A COMPARATIVE HORMONAL STUDY FOR TWO TYPES OF AMNIOTIC ANIMALS

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ABSTRACT

This research aims to study thyroid hormones, growth hormone, and estrogen hormone in two types of Iraqi amniotes. The study included two types of Mature animals, the local rabbit (*Oryctolagus cuniculus)*, an example of mammals, and the Japanese quail (*Coturnix coturnix Japanese)*, an example of birds. Twenty females were taken from each of the rabbits and quails, and they were of sexual maturity and weighed(1347.2 ± 404.2) g and (173.5 ± 42)g respectively. The level of thyroid function T3, T4, TSH, growth hormones (GH), and estrogen (E2) was measured in the blood serum of quail and local rabbit using ELISA technique following the steps in the leflet kit supplied by the company MY BioSource and CUSABIO. The results of the current study.showed a significant increase in the concentration of T3, T4, TSH, and estrogen hormones in the rabbit compared to the quail at a probability of ($p \leq 0.01$). The study also showed a Highly significant increase of growth hormone in rabbit serum compared with the quail at probability of ($p \leq 0.05$).

Keywords: Thyroid hormone, estrogen, growth hormone, rabbit, quail.
***Part of PhD. dissertation of the 1st author.**

دراسة مقارنة هرمونية لنوعين من الحيوانات السلوية

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المستخلص

يهدف البحث الى دراسة مقارنة لهرمونات الدرقية وهرمون النمو وهرمون الاستروجين لنوعين من الحيوانات السلوية العراقية. شملت الدراسة نوعين من الحيوانات هي الارنب المحلي كمثال على اللبائن والسمان الياباني كمثال على الطيور. تم اخذ 20 انثى من كل من الارانب والسمان وكانت في عمر النضج الجنسي وبوزن (42 .±173.5) و(404.2 ± 1347.2)غرام على التوالي. تم تقدير تركيز هورمونات الدرقيةT3 وT4 وTSH وهرمون النمو والاستروجين في مصل دم الطيور السمان والارانب باستعمال تقنية الاليزا ELISA وفقا للطريقة المرفقة مع عدة القياس المجهزة من شركة MY BioSource, CUSABIO . أظهرت نتائج الدراسة الحالية ارتفاع معنوي في تركيز هرمون T3, T4, TSH والاستروجين في الارانب بالمقارنة مع طيور السمان وعند نسبة احتمال ($p \leq 0.01$).) كما أظهرت الدراسة وجود ارتفاع معنوي لهرمون النمو في مصل دم الارنب بالمقارنة مع طير السمان عند نسبة احتمال ($p \leq 0.05$).)

كلمات مفتاحية: الاستروجين، السمان، الهرمونات الدرقية.

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INTRODUCTION

Thyroid gland may well have a great importance in the regulation of postembryonic development in nonmetamorphosing vertebrates as mammals. The two oval or elongated glands in amniotes are located against the trachea in mammals, partway down the trachea in lizards, even more caudad in other reptiles, or right above the bifurcation of the bronchi in birds. (15). In most mature reptiles the gland is unpaired. The thyroid's major role, at least in warm-blooded animals, is to regulate body's metabolism. The gland is placed in front of and on each side of the brain in humans, the trachea. Iodinated proteins are produced when inorganic iodides are accumulated in the thyroid gland and combined with the amino acid tyrosine. Thyrotropic hormone, produced by the anterior lobe of the pituitary gland, controls this activity. (14). Thyroxine (T4) and triiodothyronine (T3) are two hormones produced by the thyroid gland. Activation of T4 to T3 is the most step that is individually regulated by peripheral tissues (33). In comparison, T3 is the most active (3 to 5 times more than T4). It is the most active hormone and is responsible for basic metabolic activity. It is necessary for the body's metabolic rate, heart, and digestive systems to function properly. (19), muscle control processes, brain development, and bone preservation. It also plays a role in the process of physical growth and sexual developmen (7). Despite these great benefits of thyroid hormones, giving large doses of them leads to the breakdown of proteins, leading to nitrogen deficiency, muscle weakness, increased excretion of non-protein nitrogenous substances in the urine, and increased creatinine (17). They also have an indirect effect by modulating the release of gonadotrophin-releasing hormone (GnRH) in the hypothalamic-pituitary-gonadal axis through numerous interactions with other hormones and growth factors such as estrogen, prolactin (PRL), and insulin-like growth factor (IGF). (30). The ovaries secrete estrogen (estradiol), Graafian follicle cells create this female sex hormone. Estrogen is also secreted from fat cells and the adrenal gland, and It is in control of growth, maturation, the female reproductive system's development and maintenance. It also stimulates secondary sexual characteristics and additionally contribute female sexual excitation (26). It also has an effect on other hormones; when the hormone estrogen is released, it suppresses FSH production and encourages the pituitary's production of Luteinizing Hormone LH. Uterine contractions are also caused by estrogen, which help transport sperm into the oviduct to fertilize an egg (6). Thyroid hormones act indirectly through many interactions with other hormones and growth factors, such as estrogen, prolactin (PRL) and insulin-like growth factor (IGF), as well as through influencing the release of gonadotropin-releasing hormone (GnRH) in the pituitary gland. - Axis of the gonadal glands (9).

MATERIALS AND METHODS

Experimental animals: Two types of amniotes found in the Iraqi habbits were used:

1- At the age of two years, twenty local rabbits, ***Oryctolagus cuniculus***, were obtained from the Dolphin Veterinary Clinic/Ramadi, with an average weight of 1347.2 ± 404.2 g. The animals were raised under laboratory conditions at a temperature of 25°C. The light period was standard, as it was 16 hours of light and 8 hours of darkness

2- Twenty female ***Coturnix coturnix Japanese*** quail were obtained from the College of Veterinary Medicine, University of Baghdad, at 16 Week age, with an average weight of 173.5 ± 42.0 g. The animals were raised under laboratory conditions at a temperature of 21 °C. The light period was standard, as it was 16 hours of light and 8 hours of darkness. Blood was obtained after weighing the animals by slaughtering birds, while for rabbits, blood was obtained by cardiac puncture. As 5 ml of blood was obtained, it was left for 20 minutes to coagalate. Then, the blood was separated by the centrifuge for 10 minutes at 3500 r/min to obtain the serum. Subsequently, the serum was kept at -20 temperature until the physiological tests were performed.

Physiological analysis

The concentration of T3, T4, GH, TSH, and E2 serum hormones of birds and rabbits was estimated using ELISA technique according to the method attached to instrated in the

measurement kit leflet supplied by CUSABIO and MY BioSource company.

RESULTS AND DISCUSSION

The current study shows that T3 level in the rabbit serum was highly significant higher than its level in the quail 57.92 ± 11.28 pg/ml , 38.99 ± 2,83 pg/ml respectively at the probability level (p≤0.01) (F.1). The current study results also showed highly significant in the level of T4 hormone in rabbit serum 33.05 ± 1.743 ng/ml compared with bird blood serum 5.99 ± 0.542 ng/ml at probability level (p≤0.01) (F. 2). It was suggested that such an increase in the level of thyroid hormones in the blood of rabbits is due to the hyperactivity of the gland itself (20). The decrease in the concentration of these hormones in birds may be due to their presence in high places. (23) indicated that reduced availability of oxygen due to low atmospheric pressure is the primary problem associated with high altitudes (HA). Acute exposure to hypobaric oxygen at high altitudes reduces the oxygen saturation in the blood, stimulates the sympathetic system, as well as causing changes in substrate metabolism (18). These results are consistent with those of (10) in mice who recorded a significant decrease in T3 and T4 concentrations in mice exposed to chronic hypoxia for five weeks.

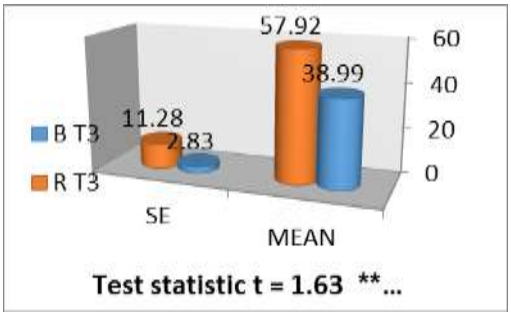

Figure 1. Concentration of T3 hormone (pg/ml) in the blood serum of rabbits (R T3) and quail birds (B T3).

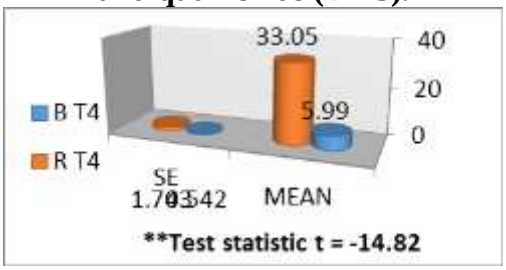

Figure 2. Concentration of T4 hormone (ng/ml) in the blood serum of rabbits (R T4) and quails (B T4)

Thyroid hormones stimulate diverse metabolic activities in most tissues, increasing the basal metabolic rate. The consequence of this activity is an increase in body heat production. This appears to be partly due to increased oxygen consumption and adenosine triphosphate (ATP) hydrolysis rates (29). This is consistent derived from the results of laboratory research chicken (8) and Japanese quail;(3,4). These studies found that feeding (Typically, this occurs throughout the light period) causes an increase in T3 concentration. Moreover, studies of day-old chickens also indicate that thyroid hormones affect body temperature and oxygen consumption (17). The study showed a Higly significant increase in the level of TSH in rabbits 8.775±0.789 lU/mlμ compared with TSH in birds of 6.79±0.442 lU/mlμ at the probability level (p≤0.01) (F.3). This was to be expected as the gland had to work somewhat hard in order to provide the right amount of thyroid hormone to maintain internal order.

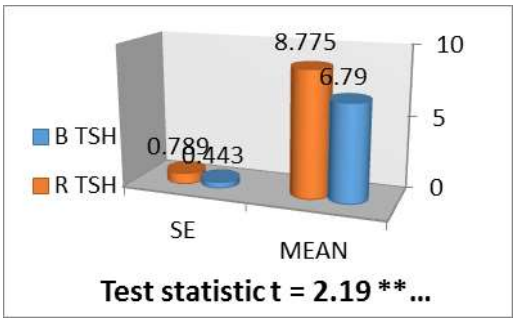

Fig. 3. Concentration of TSH (lU/mlμ) in the serum of rabbits (R TSH) and quails (B TSH).

Studies indicate the presence of TSH self-regulation. In addition to having a short feedback cascade, follicular stellate cells in the pituitary gland have been found to contain TSH receptors that act on TSH self-regulation that occurs via paracrine mechanisms (31). Studies have demonstrated the presence of TSH self-regulation in rabbits with hypothyroidism. These studies showed a decrease in TSH levels in rabbits even when injected with human thyroid-stimulating hormone (TSH). In adult chickens (thyrotropin-releasing hormone), TRH does not cause TSH release, but TSH secretion is controlled by T3 (21). This is supported by a deficient level of T3 in the thyroid gland of birds. The study results showed a significant increase in the growth hormone level in the

serum of rabbits 4116 ± 303.2 pg/ml compared with quail birds 3391 ± 195.4 pg/ml at the probability level (p≤0.05) (F.4). Growth is affected by several factors; in addition to feeding consumption and temperature, growth is affected by many factors: the hormonal system, which is triiodothyronine (T3) (34). T3 stimulates the production and release of growth hormone by the pituitary gland through direct inhibition of the pituitary somatotrophs. In this role, (32) indicated when measuring the hormone triiodothyronine (T3) in broilers on the fifth day of the experiment of exposing chickens to heat stress, a decrease in the hormone T3 occurred from 1.53 to 1.04 pg/ml. This decrease in T3 leads to a decrease in the rate of growth hormone production because T3 hormones have been beneficial in growth by increasing oxygen consumption and metabolic systems (11,12).

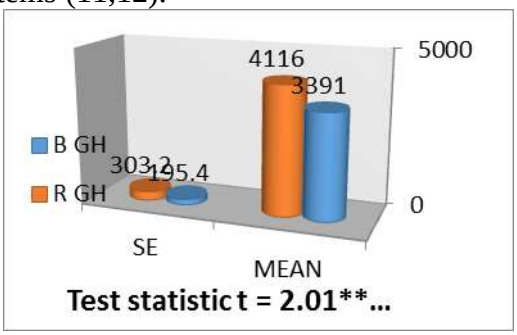

Fig. 4. Concentration of GH (pg/ml) in the serum of rabbits (R GH) and quail birds (B GH).

As for rabbits, the study conducted by (1,2) indicates that giving T4 to growing rabbits stimulates growth rate only at a young age (5-7 weeks). Still, then T4 limits the growth of rabbits. In this regard, these results are cdin line with those of (25), which showed that thyroid hormones impair the growth of chicks, pigs, quails, and rats. This may be because thyroid hormones directly affect the accumulation of newly formed pituitary growth hormones. Furthermore, (24,22) reported in their study that although the positive effect of thyroid hormones on average body growth is primarily derived from stimulation of protein synthesis. Still, growth may be reduced in hyperthyroidism due to higher metabolic rates and a shift towards catabolism(4,5). The study results also showed a highly significant in the level of estrogen in the serum of rabbits 341.1 ± 17.702 pg/ml compared with the estrogen in the serum of quails of 4.6 ± 0.469 pg/ml at the probability level (p≤0.01) (F.5). Estrogen levels in the blood correlate positively with body weight because estrogen stimulates the body to retain fat (28,13) indicated in a study conducted on rabbits that there is a positive linear relationship between body weight, estrogen rate, and ovulation. Whenever the body weight increases, the estrogen increases, and thus the number of growing follicles increases.

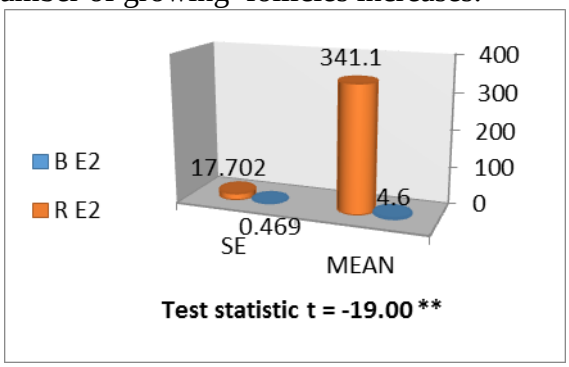

Fig. 5. Concentration of estrogen hormone (pg/ml) in the serum of rabbits (R T3) and quails (B T3)

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