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THE IMPACT OF TREATMENT WITH INSULIN ON INTERMEDIATE METABOLISM IN BROILER'S BODY

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Abstract

The experiment was performed on seven weeks old broiler chickens ant they are divided in experimental and control groups. Once a day, the insulin was administrated in a dose of 4.00 IU/kg body weight. In the experiment, the effect of insulin hormone experimental treatments on growth was pursued, in parallel with its effect on the main metabolic pathways: protein, carbohydrate, lipids. The treatment was performed for 8 day and the chickens were periodically weighted. At the end of the treatment capillary and venous blood was harvested. The results were statistically processed and the means and standard error of means were calculated. The statistical significance differences of the means between control and experimental group was searched by Student test. Following the experimental treatment of insulin on chickens, the insulin treatment had a significant decrease in blood glucose ($P<0.05$), the level being 124 mg/dl, compared to 152 mg/dl in the control. Plasma lipid levels, however, underwent changes by decreasing from 639 mg/ml in the control to 361 mg/ml in the insulin-treated group.

Key words*: chickens, insulin, protein, lipid, carbohydrate, metabolism.*

INTRODUCTION

Priority for many institutions and researchers is the increase in productive capacities of animals, to a large extent the decrease in animal costs. One way to achieve these goals is to stimulate growth based on hormonal treatments. However, the use of hormones in animal breeding should not alter their health status. For this, the effects of hormones used to stimulate different productions on different metabolic processes must be fully understood.

Insulin controls the carbohydrate metabolism and lipid and protein metabolism. It is important to note that the liver is the main target organ of insulin, in part because pancreatic venous flow enters directly into the liver (Mihalache, 2004).

The net effect of insulin action is lowering blood levels of glucose, fatty acids and amino acids to promote intracellular transformation of these compounds in their forms of storage: glycogen, triglycerides and proteins (Serban et al., 1993).

MATERIALS AND METHODS

Biological material was represented by chickens aged 7 weeks (Broiler hybrid). The avian youth was provided by S.C. Vis Campi S.R.L., Ciorani Commune, Prahova County.

It were set up two groups of chickens: a control group and a group treated with insulin. Both groups were fed *ad libitum* with food compound recipes for the stage and physiological status (growing youth) and benefited from a program conducted by artificial lighting (8 hours per day), according to technology growth.

At the end of the treatment capillary and venous blood was harvested. The venous blood was harvested without anticoagulant. From this blood, the serum was used to determine the concentration in lipids, total protein, albumin, globulin and carbohydrate.

The 18 chickens from the two groups were fed pelleted feed of prescription industrial code 21-3 (Table 1).

A batch consists of nine chickens were treated with insulin, which was administered at a dose of 4.00 IU daily, once a day. Treatment duration was eight days. The control group remained untreated.

In this category of birds were also determined the effects of insulin on the main biochemical blood parameters.

Determination of serum lipid concentration was done by the vanillin method, blood glucose dosing by colorimetric method with antron and

protein levels was determined by the method of Gornall. The results were processed statistically and the significance of difference between groups was performed based on t test (Student test) (Tacu, 1968).

Table 1. Food compound recipe 21-3 used to feed chickens

No.	Ingredients	Quantity (kg)	Metabolizable energy (kcal)	Crude protein (%)
1	Corn	36.0	1212. 3	3.13
2	Barley	14.0	378.0	1.44
3	Wheat	16.0	476.6	1.90
4	Soybean cake	15.0	345.0	6.60
5	Sunflower cake	7.0	105.0	2.24
6	Meat flour	2.0	57.3	1.14
7	Oil	4.5	396.0	-
8	Premix methionine	0.9	18.8	0.50
9	Dicalcium phosphate	1.8	-	-
10	Calcium carbonate	1.0	-	-
11	Salt	0.3	-	-
12	Premix (MVP)	1.5	30.0	0.10
13	Total	100	3019.0	17.05

Legend: MVP = mineral-vitamin premix

RESULTS AND DISCUSSIONS

Every day, during treatment, the chickens of both groups were weighted (Table 2 and Figure 1).

Table 3 presents the results of determinations regarding the experimental group treated with insulin compared with controls.

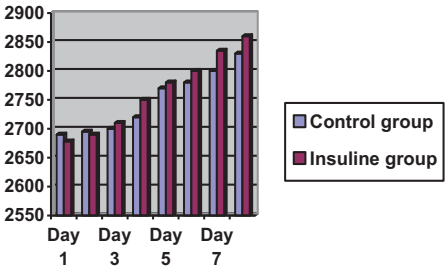

Figure 1. Evolution of chickens weight during the treatment with insulin

Table 2. Evolution of chicken weight (g) during the treatment with insulin

Group	Experimental period (day)							
	1	2	3	4	5	6	7	8
Control group	2690	2695	2700	2720	2770	2780	2800	2830
Experimental group	2678	2690	2710	2750	2780	2800	2835	2860

Insulin treatment had a significant decrease in blood glucose ($P<0.05$), the level being 124 mg/dl, compared to 152 mg/dl in the control. Plasma proteins were not significantly affected by this hormone.

Thus, total plasma protein concentration was 56.9 mg/dl in the control and 43.4 mg/dl respectively in the insulin-treated group.

Table 3. Determination of concentration in lipids, total proteins, albumin, globulins and carbohydrates in chicken

Group	Analysed parameter	Maxim level (mg/dl)	Minim level (mg/dl)	Average (mg/dl)	Standard error
Control group	Glucose	162.0	142.0	152.0	10
Experimental group		133.0	115.0	124.0	9
Control group	Albumin	42.4	42.4	42.4	0
Experimental group		32.0	32.0	32.0	0
Control group	Globulin	15.3	15.3	15.3	0
Experimental group		12.3	12.3	12.3	0
Control group	Total protein	67.9	45.9	56.9	11
Experimental group		56.4	30.4	43.4	13
Control group	Lipids	815.0	463.0	639.0	176
Experimental group		425.0	297.0	361.0	64

Plasma lipid levels, however, have been changed by decreasing from 639 mg/ml in the control to 361 mg/ml in the insulin-treated group (Figure 2).

This is also found in the literature, according to which hyperlipidemia occurs in mammals in diabetes mellitus (diabetes mellitus).

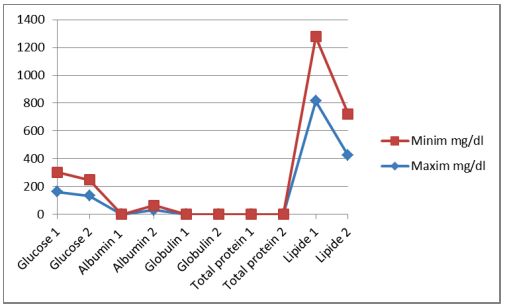

Figure 2. Plasma biochemical parameters measured in control and experimental groups

The total feed intake of the injected lot was 60 g higher than in the control group (Table 4).

Table 4. Evolution of feed consumption of broilers

Period	Feed consumption (g)	
	Control group	Experimental group
Total period	2424	2484
Day 8	325	330
Day 7	321	326
Day 6	304	315
Day 5	309	314
Day 4	303	311
Day 3	296	300
Day 2	279	299
Day 1	287	289

This weight gain has been observed to be late, because the anabolic effects of insulin are delayed, insulin being a protein, lipid and carbohydrate anabolic.

A side effect of therapy with this hormone is weight gain. If exogenous insulin is administered, it will first get into the systemic circulation and then pass into the liver.

Thus, insulin preferentially favors the penetration of blood glucose into adipose or muscle tissue, lowering blood glucose, causing subsequent hepatic glycogen mobilization to make the necessary blood corrections.

CONCLUSIONS

The body weight of broiler chickens treated with insulin evolved after a witness superior curve, although in other species, commonly, hipoglicemy cause conversely, a lower weight curve.

So, the average weight of 2678 g at the beginning of insulin administration, after 8 days of treatment it was 2860 g (an average daily gain of 22.75 g per day, compared to 20.00 g in controls).

This beneficial effect appears to be due to anabolic protein action of insulin, which sometimes go beyond what was catabolised. Since it is not fat deposits, means that insulin stimulates the growth itself.

The administered insulin to chickens Broiler induced a significant decrease in their blood glucose at 124 mg/dl, compared to 152 mg/dl in the control group;

Plasma protein levels have changed insignificantly in the experimental group

A significant decrease in plasma lipid levels from 639 mg/dl to 361 mg/dl was seen in controls, thus demonstrating that diabetes mellitus is specific for hyperlipidemia.

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TECHNOLOGIES OF ANIMAL HUSBANDRY