption

Parameters	Control Group	Hyperthyroid Group
Body weight of rat (gm)	251.02(.±29.32)[b]	233.59 (.±28.98)[a]
Food Consumption (gm)	18.28 (±5.24)[d]	19.49 (±5.77)[c]
Water Consumption (ml)	28.39 (±8.48)[f]	29.77 (±8.43)[e]

All Values are means ±SD. Means within rows with not sharing common letter (s) are significantly different (P ≤ o.o5).

The results (table 2) illustrate that in hyperthyroid group, T_3 and T_4 is higher than in control rats group, but TSH is low in hyperthyroid group as compared with control group. This finding was accepted due to effective of thyroxine use in inducing hyperthyroidism. Because hyperthyroidism (or thyrotoxicosis) is characterized by an increase in serum T3 and T4 and a decrease in serum TSH. The most common cause of hyperthyroidism is Graves' disease (production of antibodies to TSH receptor). In previous studies, the peak age-specific incidence of Grave's disease was between 20 and 49 but incidence has been reported to increase with age, with the peak occurring at 60–69 years in a Swedish study[6]. FSH and LH showed conflict results; FSH was decreased not significant in contrast to LH, which was increased in hyperthyroid as compared to control rats group.

Table-2
Mean values of plasma thyroid hormones and gonadtrophins concentrations

Parameters	Control group	Hyperthyroid group
TSH µIU/Ml	0.1 (±0.00)[a NS]	0.01 (±0.00)[a NS]
T_3 ng/mL	0.38 (±0.09)[c]	1.5 (±0.51)[b]
T_4 µg/Dl	1.48 (±1.41)[e]	8.80 (±1.24)[d]
FSH mIU/mL	< 1.00 (±0.00)[g NS]	< 0.20 (±0.00)[f NS]
LH mIU/Ml	<0.20 (±0.00)[i NS]	<1.00 (±0.00)[h NS]

All Values are means ±SD. Means with rows not sharing common letter (s) are significantly different (P ≤ o.o5).

Conclusion

The results indicated that thyroxin used for inducing hyperthyroidism was effective. Results of LH and FSH gave conflicting finding. It may be due to induced hyperthyroidism.

Abbreviations

T_3 = 3, 5, 3' Triiodothyronine, T_4 = 3, 5, 3', 5' Tetraiodothyronine, FSH = Follicle stimulating hormone, TSH= Thyroid stimulating hormone and LH= Leuteinzing hormone.

References

1. Capuco A.V., Wood D.L., Elsasser T.H., Kahl S., Erdman R.A., Van Tassell C.P., lefcourt A. and Piperova L.S., The effect of somatotropin on thyroid hormones and cytokines in lactating dairy cows during adlibitum and restricted feed intake, *J. Dairy. Sci*., **82,** 2430-2439 **(2001)**

2. Tan J.P., Seidler F.J., Schwinn D.A., Page S.O. and Slotkin T.A., A critical period for the role of thyroid

hormone in development of renal alpha-adrenergic receptors, Pediatr Res, **42,** 93–102 **(1997)**

3. Hetzel B.S., Wellby M.L., Iodine. In: O'Dell B.L., Sunde R.A. (Eds), Handbook of nutritionally essential mineral elements, New York: Marcel, Deckker, 557-81 **(1997)**

4. WHO, Promotion of iodized salt in the Eastern Mediterranean Countries and North Africa Countries meeting Report, WHO, Dubai, UAE **(2001)**

5. Howdeshell K.L., A modal of the development of the brain as construct of the thyroid system, Environ Health Percept 100 (Suppl, 3), 337-348 **(2002)**

6. Berglund J., Christensen S.B., Hallengren B., Total and age-specific incidence of Graves's thyrotoxicosis, toxic nodular giotre and solitary toxic adenoma in Malmo 1970-74, *J. Intern. Med*., **227**, 137-141 **(1990)**

7. Jannini E.A., Uliss S. and D'Armiento M., Thyroid hormone and male gonadal function. Endoer Rev., **16,** 443-459 **(1995)**

8. Neepa Y., Choksi 1,, Gloria D., Jahnke 2, Cathy St. Hilaire 3 and Michael Shelby, Role of Thyroid Hormones in Human and Laboratory Animal Reproductive Health, Birth Defects Research (Part B) **68,** 479–491 **(2003)**

9. Krassas G.E., Pontikides N., Deligianni V. and Miras K., A prospective controlled study of the impact of hyperthyroidism on reproductive function in males, *J. Clin. Endocrinol. Metab*., **87**, 3667-71 **(2000)**

10. Kaya S., Pirncci I.V. and Biligili A., Veterinary Uygulamali Farmokologi, Cilt 2, AnKara, Medisa, 108-109 **(1997)**

11. Taimela E., Tahtela R., Koskinen P., Nutila P., Forsstorm J. and Taimela S., Ability of two new thyrotropin (TSH) assays to separate hyperthyroid patients from euthyroid patients with low TSH, *Clin. Chem*., **40**, 101-105 **(1994)**

12. Boyar R.M., Katz J., Finkelstin J.W., Karen S., Weiner H., Weitzman E.D. and Helleman L., Anorexia Nervosa: Immaturity of the 24-hour luteinizing Hormones Secretary Pattern, *N. Engl. J. Med*., **291**, 861 **(1976)**

13. Veditti P., Balestrieri M., Di Meo S. and Leo T.D., Effect of thyroid status on lipid peroxidation, antioxidant defences and susceptibility to oxidative stress in rat tissues, *J. Endocrinal*, **155**, 151-7 **(1997)**

14. Pamplona R., Portero-Otin M., Ruiz C., Bellmunt M.I., Requena J.R. and Throp J.W., Thyroid status modulates glycooxidative and lipooxidative modification of tissue protein, *Free Radic. Bio Med*., **27**, 901-10 **(1999)**