

## IMPACT OF *AD LIBITUM* MILK FEEDING REGARDING WEIGHT GAIN AND BEHAVIOUR OF SIMMENTAL CALVES

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*The aim of this study was to find out how ad libitum milk intake affects weight gain, drinking behavior and cross-sucking in simmental calves. Right after birth 97 simmental calves were assigned either to the control group (RES: restricted group, fed only twice a day) or to the test group (ADL: milk was ad libitum available). All calves were housed in single boxes with straw bedding for the first two weeks of life and in group housing after this. Calves were fed colostrum in the beginning and acidified milk afterwards. The individual milk intake and bodyweight was recorded, as well as the cross-sucking via video recording.*

*Until weaning the weight gain of the ADL calves was higher than that of the restricted group. This became also evident in the higher weight at the end of the trial. Although the calves of both groups took in the same amount of starter feed the ADL animals had a higher weight. The ADL fed calves drank more often but smaller portions throughout the day. There was no difference in drinking speed between the groups. Regarding the results of this study the ADL drinker increases the cross-sucking of calves kept in groups. The ad libitum drinker represents an animal-friendly feeding method for calves because the animals can perform their drinking behavior longer and more frequently during the day, no hunger periods occur and thus this feeding method better meets the natural behavior. By the higher frequency of milk intake during the day and the therefore higher suckling motivation the ad libitum drinker encouraged the cross-sucking of the calves in groups.*

**Keywords:** CALVES, *AD LIBITUM* DRINKING, CROSS SUCKING, DRINKING BEHAVIOUR

Successful rearing of calves is influenced by different factors such as housing, feeding, hygiene and drinking supply. An optimal drinking supply from the first day of life to at least the 5<sup>th</sup> week of life has a positive effect on the life performance of cattle [10]. [2, 3, 6] found out that an unrestricted intake of milk in the first 3 or 6 weeks respectively influences the weight gain, the number of sick days and the vitality of the calves in a positive way. Dam calves drink 6–10 times daily with an average milk intake of 8–12 l [1]. Restrictive feeding with buckets 2–3 times daily results in a significantly lower milk intake. Thereby, an early intake of roughage shall be achieved. By short milk intake the natural sucking need of the calves is not satisfied which can result in behavioral disorders like cross-sucking [4, 7]. The new findings concerning the *ad libitum* drinker and the metabolic programming could lead to a revision of the current recommendation for the rearing of calves.

### Materials and methods

The trial was divided into two groups. The first was fed milk restrictedly (RES, control group) and the second was fed *ad libitum* (ADL, trial group). In total, there were 8 groups with 12 calves each, 4 fed restrictedly and 4 fed *ad libitum*. During the first two weeks of life the calves were kept in single boxes interspersed with straw and rehoused afterwards into sections with deep bedding.

From the first day of life the calves were provided with hay, water and concentrated feed. The first 5 days the calves were fed colostrum and afterwards whole milk. During single housing the calves of the control group were fed acidified milk in buckets twice daily (1<sup>st</sup> week of life 2.5 l each time, 2<sup>nd</sup> week 3 l). The trial group was provided round the clock with buckets of acidified milk, each containing 13 l. From the 3<sup>rd</sup> drinking the drinker was acidified with 2.0 ml acid per liter milk to a pH-value

of 5.5. During group housing the individual supply with milk and concentrated feed was controlled by a computerised automat. The drinking plan shows the offered amounts of milk (table 1).

Table 1  
Schedule for calves milk intake in the two feeding groups

Day	Restricted feeding		Day	Ad libitum feeding	
	Beginning [l]	End [l]		Beginning [l]	End [l]
1–7	5.0	5.0	1–28	ad libitum	ad libitum
8–14	6.0	6.0	29–42	25.0	8.0
15–21	6.0	8.0	43–70	8.0	0.0
22–42	8.0	8.0			
43–70	8.0	0.0			

The drinking behavior was examined with 22 calves (11 ADL, 11 RES) from 3<sup>rd</sup>–14<sup>th</sup> day of life. The daily milk intake in l, the number of meals per day, the duration of meals in minutes, the total duration of drinking per day in minutes and the drinking speed in l per minute was recorded. To measure the drinking behavior, a special weighing system was developed. Video recordings were taken of 6 groups over 4 weeks each to measure cross-sucking. One sucking-action was defined when the muzzle of one animal had contact to ear, abdomen, elbow or genital area of another animal and simultaneously performed a head butt and/or overstretched its neck area. The contact had to last a minimum of 5 sec. The sucking act ended when there occurred no more sucking for a minimum of 10 seconds.

## Results and discussion

**Milk intake and weight development.** During the first 4 weeks the ADL animals took in 2.1 l of milk more than the calves of the RES group. Between the 28<sup>th</sup> and 42<sup>nd</sup> day the weaning of the ADL animals started and from day 43 on both groups were weaned beginning with 8 l (fig. 1). During the first 4 weeks, the medium daily weight gain of the ADL animals was 300 g higher than that of the RES group. Therefore, not only the weight gain but also the end weight of the ADL animals was higher (fig. 2).

[4] showed that calves are able to take in a great amount of milk in one meal.

The capacity of the abomasum in their study was 6.8 l. In the present study this quantity was confirmed. Some calves could take in even more, e.g. one calf drank 7.2 l on the 14<sup>th</sup> day of life.

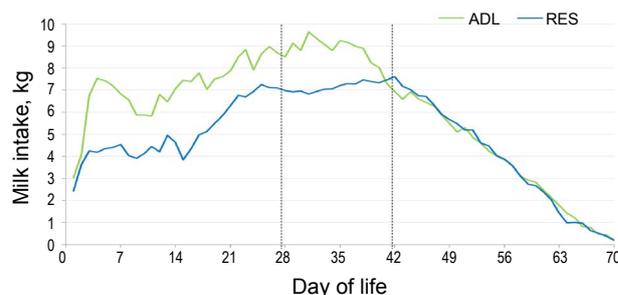


Fig. 1. Milk intake of ad libitum and restricted fed calves during the first 10 weeks of life

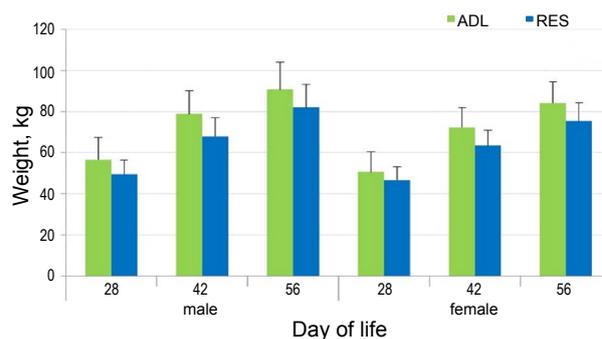


Fig. 2. Development of live weight of ad libitum (ADL) and restrictive (RES) fed calves in dependence upon gender

In week 5 and 6 the effect of weaning was noticeable in the ADL group. The weight gain sank and adjusted to that of the control group.

**Drinking behavior.** Calves with unrestricted milk supply took in nearly twice the amount of milk compared to the control group during the first 2 weeks of life (ADL: 7 l; RES: 4 l) and drank twice as often during the day (ADL: 6.6; RES: 3.6). This does not comply with the number of meals of 9 to 10 times that a calf shows in the presence of the dam [11] but it becomes clear that calves take in more than 2 meals when given the possibility.

The duration of an average ADL meal was significantly shorter than that of a RES calf (ADL: 4.6 min.; RES: 6.7 min.). Concerning the total duration of drinking during the day, the ADL calves spent significantly more time for their meals than the RES animals (ADL: 26.2 min.; RES: 16.4 min.). The standard deviation was strikingly high, 21.1 min. during the first week with the ADL animals. These points to the great individual differences in the drinking behavior between the calves. No considerable differences in drinking intensity (drinking speed) could be detected between the groups in the first or second week, unlike [9], who found that in the 3<sup>rd</sup> week the restrictively fed

**Drinking behavior (frequency and duration of milk intake, total drinking duration, intensity of drinking) of *ad libitum* (ADL) and restrictive (RES) fed calves in the first and second week of life**

	Week 1		Week 2	
	ADL	RES	ADL	RES
Milk intake, l/day	7.0 <sup>a</sup> ±2.8	4.2 <sup>b</sup> ±1.8	7.2 <sup>a</sup> ±2.9	4.1 <sup>b</sup> ±1.9
Frequency of drinking, n/day	6.5 <sup>a</sup> ±3.9	2.1 <sup>b</sup> ±0.8	6.7 <sup>a</sup> ±3.3	3.3 <sup>b</sup> ±1.9
Duration of meal, min	4.8 <sup>b</sup> ±2.6	8.2 <sup>a</sup> ±3.5	4.3 <sup>b</sup> ±2.5	5.5 <sup>a</sup> ±2.6
Total drinking duration per day	28.0 <sup>a</sup> ±21.1	16.2 <sup>b</sup> ±7.3	24.3 <sup>a</sup> ±12.6	16.5 <sup>a</sup> ±10.1
Intensity of drinking, l/min	0.31 <sup>a</sup> ±0.13	0.29 <sup>a</sup> ±0.15	0.34 <sup>a</sup> ±0.17	0.29 <sup>a</sup> ±0.16

calves had a higher drinking speed of 0.41 l/min than the *ad libitum* calves with 0.35 l/min.

As the restrictive drinkers were supplied only twice a day the motivation for milk intake at the meals seems to have been so high that a higher drinking speed occurred in their study. The more frequent visits at the drinking automat and the higher drinking speed of the restrictively fed calves are behavior patterns that point to the unfulfilled need of milk intake.

**Cross-sucking.** Cross-sucking occurred from introducing the calves into group housing on day 15. Almost exclusively the genital region was sucked. There was no difference between the genders. Most of the sucking occurred immediately after milk drinking. The intensity of sucking behavior was individually different (0–7 times/day and calf). Comparing the groups, the calves of the ADL group sucked their box companions more than twice as often as the calves of the RES group (ADL: Ø 2.46/day; RES: Ø 1.04/day).

Cross-sucking is a common problem of the motherless rearing of calves that on the one hand leads to health problems and on the other hand to sucking at lactating cows at a later age of the heifer [8]. In contrast, cross-sucking does hardly ever occur in a mother-bound rearing [5].

### Conclusions

The *ad libitum* drinker is animal friendlier because the calves can perform their drinking behavior longer and more often throughout the day, no hunger times occur and therefore this housing form better meets the natural behavior. It remains to be clarified which housing measures can be taken to fulfill the sucking motivation following the milk meals of the *ad libitum* drinker.

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