THE EFFECTS OF THE ADDITION OF CIMATEROL IN THE DIETS OF JAPANESE NATIVE GOATS ON THEIR ENERGY AND NITROGEN METABOLISMS

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Introduction

Excess fat intake for humans is one of the major causes of cardiovascular disease. Therefore, there have been numerous efforts in recent years to produce meat with as little fat as possible.

Since 1984, Beta adrenergic agonist (beta agonist) which resembles adrenalin and noradrenalin has been used as an attempt to increase lean meat and decrease fat in carcass in livestock. It has been found that the beta agonist exhibited a repartitioning effect by promoting low fat but high protein meat (Hoffman, 1987).

Cimaterol (Boehlinger Ingerhaim, West Germany) is one of the beta agonists which was considered to affect lipid and amino acid-protein metabolisms. An experiment in which the effects of beta agonist on energy and nitrogen utilization in goats and enzyme activity of these metabolisms was conducted to provide more information on this field of study.

Materials and Methods

Five-month old castrated Japanese native goats (total number 10) were used in this experiment. They were divided into two groups and were fed a basal diet (0.03 x body weight/day) over a period of 8 weeks. The goats were reared individually and drinking water was always available.

The basal diet was Italian ryegrass wafer (2nd cut, early bloom) 20%, barley 16%, corn 16%, milo 16%, wheat bran 8%, defatted rice bran 8%, soybean hull 5.2%, calcium carbonate 1.44%, tricalcium phosphate 0.4%, sodium chloride 0.8%, trace mineral premix 0.08%, vitamin ADE premix 0.08%. The digestible crude protein (DCP) and metabolizable energy (ME) contents of the diet were 9.47% and 2.85kcal/g in a dry matter basis respectively.

Goats were separated randomly into two groups. The half goats (n=4) were given only the basal diet and acted as the control. The other goats (n=4) were fed the diet containing 1 ppm cimaterol. After 8 weeks, the goats were killed and their carcass compositions were determined. Two goats were also slaughtered at the beginning of the experiment and their carcass compositions were taken as that of representing the initial carcass value.

Carcass samples were separated into muscle, fat, bone, liver, digestible tracts, blood, skin, etc. and were minced with a meat chopper. The aliquotes of carcass samples were taken for the determination of energy, nitrogen, moisture and fat contents. The methods of carcass analysis have been described in detail in a previous paper (Abe and Saitoh, 1988).

Energy and nitrogen retentions were determined by the respective differences in energy and nitrogen contents of the values of the initial and final carcass.

Tissue sample, liver and adipose tissue, for enzymatic analysis were collected immediately after slaughtering. These samples were used for the determination of asparate aminotransferase (GOT UV Test, Wako), alanine aminotransferase (GPT UV Test, Wako) and acetyl Co A carboxylase (Vernon, 1976).

Results and Discussion

The efficiencies of nitrogen and energy utilizations are shown in table 1. Nitrogen utilization for nitrogen accumulation in the body were calculated by dividing nitrogen accumulation in the body by the digestible nitrogen intake. The efficiency of digestible nitrogen in the experimental group were

higher than the control group. However, the differences were not significant.

The efficiency of energy utilization for energy accumulation was calculated by dividing the energy in the body by the amount of ME for production. The value for the experimental group was lower than that of the control group, but not significant. These results were the same as our data in the rats experiment (Abe and Saitoh, 1988).

TABLE 1. EFFECTS OF CIMATEROL ON NITROGEN AND ENERGY UTILIZATION

Cimaterol (ppm in diet)	0 ppm	1 ppm
Efficiency of[1] digestible N(%)	17.1	18.1
Efficiency for[2] *energy accumulation(%)*	37.3	35.3

[1](N accumulation/digestible N intake) x 100
[2]Energy accumulation/(ME intake – ME for maintenance) x 100
ME for maintenance was calculated 88.95 kcal/$kg^{0.75}$/day (Itoh et al., 1978)

TABLE 2. EFFECTS OF CIMATEROL ON ENZYME ACTIVITIES[1]

Cimaterol (ppm in diet)	0 ppm	1 ppm
Liver:		
Asparate amino transferase	59	75
Alanine amino transferase	1,180	1,322
Acetyl Co-A carboxylase	72	71
Adipose tissue:		
Acetyl Co-A carboxylase	39	92

[1]Enzyme activities were described μmol/min/mg tissue.

Table 2 presents values of the enzyme activities. Transaminase activities in the liver tended to be higher in the experimental group (not significantly). Acetyl Co-A carboxylase, a key enzyme of lipid synthesis, and activity in liver were not affected by the addition of cimaterol. However, acetyl Co-A carboxylase activity in adipose tissue was higher in the experimental group ($p < 0.05$).

From the results of this experiment, it has been shown that cimaterol affects nitrogen and energy metabolisms. Beta agonists were considered to cause lipolysis and hinder protein degradation. But our results suggest that they might also promote lipid synthesis, too.

(Key Words: Beta Agonist, Cimaterol, Goat)

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