

## EFFECT OF FEEDING PATTERN ON OMASAL WEIGHT AND THICKNESS IN GOATS

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### Introduction

The comparative omasal size against body size is smaller in the concentrate eaters than that in fiber rich eaters in wild ruminants (Hoffmann, 1973). The vital role of the diet on the omasal development has been pointed out by Backer et al. (1963) and Huber (1968). Details of the effect; i.e., the omasal developmental patterns under various diets, remains unclear in the young domestic ruminant.

Present study shows the development of the omasum in the postnatal young goats maintained by the various diets in terms of the weight and thickness of the components.

### Materials and Methods

In total, 15 male goats were used in the present study. Two newborn animals were sacrificed 12 hours after birth without any diet. Four animals maintained by maternal milk alone were killed on day 8 after birth. Five animals weaned on day 14 and maintained by substitutional milk (made of mainly soy meals and skim milk) thereafter were killed on the 70th day. The other four animals were sacrificed on day 70; one animal maintained by a fiber-diet (containing 10% Italian ryegrass) and three animals by a concentrate diet alone after weaning on day 14. Each animal was sacrificed with an overdose of pentobarbital sodium (Somnopenyl; Pitman Moore, Inc., U.S.A.). The ruminal stomach was excised and divided into 3 parts; reticulo-rumen, omasum and abomasum. Each compartment was weighed to the nearest gram. The omasum was fixed in Zamboni solution. The tissue specimens were made by the conventional method. The thickness of the epithelial, conified

and muscular layers were measured under the light microscope, using an image analyzer (Kontron; Mutoh Kogyo Co., Ltd., Japan).

### Results

#### Gross anatomy

The weight of forestomachs (reticulo-rumen, omasum and abomasum) increased with age. The weight of reticulo-rumen in the fiber-diet was about twice of that in the milk-diet. The omasum was of the same patterns as the reticulo-rumen in weight on day 70 (table 1).

#### Histology

The thickness of the epithelial layer was not drastically changed from birth to 70 days in animals with a milk-diet alone. The thickness of the epithelial layer in the fiber-diet group was about twice that in the milk-diet group on day 70. The thickness of the conified layer of the epithelium was kept about 3 times of that at birth from 8 to 70 days. The thickness of the muscular layer gradually increased with age (table 1).

### Discussion

The present study confirmed that the solid-diets induce the reticulo-rumen formation and milk-diets maintain or stimulate the abomasal formation in postnatal young goats as in the calves (Tamate et al., 1962).

Histological study showed that the milk-diet suppressed the epithelial thickness in the omasum, and the fiber-diet induced the omasal epithelial development in the reticulo-rumen in calves (Tamate et al., 1962). The conified and muscular layers seem to develop irrespective to the diet

TABLE 1. WEIGHTS OF STOMACHS AND THICKNESSES OF STOMACH COMPONENTS IN GOATS MAINTAINED BY VARIOUS DIETS (Mean  $\pm$  SE)

	At birth (non-diets)	8 days (milk)	70 days (milk)	70 days (concentrate)	70 days (fiber)
(numbers)	(2)	(4)	(5)	(1)	(3)
Gross anatomy (weight; g)					
Reticulo-rumen	11.6	15.8 $\pm$ 2.8	85.4 $\pm$ 8.0*	136.4	151.8 $\pm$ 8.1*
Omasum	1.7	1.7 $\pm$ 0.4	5.5 $\pm$ 0.2*	7.4	10.1 $\pm$ 2.3*
Abomasum	16.6	26.7 $\pm$ 5.5	69.3 $\pm$ 7.1*	32.9	45.5 $\pm$ 7.0*
Histology in omasum (thickness; $\mu$ m)					
Epithelial layer	42	35 $\pm$ 1	41 $\pm$ 1	78	93 $\pm$ 2*
Conified layer	2	5 $\pm$ 0*	7 $\pm$ 0*	6	6 $\pm$ 2*
Muscular layer	273	580 $\pm$ 31*	857 $\pm$ 24*	842	990 $\pm$ 24*

\*Statistically different ( $p < 0.05$ ) from the respective values obtained at birth.

(milk-, concentrate- and fiber-diets). This reason was not revealed in the present study.

(Key Words: Development, Omasum, Various Diets)

#### Literature Cited

- Backer, R.B., S.P. Marshall and P.T.O. Arnold. 1963. Anatomy, development and function of bovine omasum. *J. Dairy Sci.*, 46:835-839.
- Hoffmann, R.R. 1973. The ruminant stomach (Stomach structure and feeding habits of east African game ruminants). *Monogr. Biol. Nairobi* 2:1-354.
- Huber, J.T. 1968. Development of the digestive and metabolic apparatus of the calf. *J. Dairy Sci.* 52:1303-1315.
- Tamate, H., A.D. McGilliard, N.L. Jacobson and R. Getty. 1962. Effect of the stomach in the calf. *J. Dairy Sci.* 45:408-420.