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Effect of excess iodine supplement on serum total proteins, electrophoretic patterns and body weight of Fayoumi chickens

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With 3 tables

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The importance of iodine in the nutrition of animals has been recognized for a long time. A severe deficiency of this element in the diet results in hypertrophy of the thyroid glands. The results of *Wilgus* et al. (20) indicate that in the case of the growing chicken, 0.01 mg of iodine per pound of diet is inadequate and that 0.1 mg/pound of diet is borderline. *Perdomo* et al. (15) observed that experimental intakes of excess iodine causes toxic effect for poultry. Later *Arrington* et al. (2) studied the effect of excess dietary iodine upon subsequent egg production and compared the effects of iodine on pullets and mature hens. They found that the egg production decreased with increasing levels of iodine. The decreases were greater for hens than for pullets.

So, it may be concluded that to assure an adequate allowance of iodine under the various environmental and dietary conditions under which chickens are raised, it is advisable to supply their diet with a suitable source of iodine. An iodine compounds stability is an important factor in determining its suitability and value as a dietary ingredient. Another important factor is its freedom from toxicity or undesirable side effects.

The present study aimed to investigate the effect of excess iodine supplement, in drinking water, during the life of Egyptian chickens on the rate of growth, body weight and serum proteins in both sexes.

Materials and methods

Four hundred one-day old Fayoumi chickens were assigned at random. The birds were hatched at February 1977 and reared in electric controlled brooders at the experimental station of Faculty of Agriculture (Shebien El-Koum, Egypt) until 4 weeks age and thereafter kept in cages at room ambient temperature. In order to

Table 1. Serum proteins of male Fayoumi chickens (values are expressed in g/100 ml, represent range with mean in parentheses).

Group	Age (days)	Sex	No. of cases	Total protein	Albumin	Globulin				A/G ratio
						α_1-	α_2-	β-	γ-	
Control	30	M	6	1.07–3.00 (2.45)	1.08–1.42 (1.22)	0.04–0.14 (0.08)	0.05–0.08 (0.07)	0.07–0.19 (0.13)	0.44–1.61 (0.95)	1.00
Treated		M	8	1.17–2.33 (1.72)	0.60–1.25 (0.87)	0.02–0.19 (0.10)	0.05–0.10 (0.07)	0.07–0.20 (0.13)	0.42–0.68 (0.56)	1.02
Control	60	M	6	1.66–2.50 (1.78)	0.62–1.17 (0.83)	0.06–0.11 (0.09)	0.05–0.28 (0.16)	0.06–0.20 (0.15)	0.31–0.72 (0.55)	0.88
Treated		M	5	1.67–3.67 (2.39)	0.79–1.89 (1.16)*	0.06–0.16 (0.12)	0.04–0.09 (0.07)**	0.02–0.16 (0.07)*	0.64–1.64 (0.97)*	0.94
Control	90	M	6	4.00–7.00 (5.79)	1.79–3.09 (2.37)	0.11–0.49 (0.35)	0.15–0.54 (0.35)	0.11–0.90 (0.44)	1.79–2.69 (2.29)	0.69
Treated		M	5	3.33–4.33 (3.83)**	1.47–1.85 (1.68)*	0.14–0.26 (0.21)*	0.26–0.31 (0.28)	0.06–0.45 (0.23)**	0.99–1.89 (1.43)*	0.78
Control	120	M	6	3.66–7.83 (5.39)	1.62–2.20 (1.95)	0.11–0.29 (0.19)	0.22–0.54 (0.39)	0.16–0.73 (0.45)	1.56–2.95 (2.34)	0.57
Treated		M	6	3.17–5.67 (4.62)	1.11–2.51 (1.84)	0.16–0.30 (0.23)	0.08–0.28 (0.33)	0.16–0.47 (0.30)*	1.66–2.23 (1.92)	0.66
Control	150	M	4	3.49–7.33 (4.25)	1.05–2.53 (1.65)	0.07–0.82 (0.46)	0.14–0.63 (0.29)	0.07–0.90 (0.42)	0.75–2.44 (1.43)	0.64
Treated		M	7	2.17–5.67 (4.29)	0.63–1.95 (1.45)	0.14–0.52 (0.39)	0.35–0.52 (0.36)	0.14–0.43 (0.29)	1.04–2.34 (1.82)	0.51
Control	180	M	3	2.67–4.17 (3.61)	1.18–1.96 (1.64)	0.08–0.11 (0.09)	0.16–0.21 (0.18)	0.09–0.12 (0.10)	1.14–1.87 (1.60)	0.83
Treated		M	6	1.33–3.17 (2.11)*	0.53–1.14 (0.73)*	0.08–0.12 (0.09)	0.08–0.19 (0.12)*	0.06–0.16 (0.11)	0.58–1.71 (1.06)	0.53

* = P value < 0.05 ** = P value < 0.01

Table 2. Serum proteins of female Fayoumi chickens (values are expressed in g/100 ml, represent range with mean in parentheses).

Group	Age (days)	Sex	No. of cases	Total protein	Albumin	Globulin				A/G ratio
						α_1-	α_2-	β-	γ-	
Control	30	F	7	3.47–6.67 (5.50)	1.51–2.93 (2.03)	0.07–0.35 (0.21)	0.14–0.65 (0.34)	0.07–0.86 (0.43)	1.57–3.44 (2.49)	0.59
Treated		F	7	3.83–5.17 (4.83)	2.06–2.63 (2.34)	0.07–0.18 (0.12)*	0.18–0.35 (0.26)*	0.09–0.34 (0.20)*	1.81–2.07 (1.91)*	0.94
Control	60	F	5	1.33–5.08 (3.28)	0.72–2.92 (1.49)	0.07–0.18 (0.12)	0.10–0.18 (0.16)	0.11–0.27 (0.20)	0.99–1.67 (1.31)	0.83
Treated		F	5	2.00–3.33 (2.56)*	0.70–1.26 (0.94)*	0.05–0.18 (0.09)	0.05–0.27 (0.13)	0.02–0.35 (0.14)*	0.99–1.46 (1.26)	0.58
Control	90	F	5	5.67–8.83 (7.71)	1.89–3.89 (3.14)	0.40–0.53 (0.47)	0.15–0.79 (0.43)	0.26–0.99 (0.60)	1.99–3.68 (3.07)	0.68
Treated		F	5	1.66–6.33 (4.39)**	0.86–2.17 (1.52)**	0.11–0.72 (0.33)*	0.06–0.56 (0.39)	0.06–0.54 (0.34)**	0.58–2.51 (1.81)**	0.53
Control	120	F	6	4.00–6.67 (5.40)	1.63–2.52 (2.06)	0.18–0.30 (0.24)	0.18–0.53 (0.31)	0.25–0.73 (0.41)	1.27–3.27 (2.38)	0.61
Treated		F	6	3.17–7.67 (5.29)	0.99–3.34 (1.87)	0.99–0.39 (0.31)	0.12–0.40 (0.27)	0.49–0.73 (0.59)	1.24–3.05 (2.26)	0.55
Control	150	F	6	4.50–6.67 (5.13)	1.38–2.49 (1.85)	0.12–0.41 (0.26)	0.23–0.50 (0.35)	0.17–1.06 (0.51)	1.64–2.54 (2.16)	0.56
Treated		F	5	3.33–5.50 (4.33)	1.26–2.08 (1.73)	0.14–0.25 (0.18)*	0.28–0.33 (0.30)	0.06–0.98 (0.43)	0.99–2.67 (1.69)	0.69
Control	180	F	5	4.00–5.50 (4.61)	1.28–1.89 (1.60)	0.11–0.40 (0.23)	0.18–0.40 (0.27)	0.21–0.99 (0.65)	1.27–2.35 (1.87)	0.53
Treated		F	5	3.17–5.33 (4.56)	0.99–1.54 (1.25)	0.10–0.27 (0.17)	0.24–0.56 (0.36)*	0.42–0.96 (0.66)	1.24–2.60 (2.12)	0.38

* = P value < 0.05 ** = P value < 0.01

maintain chickens in good physical condition and to obtain normal growth, egg production, and hatchability, ration must be fed that are adequate in all nutritive essentials. They fed *ad libitum* on the standard ration prepared according to that of National Research Council (13). Excess iodine was added in the form of potassium iodide to the drinking water in a concentration of 0.15 g/l.

The body weight was recorded bi-weekly till the end of experiment. Ten males and another ten females of both controls and treated groups were slaughtered every thirty days till the age of 180 days.

135 blood samples were taken, 65 for controls and 70 for the treated groups. The serum obtained was kept frozen at –20 °C until analysis. The total proteins were determined according to the method described by *King* and *Wooton* (11), and the major protein-fractions by agar gel electrophoresis method, using veronal buffer of pH 8.6 having 0.05 ionic strength according to the methods of *Grabar* and *Williams,* and *El-Hawary* et al. (5, 7).

Results

Levels of serum total proteins, five major protein-fractions, A/G ratio and body weight in controls and the treated groups are given in tables 1, 2, 3. Mean value of serum total proteins and the body weight in normals increases significantly with the increase in maturation especially in females till the period of 90 days of age. Excess iodine supplement decrease body weight, serum total proteins, α_2- and β-globulins in most of males during the experimental period, while in females the decrease was pronounced in the period of 90 days of age.

Albumin levels increased in females than in males in all ages under normal conditions, but in the treated groups it decreased in females and in some of males during the period of study. A/G ratio, in normals, tend to decrease with the increase in the age in both sexes, while in the treated groups it increased in males and decreased in most of females.

Discussion

Interest of studying the composition of chicken serum found insufficient care till now. Attempts have been made to discover, by means of

Table 3. Body weight of Fayoumi chickens (values expressed in grams, represent range with mean in parentheses).

Group	Sex	Age in days					
		30	60	90	120	150	180
Control	M	89–262 (144.8)	240–645 (414.5)	500–1090 (726.5)	570–1177 (917.5)	720–1395 (1067.1)	880–1500 (1251.0)
Treated	M	81–189 (126.5)*	225–480 (361.9)*	520–800 (668.6)*	660–1051 (828.2)*	775–1315 (1046.8)	1000–1675 (1325.0)
Control	F	72–216 (139.7)	180–520 (355.7)	350–840 (605.0)	398–985 (738.8)	500–1210 (906.7)	975–1435 (1118.0)
Treated	F	60–189 (127.0)*	155–500 (328.0)*	370–830 (600.0)	550–992 (726.4)	630–1185 (866.8)	900–1260 (1049.0)*

* = P value < 0.05

reliable methods, what chemical substances are present in the circulating blood under physiological and pathological conditions.

Several comprehensive reviews of the role of iodine are available. Thyroxine was found to have a specific effect on growth rate of chickens. The study of *Lush* (12) has shown that iodine depressed growth and increased mortality of chickens fed a diet low in chloride and also depressed growth when adequate chloride was fed. There were great discrepancies between results of thyroxine and iodine administration obtained by different workers (1).

Total serum proteins of Fayoumi chickens, normally, increased significantly with the increase in maturity till age of 90th day, then decreased gradually (6). Our findings were similar to those observed by *Brandt* et al. (3) and *Perek* et al. (16). The significant increase in normal females serum total proteins, albumins and the slight increase in α_2-, β- and γ-globulins in all ages than in males, indicate that sex differences may be responsible for these changes. Excess iodine administration decreased significantly the serum total proteins and the albumin levels. In turn, a significant decrease in the body weight was observed. The decrease in the body weight of males in the treated groups were more pronounced than in females. This may be due to the plasma protein functions, one of which is the maintenance of normal blood volume and water content in the tissue. Accordingly the A/G ratio was found to be decreased with the increase in the body weight in both sexes in normals, while in the treated groups it increased in males than in females.

It is well known that the thyroid gland is involved in the growth process of all animals. *Irwin* et al. (9) and *Parker* (14) found that iodinated casein accelerated the growth of chickens to a limited extent provided that the dosage was low. On the other hand, *Turner* et al. (18) reported a slight growth depression with 0.1% iodinated protein in the ration. *Wheeler* et al. (19), also, reported a significant increase in the weight of Rhode Island Red males but not in females when thyroprotein was fed. Recently *Kamar* et al. (10) studied the effect of desiccated thyroid and potassium iodide on Fayoumi chicks. They showed that males grow faster than females and the differences in body weight between the different rates of growth or sexes were highly significant at all ages before treatments. The growth rates of both males and females were increased by treatments used during the first month of experimental period. Our finding, especially after treatment with excess iodine, differed significantly from that of *Kamar* et al. because the decrease observed in serum protein was accompanied by a decrease in the body weight.

The studying of blood constituents in chickens in different age groups during the period of growth sets an important parameter to predict the rate of growth, maturity and egg productions.

Summary

Total proteins and their major fractions were determined in the serum of 135 males and females of Fayoumi chickens, 65 were used as controls and 70 were treated with excess iodine in the form of KI.

Serum proteins increased significantly with the increase in age till the 90th day in normals, then decreased gradually. Excess iodine supplement decreased body

weight, serum total proteins, α_2- and β-globulins in most of males, while in females the decrease was pronounced till the 90 days old.

Albumin increased in females than in males in normals, while in the treated groups it decreased in all females and in some of males. A/G ratio decreased with maturation in normals, but in the treated groups it increased in males and decreased in most of females than those of controls.

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