

THE IMPACT OF TREATMENT WITH INSULIN ON THE COMPOSITION OF PANCREATIC JUICE ENZYMES IN CHICKEN ORGANISM

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Abstract

The experiment was performed on seven weeks old chickens. Experimental and control groups have been made. The insulin was administrated in a dose of 4.00 U.I./kg body weight, once a day. The treatment was performed for 8 day and the chickens were periodically weighted. The pancreatic juice was obtained in an acute experiment. Then, pancreatic juice was volumetric measured and the flow of trypsin and amylase was measured too. The results were statistically processed and the means and standard error of means were calculated. The statistic significance differences of the means between control and experimental group was searched by Student test. Following the experimental treatment of insulin on chickens, these results were obtained: 1. Insulin induced a juice flow of 387.5 microliter/kg body weight/30 minutes, insignificantly increased versus the control group. 2. Insulin increased the flow of pancreatic juice amylase and trypsin; that could explain the significant increase of the weight gain.

Keywords: amylase, chickens, insulin, pancreatic juice, trypsin

INTRODUCTION

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 the chickens aged 7 weeks (Cornish breed). It were set up two groups of chickens: a control group and a group treated with insulin. Both groups were fed ad libitum feed 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.

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

Table 1. Fodder recipe 21-3 code used to feed chickens

No.	Ingredients	Quantity (Kg)	Metabolizable energy (kcal)	Crude protein (%)
1	Corn	36	1212.3	3.13
2	Barley	14	378	1.44
3	Wheat	16	476.6	1.90
4	Soybean cake	15	345	6.60
5	Sunflower cake	7	105	2.24
6	Meat flour	2	57.3	1.14
7	Oil	4.5	396	-
8	Premix methionine	0.9	18.8	0.50
9	Dicalcium phosphate	1.8	-	-
10	Calcium carbonate	1	-	-
11	Salt	0.3	-	-
12	Premix (MVP)	1.5	30	0.10
13	Total	100	3019.0	17.05

Legend: MVP = mineral-vitamin premix

A batch consists of nine chickens were treated with insulin, which was administered at a dose of 4.00 U.I. daily, once a day. Treatment duration was eight days. The second group (control group) remained untreated. Chickens of both groups were weighed every day during treatment (Table 2).

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

Specification	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Control group	2590	2590	2600	2630	2680	2680	2700	2730
Insuline group	2578	2590	2610	2650	2680	2700	2740	2760

In order to harvest pancreatic juice, each chicken was anesthetized with urethane 20% solution, administered intraperitoneally at a dose of 1.6 g per kg body weight. The abdomen was opened and spotted Wirsung canal in which a cannula was inserted. At the end of the cannula was connected to a capillary tube and gradually transparent. The basal secretion was collected pancreatic juice for a period of 10 minutes and secretion stimulated by secretin administration of an extract of duodenal mucosa, a period of 30 minutes. Every five minutes, the graduated tube was read the amount of pancreatic juice, which was then collected in a tube. They made these determinations: amylase activity and trypsin activity in pancreatic juice. Amylase activity was determined by the method of Smith and Roe, and trypsin activity was determined by the method of Schwert and Takenaka. Amylase and trypsin flows were calculated as the product between the average concentration of amylase or trypsin and the total pancreatic juice secreted a limited period of 30 minutes. The results were processed statistically and the significance of difference between groups was performed based on t test (Student test) (Tacu, 1968).

RESULTS AND DISCUSSIONS

In Table 3 presents the results regarding the total amount of pancreatic juice collected in basal conditions and in conditions of secretin stimulation of the pancreas in experimental

group treated with insulin compared with controls.

Table 3. Effects of experimental treatment with insulin on volume secretion of pancreatic juice in chicken

Control group			Insulin group		
No. prove	Values		No. prove	Values	
	Basal (10 min.)	Stimulate (30 min.)		Basal (10min.)	Stimulate (30min.)
1	0	52.5	1	4	70
2	0	80	2	11	47.5
3	7	87.5	3	0	42.5
4	11	52.5	4	7	87.5
5	4	65	5	16	140
- - x ± x	4.4	67.5	- - x ± x	7.6	77.5

It was found that administration of secretin stimulated pancreatic juice secretion in both groups, with different quantitative aspects according to the group. It is found especially stimulating effect of insulin on pancreatic juice volume: Basal (unstimulated) were higher than in controls, after 30 minutes of harvesting in conditions of acute experiment generated a total volume of 387.5 microliters of pancreatic juice from the 5 animals in experiment, which is a average of 77.5 microliters per 30 minutes compared with controls who had received only a total of 337.5 microliters pancreatic juice, with an average of 67.5 microliter per 30 minutes, distinct differences were statistically insignificant. In pancreatic juice samples were determined amylase activity and trypsin activity (Table 4).

Table 4. Enzymatic activity of pancreatic juice in chickens treated with insulin compared with control group

Control group			Insulin group		
No. prove	Values		No. prove	Values	
	Amylase activity*	Trypsine activity**		Amylase activity*	Trypsine activity**
1	351	44.0	1	555	11.1
2	210	23.5	2	540	31.0
3	659	52.2	3	319	33.0
4	640	24.9	4	877	14.5
5	195	36.9	5	74	20.4
- - x ±, x	411± 132.1	36.3± 2.0	- - x ±, x	473± 153	22.0± 7.5

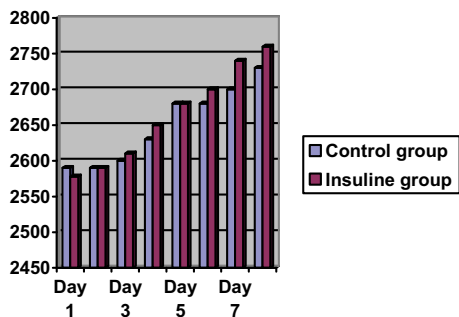


Figure 1. Evolution of chickens weight during the treatment with insulin

Legend

*- Activity expressed in AU/ μ l = units amylase-hydrolyzed starch amount in mg of the enzyme after its incubation on cooked starch substrate for 30 minutes at 37°C

** - nmoli BAEE (N-benzoil L-arginil etil ester) decomposed/ml/min. at 25°C/ μ l

So, the group treated with insulin, enzyme activity was stimulated both in terms of amylase, and trypsin. In this group, amylase activity was 473.0 UA from the control group the amylase activity was only 411 UA. Trypsine activity in the same group was 22.0 nmol BAEE (benzoyl ethyl ester arginil), lower than the control. Correlated with effects on growth ponderal, this stimulation of pancreatic enzyme flow explains

the weight gain recorded in the experimental group treated with insulin (Figure 1).

CONCLUSIONS

Body weight of Cornish 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 2578 g at the beginning of insulin administration, after 8 days of treatment it was 2760 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 Cornish induced pancreatic juice volume a little higher than the control - in 30 minutes the volume was 387.5 microliters, higher with 50 microliters pancreatic juice greater than in controls, differences were insignificant ($P > 0.05$). Insulin, to the same type of chicken, stimulated enzyme activity, both in terms of amylase, as well as that of trypsin. Trypsine activity was 22.0 nmol BAEE (benzoyl ethyl ester arginil), higher than in controls. In this way stimulating the flow of pancreatic enzymes to understand why there is a weight increase registered in the group treated with insulin.

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