PRELIMINARY CONSIDERATION ON EFFECT OF SEASONAL ADAPTATION ON WATER DRINKING HABIT IN GROWING CALVES

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Introduction

It is well recognized that water consumption is affected by numerous dietary and environmental factors. In growing calves, water consumption has increased at the temperature above 15 °C and effect of dry-matter intake (DMI) has been inferred to diminish or vanish at the temperature about 25 °C (Sekine et al., 1988). Water consumption by growing calves, however, showed a considerable variation at the same ambient temperature (Sekine et al., 1986). Some other factors than DMI and ambient temperature may be involved in the constraints on water consumption of growing calves.

The present study was to sort a possible factor that has caused a difficulty to quantify the water needs for growing calves.

Materials and Methods

Results observed on 29 6-week-weaned Holstein castrated male calves were adopted from the trials reported elsewhere (Sekine et al., 1987; Sekine et al., 1988) for water consumption, energy and nitrogen metabolism, environmental temperature and live weight. Among 29 calves, 4 were born in winter, 6 in spring, 7 in early summer, 10 in summer and 2 in early fall. Calves were fed mixed rations consisting of 6 parts of concentrate and 4 parts of grass hay. Rations contained 141 to 150 g of crude protein, 205 to 257 g of acid detergent fiber and 18.4 to 18.9 MJ of gross energy per kg of DM. Drinking water consumption (DWC) was measured daily and averaged on weekly basis corresponding to the age of individual animals. Live weight was measured every other weeks. The DMI, urine excretion and heat production (HP) were measured at 7, 9, 13, 17, 21 and 25 weeks of age. Daily barn temperature was recorded at the interval of 1 or 2 hours and averaged for 5 days.

Results and Discussion

The 5-day average barn temperature (ABT) ranged about 3 to 6 °C through December to the first ten days of March. The ABT rose above 15 °C in early June and reached to the highest (23.8 °C) in early August, then it descended toward the level of December as the day progressed. Calves born in summer and fall increased their DWC with much slower rate than those born in winter and spring. Thus, animals were grouped into ones with high increasing trends of DWC (HI group) and others with low increasing trends (LI group). Table 1 shows mean DWC for each group.

Although calves in LI group were raised in the period with descending trends of ABT, DWC of those animals increased gradually as they grew.

TABLE 1. CHANGES WITH AGE IN MEAN DWC (l/DAY/CALF) OF CALVES BORN IN WINTER AND SPRING (HI GROUP) AND IN SUMMER AND FALL (LI GROUP)

Age (wk)	HI group, calves born in				LI group	
	Winter		Spring			
	Mean	SD[1)]	Mean	SD	Mean	SD
	l/day/calf					
7	3.6	0.6	5.6	2.4	3.8	0.9
9	4.2	0.7	8.0	3.5	4.4	0.9
13	6.2	1.3	12.6	2.5	5.5	0.9
17	10.2	3.1	19.2	3.5	6.5	1.0
21	14.3	4.6	27.4	6.6	6.9	1.0
25	19.0	6.4	26.8	11.6	7.8	1.0

1) Standard deviation

Increases in DMI, nitrogen intake and HP with age affected the changes in DWC of LI group. Daily DMI and nitrogen intake were not significantly different between the groups. Thus, an increase in ABT in raising period was inferred to be responsible for a greater increase in DWC of HI group than LI. Spring-born calves in HI group, however, increased their DWC in the period descending trend of ABT during early fall. The physiological response to a stressing temperature typified by the semen characteristics of bull has appeared after the period when the stressing impact has passed its peak. Calves raised under ABT above 15 °C increased their DWC with a greater rate (Sekine et al., 1988). Spring-born calves spent their first 12 to 16 weeks of life under the condition of ABT going up. Thus, they may have physiologically adapted to the condition convenient for dissipation of heat that may underlie a stressing condition in summer. Significant greater live weight from 17 to 21 weeks of age in HI group may have suggested that calves increased their circulation volumes to facilitate heat dissipation together with an increased urinary water excretion. These physiological changes may have been unable to be turned off immediately after stressing factors have removed. Therefore, a decrease in DWC of spring-born calves may have deviated from the changes in ABT. This physiological deviation of DWC may compound factors affecting the water requirement of growing calves together with DMI, dietary nitrogen, ABT, HP and so forth.

(**Key Words**: Water Consumption, Calves, Adaptation)

Literature Cited

Sekine, J., S. Morita, M. Hanada, T. Morooka, S. Kondo, M. Okubo and Y. Asahida. 1986. A note on the prediction of drinking water intake in 3- to 4-month-old calves fed a dry ration. Jpn. J. Zootech. Sci. 56:542-545.

Sekine, J., R. Oura, Z. Morita, T. Morooka and Y. Asahida. 1987. A consideration on evaluating basal water requirement for growing calves using results observed on water consumption and energy metabolism. In "Herbivore Nutrition Research" (Ed. by M. Rose) Aust. Soc. Anim. Prod., pp.125-126.

Sekine, J., Z. Morita, R. Oura and Y. Asahida. 1988. A consideration on factors affecting water consumption of growing calves. Jpn. Soc. Zootech. Sci. Annual Meeting Abstracts p.49. (In Japanese)