

## **EFFECT OF SPRAYING POTASSIUM IODIDE ON PRODUCTIVE PERFORMANCE, BLOOD PARAMETERS AND IMMUNO-RESPONSE OF TURKEY CHICKS**

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### **ABSTRACT**

A total of 120 one day-old Nicholas turkey chicks were divided randomly into six equal groups. The first and second groups were treated with distilled water (once and twice weekly) and served as control (T1 and T2), the third and fourth groups (T3 and T4) were treated with 5% potassium iodide (KI) solution once and twice weekly, respectively, while fifth and sixth (T5 and T6) groups were treated with 10% potassium iodide (KI) solution once and twice weekly, respectively. The treatments were spraying over chick heads. The chicks were kept at rearing wire cages, and the feed and water were available *ad libitum*. At 45 days of age ten birds from each group were intramuscularly injected with 0.5 ml of SRBCs. The obtained results showed that chicks sprayed with 10% KI showed the highest LBW and gain ( $P<0.05$ ) at 30, 45 and 60 days of age, followed by 5% KI, while the control showed the lightest weights and gain. LBW and gain of chicks at 60 days of age was higher ( $P<0.05$ ) for spraying once than twice/week. Both KI levels increased ( $P<0.05$ ) WBCs count and blood hemoglobin (Hb) concentration as compared to control. Chicks in 10% KI treatment showed the highest ( $P<0.05$ ) WBCs count and Hb concentration. WBCs count was higher ( $P<0.05$ ) by spraying the chicks twice/week than once/week. RBCs count and Hb concentration were nearly similar as affected by spraying time. Serum total protein (TP) concentration increased ( $P<0.05$ ) with 10% KI as compared to control, but did not differ from that with 5% KI. Globulin (GL) concentration increased ( $P<0.05$ ) and albumin (AL) was not affected by 10% KI. However, AL/GL ratio increased ( $P<0.05$ ) with 5% KI as compared to control, but did not differ from that with 10% KI. There were insignificant differences in AST and ALT activities. Serum T3 concentration was the highest ( $P<0.05$ ) with 10% KI, followed by 5% KI and the lowest in control, respectively. T3 concentration was higher ( $P<0.05$ ) by spraying twice than once/week. Chicks treated with 10% KI showed the highest ( $P<0.05$ ) antibody titer and the lowest ( $P<0.05$ ) lysozyme concentration, followed by 5% KI, while the control showed the lowest antibody titer and the highest lysozyme concentration ( $P<0.05$ ). Spraying twice/week increased ( $P<0.05$ ) antibody titer and decreased lysozyme concentration, reflecting the highest immune response for chicks treated with 10% KI twice/week.

It could be concluded that potassium iodide had positive effect on turkey chicks when used as spraying over heads of growing chicks with 10% once a week.

**Keywords:** Turkey chicks, iodine, growth performance, blood, immunity.

### **INTRODUCTION**

The importance of iodine as an essential element in animal's diet arises from the fact that it is a major component of the thyroid hormone, tri-iodothyronine ( $T_3$ ) and, tetra-iodothyronine ( $T_4$ ) or thyroxine (Ganong, 2001). It has an important effect on thyroid gland (Abd-El-Latif *et al.*, 2001). The thyroid gland contains the highest concentration of iodine (0.2-5% on a dry weight basis) in the body; to be 70-80% of the total body iodine stores. Approximately 90% of the iodine which passes through the thyroid gland is captured by that organ (Hetzl and Welby, 1997). Iodine is combined with tyrosine in the thyroid to form diiodotyrosine, then two molecules of diiodotyrosine are combined to form thyroxine molecule. Approximately 80% of thyroxine in blood circulation is broken down through de-iodination in liver, kidney and other tissues (Gado, 1996).

Thyroid hormones regulate metabolic activity and promote growth. The importance of iodine is considered as limited element for thyroidal hormones ( $T_3$  and  $T_4$ ) biosynthesis (Magilvery, 1979). Deficiency of dietary iodine can be solve by re-utilization of released iodine from degradation of thyroid hormones (Sturkie, 1986). The mode of action of thyroid hormones could be divided into two general ways, the first is metabolic effects as calorigenesis, regulation transportation of water and ions and regulation of intermediary metabolism; and the second is their growth-promoting developmental action (Hadlley,

1992; McNabb and King, 1993). Thyroid gland cannot synthesize its hormones without adequate amount of iodine in blood. At the same time, inadequate amount of iodine not only reduces activity of thyroid hormone, but also cause hypertrophy of thyroid gland. Thyroid gland consumes about 70-100  $\mu\text{g}$  of iodine daily for hormone synthesis (Turner and Bagna, 1971).

Hamdy and Abd El-Latif, (1999) revealed that supplementing drinking water with potassium iodide (KI) at levels of 300 and 600 ppm improved age of sexual maturity, egg number, egg weight and feed conversion ratio in Japanese quail hens. While adding a level of 900 ppm of KI showed an opposite results in egg number, egg weight, and feed conversion ratio. Other investigators found that KI had antimicrobial effects against wide range of microbes, gram (negative and positive) bacteria species (Cooper, 2007), due to developing of general healthy including immunity and growth performance.

The present study was conducted to investigate the effect of spraying KI on productive performance, blood parameters and immune-response of growing turkey chicks during the first 60 days of age.

### **MATERIALS AND METHODS**

This study was carried out at the Turkey Breeding Station, Mahallet Mousa, Kaferehshikh Governorate, Animal Production Research Institute, Agricultural Research Center, Egypt.

**Birds and feeding system:**

A total number of 120 one day-old Nicholas turkey chicks were used in this study. Birds were divided randomly into six similar groups in wire cages. Water and feed were available *ad libitum* all times. Birds in all groups were fed commercial diet containing 0.4 mg iodine/kg during 60 days as an experimental

period. Ingredients and calculated energy and CP contents are shown in Table (1).

Iodine content of feed was determined according to McDowell (2003).

**Table (1): Ingredients and calculated energy and CP contents of the basal diet.**

Ingredient	Diet from 0-60 days
Yellow corn	60.0
Wheat bran	0.60
Soybean meal (44%)	39.0
Broiler concentrate (50 %)	10.0
Limestone	0.00
Bone meal	0.30
Iodine (mg/kg)	0.4
Premix*	0.10
Total	100
Calculated chemical composition**:	
Metabolizable energy ME (Kcal /kg)	2900
Crude protein (%)	26.90

\* Each 3 kg of vitamins and minerals mixture contain: 12000.000 IU vitamin A acetate; 2000.000 IU vitamin D3; 10.000 mg vitamin E acetate; 2000 mg vitamin K3; 100 mg vitamin B; 4000 mg vitamin B2; 1500 mg vitamin B6; 10 mg vitamin B12 ; 10.000 mg Pantothenic acid; 20.000 mg Nicotininc acid; 1000 mg Folic acid; 50 mg Bioten; 500.000 mg Chorine; 10.000 mg Copper; 1000 mg Iodine; 30.00 mg Iron; 55.000 mg Manganese; 55.000 mg Zinc; and 100 mg Selnium. \*\* According to NRC, 1994.

**Experimental design:**

Six treatments were used in this study. Birds in the control groups (T1 and T2) were subjected to spraying with distilled water once or twice, respectively,

while those of treatments T3 to T6 were subjected to spraying over heads with 10 ml (volume of solution) contained 5 or 10% KI once and twice weekly, respectively (Table 2).

**Table (2): Experimental design of treatments.**

Treatment	No. of birds	Spraying time (KI level/week)
T1	20	Distilled water once a week
T2	20	Distilled water twice a week
T3	20	5% KI* once a week
T4	20	5% KI twice a week
T5	20	10% KI once a week
T6	20	10% KI twice a week

\* KI: Potassium Iodide (a commercial product 2.5% I, diluted with distilled water to obtain 5 or 10% I solutions).

**Experimental procedures:**

During an experimental period of 60 days, birds were weighed to record live body weight (LBW) at one day old and biweekly thereafter. Body weight gain (BWG) was calculated at biweekly intervals and during the whole experimental period.

On day 45 of age, 10 chicks from each group were injected intramuscularly with 0.5 ml of 50% sheep red blood cells (SRBC) as T-dependent antigen. Blood samples were collected at the end of the experimental period (60 days of age) and divided into two aliquots. In the first one, count of red blood cells (RBCs) and white blood cells (WBCs) was determined using haemocytometer (Hawkey and Dennett, 1989). Haemoglobin (Hb) concentration was measured according to Drew *et al.* (2004). The second aliquot of blood sample was centrifuged at 3500 rpm for 15 minutes to obtain serum and immediately stored at -20° until analysis. Concentration of serum total protein and albumin as well as activity of aspartate (AST) and alanine (ALT) transaminases were determined colorimetrically using available commercial kits (Bio-Merius, France). Concentration of serum T<sub>3</sub> was

determined by radioimmunoassay (RIA) as described by Darras *et al.* (1992).

Humeral Immune Response was evaluated by haemagglutination (HA) test according to Prescott *et al.* (1982). Titers were measured as log 2 values. Haemagglutination anti-bodies were assessed 7 days later by HA test. Measurement of lysozyme activity was determined according to the method described by Schlitz (1987).

**Statistical analysis:**

Data were subjected to statistical analysis using SAS (1995) according to the following model:  $Y_{ijk} = \mu + T_i + F_j + TF_{ij} + e_{ijk}$  Where:  $Y_{ijk}$  = the observation of individuals,  $\mu$  = overall mean,  $T_i$  = effect of treatment (Iodine level, 0, 5 and 10%),  $F_j$  = effect of spraying time (once or twice weekly),  $TF_{ij}$  = effect of interaction between treatments and time, and  $e_{ijk}$  = experimental error or residual. Means were separated using Duncan's Multiple Range Test (Duncan, 1955).

**RESULTS**

**Productive performance:**

**Live body weight:**

Data presented in Table (3) showed that the significant ( $P < 0.05$ ) effect of KI treatment appeared on LBW of chicks at 30, 45 and 60 days of age. Chicks sprayed at a level 10% KI were significantly ( $P < 0.05$ ) the heaviest at 30, 45 and 60 days of age, followed by those sprayed with 5%, while control chicks showed the lightest weights.

The effect of spraying time on LBW of chicks was not significant at 0, 15, 30 and 45 days of age.

However, LBW of chicks at 60 days of age was significantly ( $P < 0.05$ ) higher for spraying once than twice/week. The effect of interaction between treatment and spraying time was significant ( $P < 0.05$ ) at 30, 45 and 60 days of age, reflecting the heaviest LBW of chicks sprayed with KI at a level of 10% for once/week at these ages. However, the least LBW was obtained for those sprayed with water for once/week (Table 3).

**Table (3): Live body weight of turkey chicks at different ages as affected by treatment, spraying time and their interaction.**

Variable	Live body weight (g) at different ages				
	Day one	Day 15	Day 30	Day 45	Day 60
Effect of treatment (KI level):					
0%	60.63	218.9	1936.8 <sup>c</sup>	2830.9 <sup>c</sup>	3634.8 <sup>c</sup>
5%	60.58	214.7	1978.1 <sup>b</sup>	2973.6 <sup>b</sup>	3879.2 <sup>b</sup>
10%	60.59	220.7	2064.6 <sup>a</sup>	3156.4 <sup>a</sup>	4298.0 <sup>a</sup>
±SEM	0.13	0.33	5.20	39.2	40.80
Effect of spraying time/week:					
Once (O)	60.23	219.2	1997.6	2967.6	4235.0 <sup>a</sup>
Twice (T)	60.96	216.7	1992.4	2974.0	3939.6 <sup>b</sup>
±SEM	0.11	0.29	3.9	32.2	39.1
Interaction between treatment and spraying time: :					
O × 0%	60.13	218.5	1935.7	2821.4	3623
O × 5%	59.30	214.0	1942.7	2964.8	3791.4
O × 10%	61.27	225.2	2114.3	3213.8	4390.0
T × 0%	61.13	219.3	1937.8	2840.6	3645.9
T × 5%	61.86	215.5	2013.5	2982.5	3967.0
T × 10%	59.90	216.1	2025.0	3099.0	4206.0
±SEM	0.13	0.37	5.20	39.30	40.10

a, b and c: Means in the same column for each factor having different superscripts are significantly different ( $P < 0.05$ ).

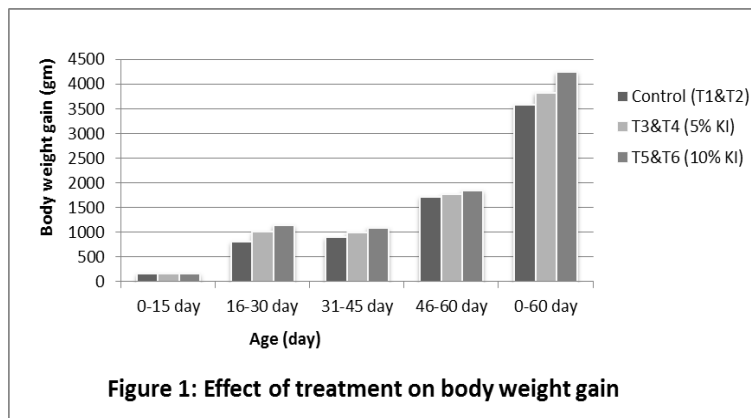
**Body weight gain:**

Data illustrated in Fig. (1) revealed that body weight gain (BWG) was the highest for chicks sprayed with 10% KI, moderate for those sprayed with 5% KI and the lowest for control chicks without KI treatment at all interval studied and during the whole experimental period.

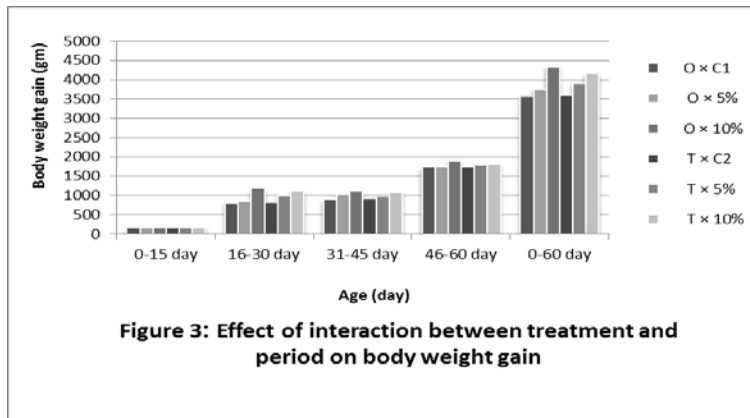
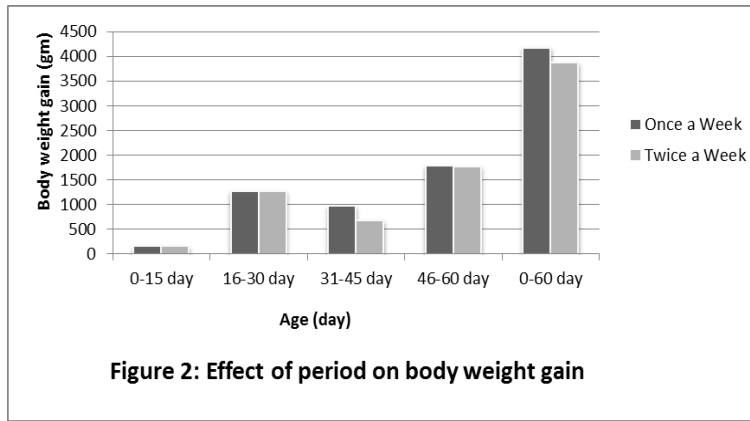
As affected by spraying time, spraying the chicks once/week had no effect on BWG of chicks at all intervals studied, but the effect of spraying for

once/week cleared during the whole experimental period (0-60 d of age), whereas chicks sprayed once/week significantly ( $P < 0.05$ ) increased BWG as compared to twice/week (Fig. 2).

The effect of interaction between treatment and spraying time was significant ( $P < 0.05$ ) during the interval from 0 – 60 d, reflecting the highest BWG of chicks sprayed with KI at a level of 10% for once/week (Fig. 3)



**Figure 1: Effect of treatment on body weight gain**



**Blood components:**

**Hematological parameters:**

Data shown in Table (4) revealed insignificant effect of KI treatment on count of RBCs, but both KI levels significantly ( $P < 0.05$ ) increased count of WBCs and blood hemoglobin (Hb) concentration as compared to control. Treatment with KI at a level of 10% showed significantly ( $P < 0.05$ ) the highest WBCs count and Hb concentration.

The effect of spraying time was significant only on WBCs count. Count of WBCs was significantly

( $P < 0.05$ ) higher by spraying the chicks twice/week than once/week. However, RBCs count and Hb concentration were nearly similar as affected by spraying time (Table 4).

The effect of interaction between treatment and spraying time was significant ( $P < 0.05$ ) on WBC count and Hb concentration. Therefore, chicks sprayed with 10% KI twice/week showed the highest values as compared to other treatments (Table 4).

**Table (4): Hematological parameters of turkey chicks as affected by treatment, spraying time and their interaction.**

Variable	Hematological parameter		
	RBCs ( $\times 10^6/\text{mm}^3$ )	WBCs ( $\times 10^3/\text{mm}^3$ )	Hemoglobin (g/dl)
Effect of treatment (KI level):			
0%	3.49	4.99 <sup>c</sup>	9.74 <sup>b</sup>
5%	4.65	5.21 <sup>b</sup>	10.23 <sup>a</sup>
10%	4.74	7.01 <sup>a</sup>	10.67 <sup>a</sup>
±SEM	0.14	0.18	0.02
Effect of spraying time/week:			
Once (O)	4.31	5.52 <sup>b</sup>	10.14
Twice (T)	4.26	5.96 <sup>a</sup>	10.29
±SEM	0.11	0.32	0.10
Interaction between treatment and spraying time: :			
O × 0%	3.50	4.99	9.74
O × 5%	4.64	5.10	10.21
O × 10%	4.80	6.45	10.48
T × 0%	3.48	4.99	9.75
T × 5%	4.65	5.32	10.26
T × 10%	4.67	7.56	10.86
±SEM	0.13	0.16	0.03

a, b and c: Means in the same column for each factor having different superscripts are significantly different ( $P \leq 0.05$ ).

**Blood serum biochemicals:**

Data presented in Table (5) showed significant ( $P < 0.05$ ) increase in serum total protein (TP) concentration only with KI treatment at a level of 10% as compared to control, but did not differ from that with 5% KI. The observed significant increase in TP concentration was associated with significant ( $P < 0.05$ ) increase in globulin (GL) not in albumin (AL) concentration as affected by 10% KI. However, AL/GL ratio significantly ( $P < 0.05$ ) increased with 5% KI as compared to control, but did not differ from that with 10% KI.

It is of interest to note that the effect of spraying time was not significant on concentration of TP, AL, GL and AL/GL ratio. The effect of interaction between treatment and spraying time was insignificant on TP, AL and GL concentrations. This was reflected in similar trend of increase in TP, AL and GL by increasing KI level either by spraying once or twice/week, being the highest for chicks treated with 10% KI twice/week. However, the effect of interaction between treatment and spraying time on AL/GL ratio was significant ( $P < 0.05$ ), reflecting the highest AL/GL ratio for chicks treated with 5% KI once/week (Table 5).

**Table (5): Biochemical parameters in blood serum of turkey chicks as affected by treatment, spraying time and their interaction.**

Variable	Blood serum biochemical			
	Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Albumin/globulin ratio
Effect of treatment (KI level):				
0%	4.11 <sup>b</sup>	2.44	1.67 <sup>b</sup>	1.46 <sup>b</sup>
5%	4.53 <sup>ab</sup>	2.84	1.69 <sup>b</sup>	1.68 <sup>a</sup>
10%	4.78 <sup>a</sup>	2.92	1.86 <sup>a</sup>	1.57 <sup>ab</sup>
±SEM	0.14	0.18	0.02	0.04
Effect of spraying time/week:				
Once (O)	4.35	2.72	1.63	1.67
Twice (T)	4.60	2.73	1.87	1.46
±SEM	0.11	0.32	0.10	0.13
Interaction between treatment and spraying time: :				
O × 0%	4.12	2.42	1.70	1.42
O × 5%	4.32	2.85	1.47	1.94
O × 10%	4.60	2.87	1.73	1.66
T × 0%	4.10	2.47	1.63	1.51
T × 5%	4.74	2.83	1.91	1.48
T × 10%	4.96	2.89	2.07	1.40
±SEM	0.13	0.16	0.03	0.02

**a, b and c: Means in the same column for each factor having different superscripts are significantly different ( $P \leq 0.05$ ).**

**Enzyme activity and T3 concentration:**

Results presented in Table (6) showed insignificant differences among treatments in AST and ALT activities. However, serum T3 concentration was significantly ( $P < 0.05$ ) the highest in chicks treated with 10% KI, followed by those treated with 5% KI and the lowest in control, respectively.

The effect of spraying time was also significant ( $P < 0.05$ ) only on T3 concentration, being higher by spraying the chicks twice than once/week. As affected by insignificant interaction between treatment and spraying time, chicks treated with 10% KI twice/week showed the lowest AST and ALT activities and the highest T<sub>3</sub> concentration in blood serum (Table 6).

**Table (6): Activity of transaminases (AST and ALT) and T3 concentration in blood serum of turkey chicks as affected by treatment, spraying time and their interaction.**

Variable	AST (U/L)	ALT (U/L)	T <sub>3</sub> (ng/dl)
Effect of treatment (KI level):			
0%	11.96	2.57	72.05 <sup>c</sup>
5%	11.84	2.28	73.83 <sup>b</sup>
10%	11.16	2.01	82.30 <sup>a</sup>
±SEM	0.14	0.18	0.12
Effect of spraying time/week:			
Once (O)	11.76	2.44	74.21 <sup>b</sup>
Twice (T)	11.56	2.14	77.91 <sup>a</sup>
±SEM	0.17	0.15	0.10
Interaction between treatment and spraying time: :			
O × 0%	11.98	2.57	72.13
O × 5%	11.86	2.45	74.31
O × 10%	11.44	2.29	76.19
T × 0%	11.95	2.55	71.98
T × 5%	11.82	2.11	73.35
T × 10%	10.88	1.74	88.42
±SEM	0.13	0.16	0.03

**a, b and c: Means in the same column for each factor having different superscripts are significantly different ( $P \leq 0.05$ ).**

**Immune response:**

Results shown in Table (7) revealed that chicks treated with 10% KI showed significantly ( $P<0.05$ ) the highest antibody titer ( $\log_2$ ) against sheep red blood cells (SRBC's) and the lowest lysozyme concentration, followed by those treated with 5% KI, while the control chicks showed significantly ( $P<0.05$ ) the lowest antibody titer and the highest lysozyme concentration.

Spraying chicks twice/week significantly ( $P<0.05$ ) increased antibody titer and decreased lysozyme concentration. Accordingly, the insignificant interaction between treatment and spraying time on both parameters reflected the highest immune response for chicks treated with 10% KI twice/week (Table 7).

**Table (7): Immune response of turkey chicks as affected by treatment, spraying time and their interaction at different ages.**

Variable	Antibody titer	Lysozyme ( $\mu\text{mol/ml}$ )
Effect of treatment (KI level):		
0%	3.73 <sup>c</sup>	85.26 <sup>a</sup>
5%	4.95 <sup>b</sup>	82.90 <sup>b</sup>
10%	5.30 <sup>a</sup>	80.21 <sup>c</sup>
$\pm\text{SEM}$	0.04	0.22
Effect of spraying time/week:		
Once (O)	4.33 <sup>b</sup>	85.12 <sup>a</sup>
Twice (T)	4.97 <sup>a</sup>	80.46 <sup>b</sup>
$\pm\text{SEM}$	0.03	0.10
Interaction between treatment and spraying time: :		
O $\times$ 0%	3.70	88.76
O $\times$ 5%	4.50	84.60
O $\times$ 10%	4.80	82.00
T $\times$ 0%	3.75	81.76
T $\times$ 5%	5.40	81.20
T $\times$ 10%	5.80	78.42
$\pm\text{SEM}$	0.02	0.43

**a, b and c: Means in the same column for each factor having different superscripts are significantly different ( $P\leq 0.05$ ).**

**DISCUSSION**

The current study aimed to evaluate the effect of spraying potassium iodide (KI) on productive performance, blood parameters and immune response of growing turkey chicks during the first 60 days of age. The obtained results indicated heaviest LBW and gain of chicks treated with KI at both levels, being significantly ( $P<0.05$ ) higher with KI at a level of 10% than 5%. Such results may be due to the important role of iodine in the metabolism and growth, since it has a direct effect on regulation of some metabolic hormones such as thyroid hormones (Magilvery, 1979; El-kaiaty *et al.*, 2004). It is well known that the iodine deficiency causes a low level of  $T_4$  and  $T_3$  in poultry (Guo, 1999), pigs (Schone *et al.*, 1988), rats (Fang, 2000) and humans (Orville *et al.*, 2000). Thyroid hormones are synergistic to growth hormone and there are many actions of thyroid hormones mediated to stimulation of cellular protein synthesis (Hinkle and Kinsella, 1986; Abd El-Latif *et al.*, 2001). In this respect, Fabris (1973) observed that iodine deficiency had a reverse effect on the rat's lymphocytes function. Also, Bagchi *et al.* (1985) explained that excessive consumption of iodine may be responsible for the increased incidence of autoimmune thyroiditis in chickens. They found that administration of iodine during the first 10 weeks of life increased the incidence of auto antibodies to triiodothyronine, thyroxine and thyroglobulin, therefore improve growth rate. Moreover, Vorotnitskaya *et al.* (1989) reported that all trace elements mixture affecting live weight gain, feed utilization. Other investigators

found that KI had antimicrobial effects against wide range of microbes, gram negative-positive bacteria species, due to developing of general healthy condition that led to enhance growth performance (Cooper, 2007).

It is worthy noting that the observed improvement in LBW and gain of chicks treated with 10% KI was associated with insignificant increase in RBCs count and significant ( $P<0.05$ ) increase in WBCs count and Hb concentration. Also, this was attributed to significant ( $P<0.05$ ) increase in total protein and globulin in blood serum. Although, El-Kaiaty *et al.* (2004) found that AST and ALT significantly decreased by iodine treatment in ducks, the present results indicated insignificant reduction in AST and ALT activities by KI treatment at both levels. These finding may indicate normal liver function of chicks treated with KI.

Lysozymes are proteins of low molecular weight found in polymorphnuclear leukocytes and mononuclear cells. They are present in all tissue fluids except cerebro spinal fluid, sweat and urine. Lysozymes are considered as a member of the innate humoral factors that elaborated from the body and showed a dramatic increase in concentration in response to infection or tissue injury (Weir, 1983). The effect of iodine on increasing the antibody titer and decreasing lysozyme concentration may be attributed to an indirect effect on the immune system, whereas chicks treated with KI were highly producer of antibody to SRBC's and reduced lysozyme concentration. Accordingly these birds had better immunological responsiveness than control birds. KI may preferentially affect cell-mediated

immune response relative to development of lymphoid organs and antibody production, because iodine may act by altering antigen presentation by the thyroid epithelial cells modifying the function of thyroid targeted immune cells or by other mechanisms (Bagchi *et al.*, 1985; Sonsovsckaya, 1999). Also, thyroid hormones are known to influence the function and development of lymphoid organs (Paavonen, 1982).

It could be concluded that potassium iodide had positive effect on turkey chicks when used as spraying over heads of growing chicks with 10% twice a week.

## REFERENCES

- Abd El-Latif, S.A.; Faten, A. Ibrahim, EL-Kaiaty, A.M.; and Abd El-Moty, A.K.I (2001). Effect of iodine on some productive and metabolic functions of growing Muscovy Ducklings. *Egypt. J. of Nutrition and feed*, Vol. 4 (special Issue): 1015-1023.
- Bagchi, N.; Brown, T.R.; and Urdanivia, E. (1985). Induction of Autoimmune Thyroiditis in chickens by dietary Iodine. *Science*, Vol 230: 325-327.
- Chen, Y. (1980). Effect of thyroxine on the immune response of mice in vivo and in vitro. *Immunol. Comm.* 9(3):269.
- Cooper, R.A. (2007). Iodine revisited. *International Wound Journal*, 00:1-4.
- Darras, V.M.; Visser, T.J.; Berghman, L.R.; and Kuhn, E.R. (1992). Ontogeny of type I and III deiodinase activities in embryonic and posthach chick: relationship with changes in plasma triiodothyronine and growth hormone level. *Comparative Biochemistry and Physiology*, 103 A: 131-136.
- Drew, P.R.; Charles, J.S.; Trevor, B.; and John, L. (2004). *Oxford Handbook of Clinical Haematology*. 2th Edition, Oxford University Press, USA.
- Duncan, D.B. (1955). Multiple range and multiple F test. *Biometrics* 11:1-42.
- El-Kaiaty, A.M. , Faten, A. A. Ibrahim and Nematallah G. M. Ali. (2004). Responses in growth, blood constituents, physiological functions and immune responses due to iodide injection of growing Miscovy ducklings. *Egypt. Puolt. Sci.*, Vol., 24 (IV) : (787-805).
- Fabris, N. (1973). Immunodepression in thyroid-deprived animals. *Clin. Exper. Immunol.* 15:601-611.
- Fang, H. (2000). The study on the effects of iodine deficiency and iodine excess on the expression on thyroid TG and TPO mRNA in rats. Ph.D. Thesis, Tianjin Medical University, China.
- Gado, M.S., (1996). *Endocrine Physiology: 2<sup>th</sup> Edition*. 159-165, Cairo, Egypt.
- Ganong, W. F. (2001). *Review of Medical Physiology*, Twentieth Edition. New York: McGraw-Hill, Inc., pp. 307-321.
- Guo, Y. M. (1999). The necessity of selenium to normal thyroid hormone metabolism and the influence of selenium deficiency on the metabolism of sulphur-containing compounds. Ph.D. Thesis, China Agricultural University.
- Hadlly, M.C. (1992). *Endocrinology 3<sup>rd</sup> ed* Prentic-Hall International. Inc.
- Hamdy, A.M.M., and S.A. Abdel- Latif, (1999). Effect of iodinated water on some productive and metabolic parameters of japanese quail hens. *Egyptian J. Nutrition and Feeds* (1999) 2 (Special Issue): 703-709.
- Hawkey, C.M. and Dennett, T.B. (1989). *A Color Atlas of Comparative Veterinary Hematology*. Wolf Publishing Limited, London, England.
- Hetzel, B.S. and M.C. Welby. (1997). Iodine. In: O'Dell, B.L. and Sunde, R.A. (eds.) *Handbook of Nutritionally Essential Mineral Elements*. Marcel Dekker, New York, p 557.
- Hinkle, P.M.; and Kinsella, P.A. (1986). Thyroid hormone activity iodination of an autocrine growth factor by pituitary tumor cell. *Science*, 234: 154.
- Magilvery, R.W. (1979). *Biochemistry A. Functional. Approach*. PP. 711, W.B. Saunder Company, Philadelphia, London, Toronto.
- McDowell, L.R. (2003). *Minerals in animal and human nutrition*, 2<sup>nd</sup> edn. Elsevier, Amsterdam, pp. 305-334.
- McNabb, F.M.A.; and King, D.B. (1993). Thyroid hormones in growth, metabolism and development. Pp.393-417 in the *Endocrinology of growth, development and metabolism in vertebrate* P.K.T. Pang and M. T. Schreiberman, ed. Academic Press, New York, NY, USA.
- National Research Council (1994). *Nutrient Requirements of Poultry [M]*, Ninth Revised Edition. National Academy Press, 1994, Washington, DC.
- Orville, A. Levander and Philip, D. Whanger. (2000). Deliberations and evaluations of the approaches, endpoints and paradigms for selenium and iodine dietary recommendations. *J. Nutr.* 126:2427s-2434s.
- Paavonen, T. (1982). Enhancement of human B lymphocyte differentiation in vitro by thyroid hormone. *Scand. J. Immunol.* 15:211-215.
- Prescott, C.A., B.N. Wilkie, B. Hunter and R.J. Julian (1982). Influence of purified grade pentachlorophenol on the immune response of chickens. *American Journal of Vetrinary Reseach*, 43:481-487.
- SAS (1995). *Statistical Analysis System, User's Guide Version 5*, Cary NC, USA.
- Schlitz, L.A., (1987). *Methods in Clinical Chemistry*. The C.V. Mosby Cost Louis, 742-746.
- Schone, F., H. Ludke, A. Hennig and G. Jahreis (1988). Copper and iodine in pig diets with high glucosinolate rapseed meal: II. Influence of iodine in pig diets with rapseed meal untreated or treated with copper ions on performance and thyroid hormone status of growing pigs. *Anim. Feed Sci. Technol.* 22:45-59.

- Sosnovskaya, T. (1999). Efficacy of Izamben in poultry. Vestsi- Akademii-Agrarnykh –Navuk Respubliki Belarus, 1999 No 2: 82-85 (Abstract).
- Sturkie, P.D. (1986). Avian Physiology, 4<sup>th</sup> ed. Comstock Associate, UY, USA.
- Turner, C.D.; and Bagna, J.T. (1971). General Endocrinology 5th ed. W.B. Saunders Company Philadelphia, London, Toronto.
- Vorotnitskaya, I.E.; Solov, V.A.; Yagodin, B.A.; and Gubar, G.D. (1989). A short review of the results of studies on problems of trace elements in biology in 1987. Mikroelementary-V-SSSR 30:37-50.
- Weir, D.M., (1983). Immunology: An out line for students of medicine and biology. 5<sup>th</sup> Ed. 15-16, Churchill Livingstone Edinburgh, London Melbourne, New York.
- Zhigang Song, Yuming Guo\* and Jianmin Yuan, (2006). Effects of Dietary Iodine and Selenium on the Activities of Blood Lymphocytes in Laying Hens, Asian-Aust. J. Anim. Sci. Vol 19, No. 5 : 713-719.

## تأثير الرش ببويديد اليوتاسيوم على الأداء الإنتاجي وقياسات الدم والاستجابة المناعية لكتاكيت الرومي محمد عبد العزيز الصاوي و ساميه عريان إبراهيم معهد بحوث الإنتاج الحيواني والدواجن، مركز البحوث الزراعية، وزارة الزراعة - مصر

أستخدم في هذا البحث عدد ١٢٠ كتكوت نيكولاس عمر يوم، قسمت عشوائيا إلى ستة مجاميع متساوية بكل منها ٢٠ كتكوت. المجموعة الأولى والثانية عوملت بالماء المقطر مرة واحدة أو مرتين أسبوعيا كمجموعات مقارنة بينما عوملت المجاميع الأربعة الأخرى بمحلول يوديد اليوتاسيوم بكمية ١٠ مل (بتركيز ٥% أو ١٠% رشا بطريقة الرذاذ فوق رأس الكتاكتيت) وذلك بواقع مرة واحدة أو مرتين أسبوعيا على التوالي. تم تربية الكتاكتيت في بطاريات من السلك وكان الغذاء والماء متوفر دائما بصورة حرة. وعند عمر ٤٥ يوم تم حقن ١٠ كتاكيت ٠.٥ مل من سيرم دم الأغنام عضليا. وكانت أهم النتائج كما يلي:

أظهر رش الكتاكتيت بـ ١٠% يوديد اليوتاسيوم زيادة معنوية لوزن الجسم الحي والزيادة في وزن الجسم عند ٣٠، ٤٥ و ٦٠ يوم من العمر يلي ذلك المعاملة ببويديد اليوتاسيوم بنسبة ٥%، بينما أظهر الكنترول إنخفاض في وزن الجسم الحي والزيادة في الوزن. عند عمر ٦٠ يوم من العمر أظهرت المعاملة بالرش مرتين أسبوعيا زيادة في وزن الجسم ومعدل الزيادة في الوزن عن الرش مرة واحدة أسبوعيا. جميع مستويات يوديد اليوتاسيوم أظهرت زيادة في عدد كرات الدم البيضاء وتركيز الهيموجلوبين في الدم مقارنة بالكنترول. أظهرت الكتاكتيت المعاملة بالرش ببويديد اليوتاسيوم بنسبة ١٠% زيادة معنوية في عدد كرات الدم البيضاء وتركيز الهيموجلوبين. كرات الدم البيضاء كانت أعلى معنويا برش الكتاكتيت مرتين/أسبوع عن تلك التي تم رشها مرة/أسبوع. عدد كرات الدم الحمراء وتركيز الهيموجلوبين كان متشابها تقريبا متأثرا بوقت الرش. تركيز البروتين الكلى إزداد معنويا بالمعاملة بنسبة ١٠% يوديد اليوتاسيوم مقارنة بالكنترول، ولكن لم يختلف عن المعاملة بنسبة ٥% يوديد اليوتاسيوم. إزداد تركيز الجلوبيولين معنويا والألبومين لم يتأثر بالمعاملة بنسبة ١٠% يوديد اليوتاسيوم. بينما إزداد نسبة الألبومين/جلوبيولين معنويا بالمعاملة بنسبة ٥% يوديد اليوتاسيوم مقارنة بالكنترول، لكن لم تختلف عن المعاملة بـ ١٠% يوديد اليوتاسيوم. لم يكن هناك فروق معنوية في نشاط أنزيمات ALT و AST. تركيز هرمون T<sub>3</sub> كان الأعلى بالمعاملة يوديد اليوتاسيوم ١٠%، يليه ٥% بينما الأقل كان في الكنترول على التوالي. تركيز هرمون T<sub>3</sub> كان الأعلى بالرش مرتين أسبوعيا عن الرش مرة واحدة. الكتاكتيت المعاملة بـ ١٠% يوديد اليوتاسيوم أظهرت الأعلى في مستوى الأجسام المناعية والأقل معنويا في تركيز Lysozyme. الرش مرتين أسبوعيا إزداد مستوى الأجسام المناعية معنويا وإنخفض تركيز Lysozyme، مما يعكس أعلى إستجابة مناعية للكتاكيت المعاملة بـ ١٠% يوديد اليوتاسيوم مرتين/أسبوعيا. من تلك النتائج يمكن تلخيص ذلك يوديد اليوتاسيوم لة تأثير إيجابي على كتاكيت الرومي عند الرش على رأس الكتاكتيت النامية بمعدل ١٠% مرتين كل أسبوع.