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EFFECTS OF FASTING ON PLASMA THYROXINE (T4) LEVELS AND BODY WEIGHT IN CALVES FED WITH NORMAL AND LOW ENERGY RATIONS[3].

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Normal ve düşük enerjili rasyonlarla beslenen danalarda açlığın plazma tiroksin (T4) düzeyi ve canlı ağırlık üzerine etkisi

Özet: *Bu araştırma ile değişik enerji düzeyindeki rasyonla beslenen danalarda açlığın tiroksin metabolizması ve vücut ağırlığı üzerine etkisi ve meydana gelen metabolik değişikliğin yeniden beslenme ile tekrar normale dönüşü incelenmiştir. Danalar % 100 ve % 50 Yaşama Payı Enerji (YPE) düzeyindeki rasyonlarla iki grupta beslenmişlerdir. Danalar 8 günlük alıştırma dönemini takiben 7 gün aç bırakılmışlardır. Açlık sırasında sadece su verilmiştir. Açlık sonrası 21 gün yeniden aynı rasyonla beslenmişlerdir. Deneme süresince plazma tiroksin miktarları Radioimmunoassay (RIA) tekniği ile tayin edilmiş, canlı ağırlıkları düzenli olarak kaydedilmiştir. % 100 YPE düzeyinde beslenen danalarda plazma tiroksin konsantrasyonunda açlığın 1. gününde bir düşüş ($P < 0.05$) olmuştur. Diğer taraftan % 50 YPE düzeyinde beslenen danalarda açlığın 3. gününde bir artış ($P < 0.05$) bulunmuştur. Açlık döneminde % 100 ve % 50 YPE düzeyinde beslenen her iki grup danaların canlı ağırlıklarında istatistik bakımdan önemli bir düşüş görülmüştür.*

Summary: *In order to study the effects of starvation and energy intake on the metabolism of thyroxine and body weight, two groups of calves were fed with normal and low energy rations (100 % and 50 % of their energy requirement correspondingly). The calves were fasted 7 days following 8 days of feeding and refed with the same rations for 21*

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days. During the experiment the concentrations of plasma thyroxine levels were determined by RIA technique and body weights of the animals were recorded regularly. In the 100 % *fed calves, the plasma thyroxine level was decreased on the* 1*st day of fasting* ($P<0.05$). *On the other hand in the* 50 % *fed calves there was an increase* ($P<0.05$) *on the* 3 *rd day of fasting. Fasting had caused a significant drop in the body weight of both groups of animals.*

Introduction

Thyroxine a hormone of the thyroid glands is the major regugulator of metabolic rate, growth and development of the body. In addition to these effects, thyroxine has been implicated in the regulation of the glycolytic, gluconeogenic and pentose phosphate pathways (4). It is also involved in the regulation of lipid metabolism. Hyperthroidism causes to increase in the rate of 0_2 consumption and this is accompanied by a more oxidized cytosolic redox state and to increase the rate of fatty acid oxidation (6, 7). Thyroxine metabolism is influenced by changes in the level of energy intake (2). An increase in energy intake for several days results in an increase in the utilization rate of T_4 and this increment depends on both total energy intake and nutrient composition (5).

In some parts of Turkey, feeding of animals is insufficient. Under these conditions animal production is affected in the negative way with respect to metabolic disorders.

Therefore the aim of this work is to evaluate the effect of fasting and refeeding on the plasma T_4 levels and body weight in calves fed with normal and low energy rations.

Materials and Methods

Two groups of calves were used in the experiments. One group was fed on 100 % of their maintenance energy requirements and other group was feed on 50 % of their maintenance energy requirements (Table 1, 2, 3).

After an eight day feeding, each group was fasted for 7 days and then refed with the same rations for 21 days. During starvation they were allowed water ad libitum. Blood was collected and body weights

Table 1. The rations, and the initial body weights and ages of calves fed with 100 % of their maintenance energy.

Animal No	Age (month)	Weight (kg)	Rations (kg / day)	
			Commercial feed	Fiber
1	15	184	2	1,0
2	10	110	1,5	0,5
3	9	135	1,5	1,4
4	7	145	1,5	1,75
5	6	150	1,5	1,9
6	6	110	1,5	0,5
7		113	1,0	1,0

Table 2. The rations, and the initial body weights and ages of calves fed with 50 % of their maintenance energy.

Animal No	Age (month)	Weight (kg)	Rations (kg / day)	
			Commercial feed	Fiber
1	15	160	0,5	1,9
2	9	212	1,0	1,1
3	9	171	1,0	0,5
4	8	137	0,5	1,5
5	6	177	0,5	2,1
6	6	125	0,5	1,25
7	5	97	0,5	0,7
8	3	87	0,5	0,7

Table 3. The amounts of crude feed in the straw and commercial feed mixture (%),

	Dry matter	Crude Ash	Crude Protein	Crude Fiber	Digestable Crude Protein	Energy* SE / kg
Commercial Feed	87.1	4.93	16.35	9.63	14.10	0.600
Straw	95.62	4.86	—	38.97	1.29	0.125

*SE : Starch Equivalent

1 kg. SE: 2.36 KCal Net Energy.

of animals were recorded regularly. The plasma T_4 levels were measured before, during and after starvation.

During the experiments blood samples were withdrawn from jugular veins of the calves, in the mornings. Samples were collected in heparinized tubes and after the plasma had been separated they were stored at–20°C.

The concentration of T_4 was determined in the plasma by radioimmunoassay in duplicate, using Amerlex T_4 RIA kit. The proportion of ^{125}I Thyroxine levels were detected by a Gamma counter.

The results were evaluated by means of "t" test and "t" test for coupling (10). Such an analysis made it possible to evaluate both combined and separate effects of fasting and energy intake on thyroid hormone metabolism and body weight (Table 4, 5).

The 8th day of plasma values were used as controls.

Results

The obtained results show that in the 100 % fed calves, the plasma thyroxine levels were decreased on the 1st day of fasting ($P<0.05$). But no change was detected on the first day of fasting when energy intake was low (50 %). On the other hand on the 3rd day, there was an increase in T_4 levels, but the increase in 50 % fed calves was significant ($P<0.05$) (Table 4, Fig. 1). In both groups body weights were significantly affected by the fasting (Table 5, Fig. 2).

Discussion and Conclusion

According to Dauncey et al (2), plasma T_4 levels increased in the high intake of energy but no change was observed when the energy intake was low. Although it has been shown that high energy intake is capable of increasing the secretion rate of thyroid hormones (8), the present investigation indicated that there is no significant changes in plasma T_4 levels between 100 % and 50 % fed calves (Table 4, Fig 1). In this study the values of T_4 in both groups returned slowly to their normal levels during refeeding. Dauncey, et al (1) also indicated that refeeding itself induced a slow rise in the plasma T_4 concentration.

Fasting had caused a significant drop in the body weights of both groups of animals. During refeeding they returned to their normal values. In the 50 % fed calves this process was slower (Table 5, Fig. 2), O'hea and Leveille (9) have found that there was a decrease in body weight of pigs during a four-day fasting and became normal during refeeding. Fowle and Church (3) indicated that feeding with poor quality ration and fasting caused a 15 % decrease in the body weight of goats.

Table 4: Effect of starvation and refeeding on plasma T_4 levels (n mol / litre; mean ± SEM) at different Energy rations.

Time (day)	Before Starvation			Starvation				After Starvation					
	1	4	8	9	11	13	15	16	20	23	27	30	36
50 % of maintenance energy level (n=8)	39.68± ±5.49	54.59 ±7.37	24.31 ±4.66	30.01 ±3.57	58.07 ±7.47	42.66 ±8.63	55.81 ±11.14	31.73 ±5.93	18.36 ±2.60	23.95 ±1.72	43.65 ±9.43	36.73 ±4.55	36.1 ±7.63
100 % of maintenance energy level (n=7)	32.77 ±4.09	46.09 ±4.84	40.42 ±6.81	25.74 ±4.02	58.0 ±14.29	36.52 ±8.47	56.79 ±19.04	33.7 ±8.71	21.60 ±1.97	23.63 ±2.41	36.54 ±5.36	38.66 ±5.33	30.03 ±3.66

Table 5: Effect of starvation and refeeding on body weight (kg; mean ± SEM) at different energy rations.

Time (day)	Before Starvation			Starvation				After Starvation					
	1	4	8	9	11	13	15	16	20	23	27	30	36
50 % of maintenance energy level (n=8)	131.18 ±13.07	130.81 ±12.92	131.31 ±13.19	126.75 ±12.98	119.75 ±12.98	115.12 ±12.33	110.37 ±12.24	120 ±12.50	122.31 ±12.42	123.18 ±12.74	121.25 ±12.39	122.93 ±12.79	118.25 ±12.34
100 % of maintenance energy level (n=7)	129.93 ±10.99	130.31 ±11.23	130.87 ±11.19	125.93 ±11.08	120.12 ±10.71	115.06 ±10.41	110.37 ±10.43	117.12 ±10.48	123.06 ±10.64	125.56 ±11.08	124.93 ±11.09	124.62 ±11.10	119 ±11.32

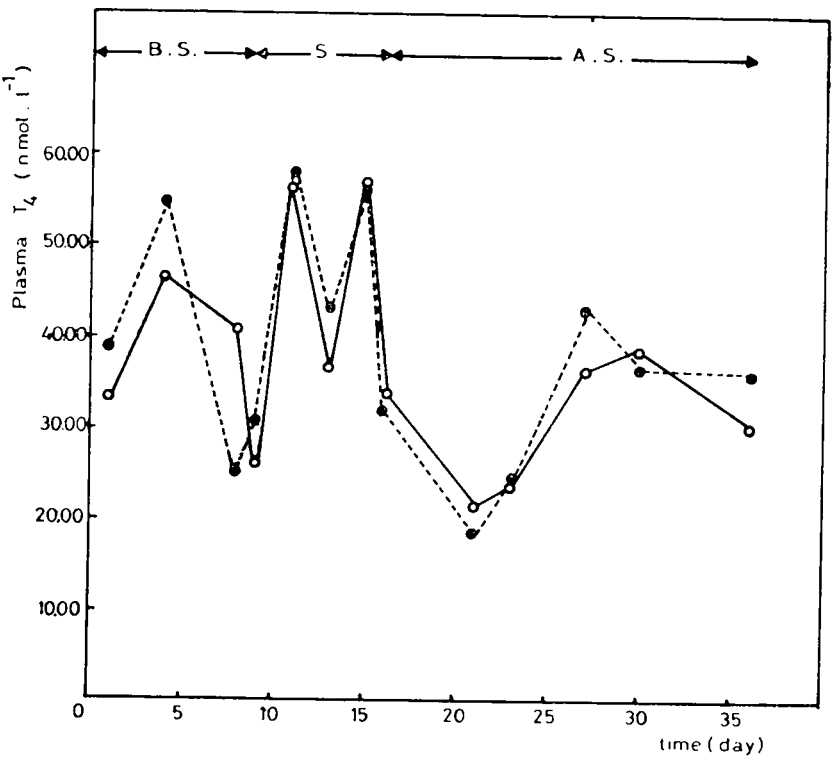

Figure 1. Effect of starvation and refeeding on plasma Thyroxine (T4) levels at different energy rations. o—o: 100 % of maintenance energy level; ●—●: 50 %of maintenance energy level; B.S: Before starvation; S: Starvation; A.S: After starvation.

Şekil 1. Farklı enerji düzeylerinde, açlık ve yeniden beslenmenin plazma Tiroksin (T4) düzeyleri üzerine etkisi. o—o: % 100 Yaşama Payı Enerji (YPE) düzeyi, ●—●: % 50 YPE düzeyi; B.S: Açlık öncesi; S: Açlık; A.S: Açlık sonrası.

In conclusion, in both groups, body weights were affected significantly during fasting ($P<0.001$) but T_4 levels did not change at the same rate as the body weights. The unaltered T_4 values in each energy ration might be due to the variations in the ages and body weights of the individual animals in each group.

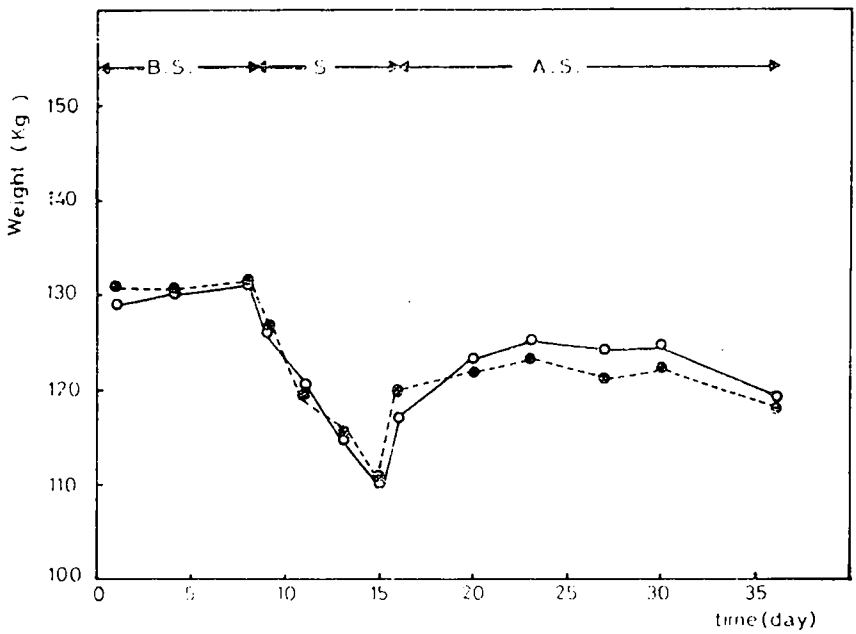

Figure 2. Effect of starvation and refeeding on body weight at different energy rations. o—o: 100 % of Maintenance energy level; ●—● 50 % of maintenance energy level; BS: Before starvation; S: Starvation; A.S: After starvation.

Şekil 2. Farklı enerji düzeylerinde, açlık ve yeniden beslenmenin canlı ağırlık üzerine etkisi. o—o: % 100 Yaşama Payı Enerji (YPE) düzeyi; ●—●; % 50 YPE düzeyi; B.S: Açlık öncesi; S: Açlık; A.S: Açlık sonrası.

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