Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm

Research article

Evaluation the thyroid activity modulation on some blood parameters in broiler chickens

Ahmed J. M. Al-Mialy
Department of the Internal Veterinary Medicine, Faculty of Veterinary Medicine, University of Kufa
Corresponding author Email: Ahmed.J.Almialy@uokufa.edu.iq
(Received 12/12/2018, Accepted 11/01/2019)

Abstract:

This experiment was designed to evaluatethe thyroid gland activity (hyperthyroidism and/or hypothyroidism) on some blood parameters in broilers. Thirty, oneday old broiler chicks were divided randomly into three equal groups. First group (G1) was control, second group (G2) Thyroxine was added to the drinking water (1 mg/L; 4 wks) serves as hyperthyroidism chicks and third group (G3) carbimazole was added to the drinking water (0.1 % ; 4wks) serves as hypothyroidism chicks. The blood samples were collected from overnight fasting birds at 15 and 30 day of experiment for the determination of serum glucose, total cholesterol (TC), total protein, albumin, and insulin concentration. At the end of experiment birds in all groups administered glucose 2g/kg/B.W. to evaluated glucose tolerance test, after 30, 60 and 90 mintfrom the glucose load, a blood sample was collected to determine serum glucose and insulin concentration. The results revealed that a significant increase in serum glucose and cholesterol concentration was observed in G3 as compared to the G1 and G2groupsat day 15 and 30 of experiment,at that timea significant decreasedwas showed in G2 group at day 30 of experiment as compared with G1 and G3 groups. A sharp descending of insulin line was showed after 90 minute in G1 group as compared with G2 and G3 groups in glucose tolerance test. In conclusions, that the effect of thyroxine and carbimazole administration to induced hyperthyroidismand hyporthyroidismrespectively caused hypoglycemia and hypolipidemic effects,and the modulations in body components according to thyroid gland condition are at least partly interposed by modulation in the control of glucose via insulin hormones in broilers.

Keywords: blood parameters, broilers, carbimazole, Thyroxine

Introduction:

Thyroid glands occure ventrolaterally to the trachea and produce it is contents in to circulatory system to the target cells. There are two important types of thyroid hormones (TH) synthesis by thyroid gland: tetraiodothyronine; (T4) aslo called throxine and triiodothyronine (T3). The main stimulation for secretion by thyroid stimulating hormones (TSH) produced from the anterier pituitary (1). Thyroid products are the key to controlling the production of metabolic heat and maintaining normal body temperature (2). likewise, pancreatic and thyroid hormones (TH) are contributory in the regulation of bodies basal metabolic rate (BMR) outgrowth, glycogen storage and synthesis, and heat product and energy recuperation from body storage when dietary input energy does not proper the demand of body system to carry out they normal physiological functions (3). Tetraiodothyronine (T4) and to a lesser extent triiodothyronine (T3) were maintenancea differences of biochemical stimulation in the all body cells. Those hormones are recognized as substantial agent in gene organization in the cells of body organ like hepatocytes, myocytes,

Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm

neurocytes and adipocytes (4), as well as involved in the control of normal BMR (5). Any obvious change in thyroid action (hyper- / hypo-thyroidism) may be inverted in metabolic disturbance. If there are excessive TH, each function of the body tends to accelerate and increase BMR. When decreases in the thyroid activity, the body function decreased and reduced of BMR, increased lipid deposition and in some situation growth depression. (6). carbimazole it's a thiourea-based compounds (7), one of thionamides regarded as antithyroid drugs, the mechamisn of action by block the binding of iodine meanwhile suppression of the iodination of tyrosine during synthesis of thyroid hormones. As well as its have several action on peroxidase enzyme that is required during the bisynthesis of thyroxine via the thyroid gland. Whereby, the primary role of the thyroid gland in glucose homeostasis may remain unclear in chichen. Subsequently, to uncover these complicated interaction a trial has been design by provoke hyperthyroidism (via treatment with thyroxine) and hypothyroidism (via treatment with carbimazole) in broiler chickens by study the effects on some metabolic metaboli and glucose concentration over glucose tolerance test (GTT) and changes in serum insulin activity have been examined. (8,9)

Materials and Methods

Ethical approval

the present was approved by Ethical Committee of Faculty of Veterinary Medicine, University Kufa, Iraq.

Animals:

After cleaning and disinfecting, thirty one-day-old broiler chicks (Ross308) were divided randomly into three equal groups of 10 chicks' each, housed individually with constant environment in controlled cages as fellow;

First group (G1) was control, second group (G2),the thyroxine was added to the drinking water (1 mg/L; wk 4) serves as hyperthyroidism chicks (10), and third group (G3) the carbimazole (l-methyl-2-imidazolethiol ethyl carbonate) was added to the drinking water (0.1 % ; wk 4) (11) serves as hypothyroidism chicks. The blood samples were collected from overnight fasting experiment animals at 15 and 30 day of experiment for the determination of serum glucose, total cholesterol (TC), total protein, albumin, and insulin concentration. At the end of experiment the chickens in all groups were fasted overnight and administered with glucose 2g/kg/B.W by orally gavages to evaluated glucose tolerance test. Just after 30, 60 and 90 mints from the glucose load, a blood sample was collected to determine serum insulin and glucose concentration. The experimental period was 30 days and the feed and water were provided *ad libitum*.

Statistical analysis

The results are expressed as the mean values with their standard error. One-way ANOVA followed by Duncan's variance was performed to compare between treatment groups. Significance was set at ($P<0.05$) by used Statistical Package for Social Science (SPSS 20).

Results

The mean value of serum insulin activity and glucose concentration in treated and control groups is clarified in table (1), the table showed a non-significant effect in serum insulin activity between thyroxine and carbimazole treated as compared with control group in day 15 and 30 0f experimental period. A significant ($P<0.05$) statistical elevation in serum glucose concentration was observed in G2 as compared to the G1 and control groups in day 15 and 30 of experiment.Table (2) illustrates the mean values of serum cholesterol concentration (mg/dL) in the control and three treated groups along the experimental period. the result show, a significant elevation ($P<0.05$) in serum cholesterol concentration was observed in chicken daily drinking 0.1 %with

Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm

carbimazole (G2) group as compared with Thyroxine treated chicken and control after four weeks of experiment, and significant reduction (P<0.05) was showed in thyroxine (G1) treated group in day 30 of experiment as compared with control and carbimazole (G2) treated groups.Table (2) illustrates the mean values of serum albumin and serum total protein concentration (mg/dL). Administration of thyroxine (G1) and carbimazole caused a non-significant (P>0.05) differences in the albumin and total protein concentrations in all experimental days.The results in table (3) figure (1) also showed a non-significant effect in serum insulin activity between Thyroxine and carbimazole treated as compared with control group in all minutes of glucose tolerance test. But when you see the figure (1) noticed the sharp descending of insulin line after 90 minute in controlgroup (green arrow) when compared with G1 and G2 groups in same time. A significant elevation in serum glucose concentration was observed in chicken in G1 treated group after 90 minute as compared with control group in glucose tolerance test.

Table (1): Effect of carbimazole and thyroxine on serum insulin activity (ng /ml) and glucose concentration (mg/dl) on broiler chicken

Groups	Insulin(ng /ml)		Glucose (mg/dl)	
	15 day	30 day	15 day	30 day
G1	0.74±0.06aA	0.76±0.09aA	69.22±8.10aB	56.48±3.72aA
G2	0.93±0.02aA	1.08±0.09aA	52.45±5.57aA	49.74±2.55aA
G3	0.77±0.04aA	0.93±0.02aA	95.91±6.87aC	113.47±2.15aB

-Mean± SE - small letters denote differences within groups, P<0.05.
-Capital letters denote differences between groups, P<0.05.

Table (2): Effect of carbimazole and thyroxine on serum cholesterol, albumin and total protein concentration (mg/dL) on broiler chicken

Groups	cholesterol (mg/dL)		albumin (mg /dL)		total protein (mg/dl)	
	15 day	30 day	15 day	30 day	15 day	30 day
G1	144.50±1.90aA	149.92±3.17aB	31.29±1.17aA	31.25±4.46aA	9.35±0.64aA	11.18±1.08aA
G2	143.00±1.82bA	129.48±5.53aA	36.85±3.75aA	28.20±1.9aA	13.96±3.2aA	8.89±1.09aA
G3	151.75±5.49aA	184.82±7.02bC	38.49±7.24aA	21.75±1.5aA	11.89±0.61aA	7.24±0.66aA

-Mean± SE - small letters denote differences within groups, P<0.05.
-Capital letters denote differences between groups, P<0.05.

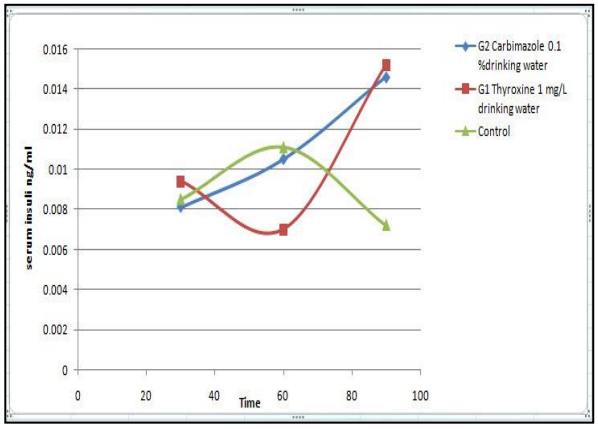
Table (3): Effect of carbimazole and thyroxine on serum insulin activity (ng /ml) and glucose concentration (mg/dl) after glucose loaded on broiler chicken

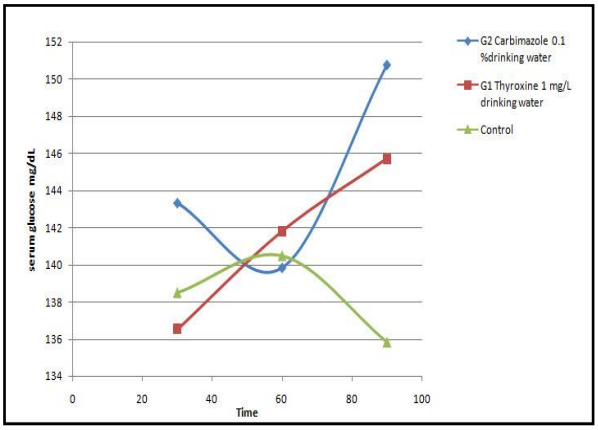
Groups	Insulin(ng /ml)*10^2			glucose concentration (mg/dl)		
	30 minute	60 minute	90 minute	30 minute	60 minute	90 minute
G1	0.85±0.1	1.11±0.36	0.72±0.06	138.51±1.87aA	140.50±2.55aA	135.85±4.39aA
G2	0.81±0.1	1.05±0.14	1.46±0.65	136.55±2.81aA	141.82±2.74aA	145.71±4.05aAB
G3	0.94±0.2	0.70±.06	1. 52±0.37	143.33±1.66aA	139.84±1.65aA	150.77±4.10aB

-Mean± SE - small letters denote differences within groups, P<0.05.
-Capital letters denote differences between groups, P<0.05.

Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm

Figure (1): Effect of carbimazole and thyroxine on serum insulin activity (ng /ml) and glucose concentration (mg/dl) after glucose loaded on broiler chicken.





Discussion

Various studies have existed the importance of T3 and T4 in the metabolism of chicken. As well as, different process were obtainable for induce the hypo- and hyperthyroidism. Thyroid hormone disorder has well-authenticated effects on insulin sensitivity plasma glucose homeostasis and carbohydrate metabolism. In the liver, adipose tissue, skeletal muscle, and pancreas (12) . relatively very little embracing dietary manipulation had been applied to study the influence of these two situation on metabolism and serum blood parameters related with insuline. Carbimazole was the one of drugs used to induction of hypothyroidism. Carbimazole Administration ameliorate thionamide that inhibition thyroid hormone biosynthesis via interfering with peroxidase enzyme that mediate iodination of tyrosine in the thyroid gland at the stage of iodine organification and iodotyrosine conjugation as well as, inhibition the conversion of T4 to T3 in the body tissues (13) . Stewart and Washburn, (14) reported that there was a negative relationship between the decrease in the concentration of thyroid hormones and increase the concentration of body fat in hypothyroidism broiler chickens induced by propylthiouracil. and the resulted show hepatic storage syndrome of lipids and glycogen. Decrease in the thyroid hormone concentraction, was correlated with hypometabolism distinguished by reduced in the productions of resting energy increased cholesterol concentration, decrease lipolysis and gluconeogenesis also tend to weight gain (15). Thyroid hormones (TH) insufficiency in the poultry is related with obesity, while hyperthyroidisms induced by administration (1% T4) or via prolong administration of thyroid hormones decreases lipid storge (16) . Thyroid hormones imoprtant and plays key word in the rates activites of lipogenesis, gluconeogenesis, oxidation/ reduction, illumination and tend to weight loss (17). Its influences on the extra- and intracelluler lipid composition, but little researches are contradictory, perhaps because of variation in amount and duration of abnormal thyroid concentration. Lipids in extracelluler fluid of hyperthyroid labrotory animals, as compared with controls, clarified the predicted decreases in cholesterol levels (18) and also important for glucose homeostasis. This modulation changes in either insulin secretion or degradation (13).

Conclusion

Administration of thyroxin and carbimazole resulted in considerable changes glucose insulin levels. The greatest effect on thyroid activity was associated with glucose.

Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm

References

1-Scanes CG, Sturkie's Avian physiology, 6th ed. Academic Press . 2015; Pp:535-538.

2-Danforth EJ, Burger A. The role of thyroid hormones in the control of energy expenditure. *Clin. Endocrinol. Metab*. 1984; 13, 581-595.

3-Hazelwood R.LPancreas. Pp. 539-555 in Sturkie's Avian Physiology, G Causey Whittow. Ed. 5th Ed. Academic Press. CA. 2000.

4-Viguerie N, Langin D. Effect of thyroid hormone on gene expression, *Curr Opin Clin Nutr Metab Care* (2003); 6 377.

5-Tortora GJ, Derrickson B. Principles of Anatomy & Physiology 14th ed., 2014; Pp: 633

6-Abdelatif AN, Elkhair MN. Effect of seasonal change in the thermal environment on physiological responses of unsexed broilers to dietary supplementation of antithyroid drug carbimazole. *Middle-East J. Scientific Res*. 2009; 4(2), 122-126.

7-Cooper DS. Drug therapy: Antithyroid drugs. N. *Engl. J. Med*., 2005; 352, 905-917.

8-Diav-Citrin O, Ornoy A. Teratogen update: antithyroid drugs-methimazole, carbimazole and propylthiouracil. *Teratology*.; 2002; 65:38-44.

9-Greenspan FS, Dong B JThyroid, antithyroid drugs. In: Basic and Clinical Pharmacology. 7th Edn. Appleton and Lange, California; 1998; pp: 619-634.

10-Luger D, Shinder D, Yahav, SHyper- or hypothyroidism: its association with the development of ascites syndrome in fast-growing chickens. *General and Comparative Endocrinology*. 2002; 127:293-299

11-Redmond O, AR Tuffery. Thyroid proliferation, body weight, thyrotropin and thyroid hormones in chronic antithyroid (carbimazole) treatment in rats. *J Anat*. 1981; 133(Pt 1): 37-47.

12-Crunkhorn S, Patti M. ELinks between thyroid hormone action, oxidative metabolism, and diabetes risk. Thyroid .2008;18: 227-237.

13-Chopra GN, JB Chua-Teco, WM Eisenberg, DH. Solomon. Structure-activity relationship of inhibition of hepatic monodeiodination of thyroxine to 3,5,3-triodothyronine by thiouracil and related compounds. *Endocrinol*., 1982; 110: 163-168.

14-Stewart PA, Washburn KW. Variation in growth hormone, T3 and lipogenic enzyme activity in broiler strains differing in growth and fatness. *Growth*, 1983; 47: 411-425.

15-Brent GA. Hypothyroidism and thyroiditis. In: Williams Textbook of Endocrinology, edited by Melmed SP, Larsen PR, and Kronenberg HM. Philadelphia, PA: Elsevier. 2012.

16-Decuypere E, Kuhn ER. Effect of fasting and refeeding time on circadian rhythms of serum thyroid hormone concentrations, glucose, liver monodeiodinase activity and rectal temperature in growing chickens. *Domest Anim Endocrinol* 1984; 1, 251-262.

17-Brent GA, Clinical practice. Graves' disease. *N. Engl J Med*. 2008; 358: 2594-2605.

18-Ruggier FM, Landriscina C, Gnohi GV, Quaouamello E. Lipid composition of liver mitochondria and microsomes in hyperthyroid rats Lipids 1984; 19(3), 171-178.

Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm