

تأثير فيتامين هـ على نشاط الغده الدرقية في الدجاج مقدرًا باليود المشع ١٢٥

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أجرى هذا البحث على مجموعتين من الدجاج النامي «دق٤» الذى تم تربيته على عليقة متوازنة لغاية سن ١٠ أسابيع .

وفى الأسبوع الثامن حقنت المجموعة الاولى بزيت الزيتون بينما حقنت المجموعة الثالثة بفيتامين هـ. وحقنت جميع الافراد فى كلا المجموعتين فى الفشاء البريتونى بمقدار ١٠ ميكروكبرى من اليود المشع . ١٢٥

وتم قياس النشاط الاشعاعى لعددها الدرقيه كما تم فصل وتقدير اجزاء اليود وهى التايروزينس وكذلك التايرونيينس فى مصل الدواجن فى كلا المجموعتين .

وقد اوضحت النتائج ان حقن فيتامين هـ فى الكتاكيت اثناء نموها لا يؤثر على نشاط غددها الدرقيه ولكنه لوحظت زيادة واضحة فى محتوى مصل الدجاج المحقون فى المتوايود وتايروزينس والتايرونيينس عند مقارنتها بمثيلاتها فى مصل الدجاج الذى لم يحقن بفيتامين هـ .

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THE EFFECT OF VITAMIN E ON THYROID ACTIVITY OF CHICKENS AS ASSESSED

By ^{125}I

(With Two tables and one figures)

By

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SUMMARY

Two groups of growing chickens "Dokki 4" were reared on a balanced diet up to 10 weeks of age. On the 8th week, the first group was injected with olive oil while the second group was injected with vitamin E. All the individuals of both groups were injected intraperitoneally with 10 microcuries of ^{125}I .

Radioactivity of the serum, thyroid and chromatographic separations of the tyrosines and thyronines in the control and treatment group were determined.

The results showed that the activity of the thyroid glands of chickens injected with vitamin E was non significantly increased when compared with the control. On the other hand, the serum radioactivity was also non significantly lowered in the treated group.

The monoiodotyrosine and thyronines were increased in the treated chickens when compared with control ones. The diiodotyrosine was absent in the serum of the treated group.

INTRODUCTION

The requirement for vitamin E in chicken's diet is established as an empirical basis, but its real need for various tissue functions is little known (TENGERDY, 1973).

Vitamin E is known as antioxidant and cell membrane regulating agent (LUCY, 1972). Moreover, vitamin E and thyroxine are required to maintain normal reproduction in poultry KAMAR, (1961 b) KUHN and ARSCOTT (1969) and LANNEK, (1971).

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Vitamin E deficiency may also affect many metabolic functions but its mode of action is partially unknown and theories about it are contradictory LEGGE, (1971).

The relationship between vitamin E and hormonal synthesis and release has been considered in the last few years by several investigators KAMAR (1961 a) PIEDRABUENA, (1969). BONN (1969) reported that vitamin E deficiency influences gonadotrophic thyrotrophic and adrenocorticotrophic hormonal synthesis and release through its effect on the anterior lobe of the pituitary gland, Meanwhile. BOGUTH and WEISER (1971), stated that when diets are deficient in tocopherol and quinone fed to rats over a long period of time, the function of the pituitary thyroid systems are reduced.

Therefore, the main purpose of the present investigation is to find out the relationship between vitamin E and thyroid function in chickens. For assessment of such relationship ^{125}I was chosen, because it is the modern tracer technique to follow up thyroid function.

MATERIALS AND METHODS

Forty "Dokki 4" chickens of one day old were used in this experiment. The chickens were divided into 2 identical groups. They were kept into an electrically heated battery brooder. The starting temperature of the brooder was 95°F which was gradually lowered by 5°F every week until the temperature reached 70°F. The illumination was controlled to provide 14 hours artificial light per day. All the chickens were fed a balanced diet (EDRISE, 1973).

At the age of 8 weeks, each chicken from the control group received 0.5 ml intramuscularly olive oil while the second group was injected intramuscularly with 0.5 ml olive oil containing 15 mg vitamin E (Vi-Etal-Wander) per week for two weeks.

At the age of 10 weeks, all the chickens were injected intraperitoneally with one ml sterile saline solution containing 10 microcuries of ^{125}I . Six hours after the injection, all the chickens were slaughtered. The blood of each individual chicken was collected separately and the thyroid gland was dissected and freed from the surrounding tissues.

The blood was centrifuged and the serum of each chicken was pooled in a clean test tube. One ml of the serum was used for determining its radioactivity

and the remaining was used for the chromatographic determination of the iodinated tyrosines and thyronines fractions according to the method adopted by ABDEL-WAHAB and MEGAHED, (1966).

The thyroid hormone fraction (T_1 , T_2 , T_3 and T_4) were expressed as a percent of the total radioactivity of the serum. The thyroid glands were placed in the center of aluminium planchets and the radioactivity of the dried glands was measured.

All the data were analysed statistically to obtain the averages, standard error and the "t" test was used to evaluate the differences between groups.

RESULTS

From the data, it could be concluded that the dose of vitamin E used in this experiment (30 mg/chicken) has a non significant effect on increasing the activity of the thyroid glands of the treated chickens. The average percent of ^{125}I thyroid uptake was (7.01 ± 0.06), and the control group was (6.00 ± 1.00), table and figure (1). On the other hand, the radioactivity of the serum was non significantly decreased in the treated group (7.41 ± 2.73) than that of the control (12.79 ± 3.70).

Table (2) shows that iodinated tyrosines and thyronines in the control group were as follows :

T_1 (10.10 %), T_2 (20.00 %), T_3 (28.30 %) and T_4 (41.60), meanwhile, in the treated group they were respectively as follows : —

T_1 (28.00 %), T_2 was absent, T_3 (25.00 %) and T_4 (46.80 %).

TABLE 1. Effects of vitamin E on the ^{125}I uptake in the thyroid glands and serum radio activity of chickens.

Group No.	Treatment	Count/second per gland	Percent of thyroid gland uptake	Count/second per ml serum	Percent of serum radio-activity
I	Control (One ml Olive oil)	11038 \pm 284.8	6.00 \pm 1.00	70.30 \pm 19.47	12.79 \pm 3.70
II	Vitamin E (30 mg/ml of olive oil)	16233 \pm 141.2	7.01 \pm 0.06 ⁽¹⁾	47.30 \pm 17.33	7.41 \pm 2.73 ^(*)

(1) P < 0.1

(2) P 0.1

TABLE 2. Effect of vitamin E on the tyrosines and thyronines in the serum of chickens.

Group No.	Treatment	Iodine fraction			
		T ₁	T ₂	T ₃	T ₄
I	Control . .	.10.10±3.00	20.00±2.36	28.30±1.89	41.60±2.15
II	Vitamin E . .	.28.00±1.73---	0.00±0.00---	25.20±2.41---	46.80±1.67---

- (1) P < 0.025
 (2) P < 0.01
 (3) P < 0.1
 (4) P < 0.1

- T₁ = Monoiodotyrosine
 T₂ = Diiodotyrosine
 T₃ = Triiodothyronine
 T₄ = Thyroxine

DISCUSSION

Vitamin E causes nonsignificant increase in ¹²⁵I uptake in the thyroids of chickens. On the other hand, the radioactivity of serum was non significantly decreased (P < 0.1).

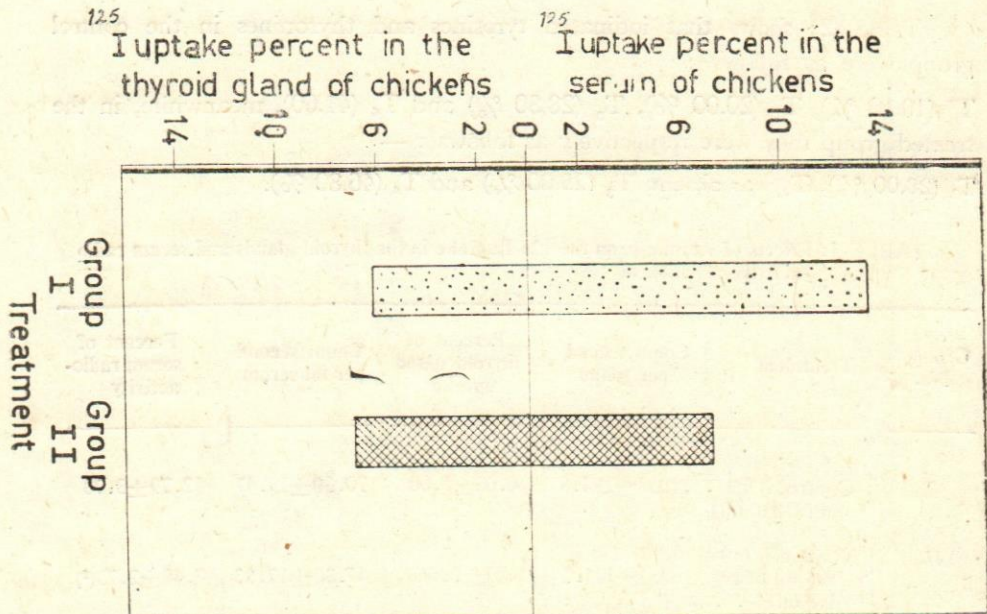


Fig. (1) Effects of vitamin E injection on ¹²⁵I uptake in thyroids and serum of chickens
 Group No. I (Control).
 Group No. II (Injected with vitamin E).

Monoiodotyrosine and thyronine, were increased in the treated group when compared with the control ($P < 0.025$), while the diiodotyrosine was completely absent ($P < 0.01$).

Although some groups of investigators reported that vitamin E had no significant effect on thyroid activity in rat (BOGUTH and SERNETZ, 1967) and in hamster DURRAND, *et al.*, (1968), but on the other hand, other authors had a contradictory findings (SIDKI and ZAHRAN, 1950 and CZYBA, GIROD and DURRAND., 1966).

From the results, it seems that vitamin E may have an affect on the utilization of thyronines and synthesis of tyrosines. Moreover, the thyroid hormone production in chickens may follow a different pathway than that described in mammals (HENRICH and TURNER, 1963).

The interaction between vitamin E and thyroid gland was also found to be mediated through the pituitary gland. BOHNN (1969) and KODRIAVITS (1970) reported that vitamin E had a stimulant effect on the anterior pituitary gland of rats, it influenced the secretion of the gonadotrophic, thyrotrophic and adrenocorticotrophic hormones. They found also that supplementation of vitamin E to rats promoted the production of these hormones and deficiency of vitamin E decreased their production.

The proposal explanation is that vitamin E injection intramuscularly at a dose 15 mg/week for each chicken cannot induce any significant effect on the rate of thyroxine secretion, but on the other hand, it alter the rate of tyrosines and thyronines ratio, if it is compared with the control non injected chickens.

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REFERENCES

- Abdel-Wahab, M.F. and Megahed, Y.M. (1966). Preparation of ^{125}I Tyrosines and ^{131}I Thyronines. Inter. Jour. of Applied Radiations Isotopes, 17, 132 - 133.
- Boguth, W. and Sernetz, M. (1967). Thyroid function in rats fed on a diet lacking tocopherol and ubiquinone. 2- Uptake of ^{131}I and changes in form of the rat thyroid. Internat. ZTSCHR. Vitamin Forsch 37, 412-415.
- Boguth, W. and Weiser, W. (1971). Vitamin E and the thyroid system. A symposium of N.J.F., Hindsjavl. castle, Middle fart, Denmark, September 8 - 11, 67 - 69.
- Bonn, G.B., (1969). Vitamin E requirements and recommended levels for DLG standards. F. Hoffman-La Roche and Co., LTD, Basle, Switzerland, 1-9.

- Czyba, J.C., Girod, C. and Durrand, N.** (1966). Morphological changes in thyroid of golden hamster treated with Vitamin E. *C.R. Med. Biol.* 160, 2101 - 2102.
- Durrand, N., Czyba, J.C., Mornex, R. and Peres, G.** (1968). Uptake of Iodine by thyroid of golden hamster treated with vitamin E and tocopheryquinone. *C.R. Soc. Biol.* 162, 888 - 890.
- Edrise, B.M.**, (1973). Studies on the affect of supplementing different concentration of vitamin C on growth performance of "Dokki 4" chicks. M.V.Sc. thesis, faculty. Vet-Med. Cairo Univ. Egypt.
- Henrich, C.E. and Turner, C.W.** (1963). Time relations in the alteration of thyroid gland function in fowls, *Poultry Sci.* 42, 1190 - 1195.
- Kamar, G.A.R.**, (1961a). Thyroid activity of growing male chickens. *Growth*, 26, 191- 204.
- Kamar, G.A.R.**, (1961b). Hyperthyroidism effects on gonads and endocrines of cocks. *J. Anim. prod. U.A.R.*, vol. I, No. 2, 83 - 104.
- Kodriavits, L.A.**, (1970) Vitamin E and its method of determination, published by the Ministry of Agriculture, Moscow, U.S.S.R., page 14.
- Kuhn, R.V. and Arcot, G.H.** (1969). Effect of varying levels of ethoxyquin and Vitamin E on reproduction in white leghorn males fed diets high in linoleic acid. *poultry sci.* 46, 1646 - 1651.
- Lannek, N.** (1971). The importance of vitamin E for domestic animals in sickness and in health, A symposium of N.J.F., Hindsgavl Castle. Middle part, Denmark, Sept. 8-11 13 - 15.
- Legge, R.F.** (1971). Resolving the vitamin E controversy. *Can. Res. Devel.* Sept - Oct., 19 - 20.
- Lucy, R.F.** (1972). Functional and structural aspects of biological membranes. Proceeding of conference of vitamin E and its role in cellular metabolism. *Ann. New York Acad. Sci.*
- Piedrabuena, L.A.** (1969). Experiments on the production of hypervitaminosis E in birds by giving DL- α -tocopheryl acetate. *An. Inst. Invest. Vet., Madrid*, 19, 153 - 196.
- Sidki, Y. and Zahran, M.E.** (1950). The influence of vitamin E on the testis and on the growth of the body. *Vet. Med. J. Cairo Univ* 3, 30 - 56.
- Tengerdy, R.P.**, (1973). The effect of vitamin E on egg production, hatchability and humeral immune response of chickens. *Poult. Sci.*, 52, 778 - 783.
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