

Berberich, Nina and Grimm, Hartmut

Effects of two feeding systems on the development of dairy calves

In calf rearing nutrition during the first weeks of life is crucial for the performance of the dairy cows. Together with the company Förster-Technik GmbH a trial was made to test controlled ad libitum vs. restricted feeding regarding its influence on growth and performance afterwards. The control group got 6 l per day as usual up to now. The trial group got milk or milk replacer in a controlled ad libitum plan and was weaned afterwards from day 35 to 70. The combination of both feeding systems was detected as positive. There was a big advantage in growth and development of the trial group during intensive feeding.

Keywords

Intensive feeding, calves, rearing, automatic feeder

Abstract

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■ Intensive rearing of calves is one of the preconditions for achieving a high performance cow later on. Newest studies indicate that intensive feeding in the first weeks of life has a life-long influence on performance of dairy cows [1; 2].

Despite this, many farmers still feed their calves restrictively with relatively low levels of liquid feed intake. They expect that the resultant insufficient nutrition will be balanced by later compensatory growth. This approach is an attempt to save feed costs [3]. Excessive, uncontrolled feed consumption and too late concentrate feed intake with traditional ad libitum feeding are the most common fears farmers associate with this method.

Before birth and during the first weeks of calf life growth mainly takes place on the basis of cell multiplication, thus supply of nutrients in this phase has an especially great importance [4]. Förster-Technik GmbH has developed a feeding programme that secures an optimal supply of nutrients while at the same time aimed at preventing the feared disadvantages. The intensive feeding phase up to the 35th day of life is followed by a restrictive feeding plan which helps in the gradual weaning of the calves [5]. In the trial described here this feeding programme is studied together with results from a control group of calves restrictively fed according to the so far usual method. There follows a comparison of both methods based on their respective effects on the calves.

Materials and methods

The trial was carried out with 54 Holstein-Friesian female calves on Agrargenossenschaft Memmendorf (Memmendorf

agricultural cooperative farm). The calves were separated from their mothers directly after calving and fed colostrum. The calves were kept in small groups (maximum four calves) over the next 12 days of life. All calves received 1.5 to 2 litres of slightly-soured mixed colostrum via feed buckets three times daily (Figure 1). At day 13 the calves were moved into pens of around 16 animals with automatic feeders. Their allotment into control and trial group took place randomly.

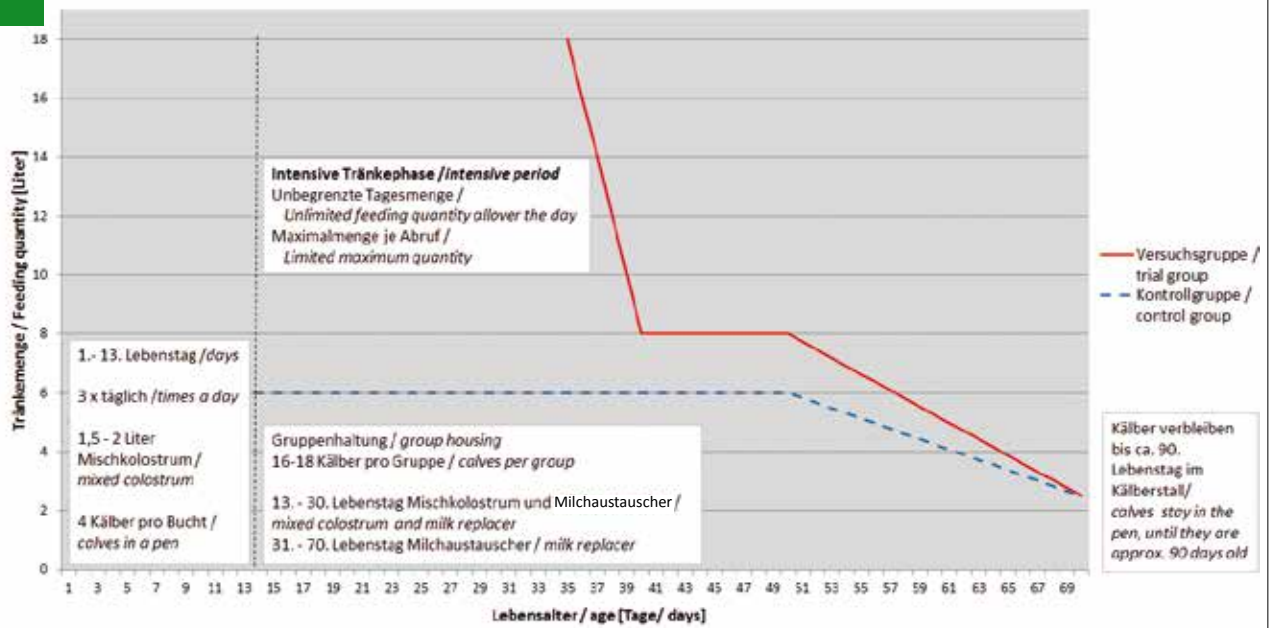
Up to day 30 mixed colostrum was available via the automatic feeder. When the milk tank became empty there was a changeover to milk replacer at 130 g/l concentration. The animals in the control group received 6 l feed daily under a restrictive regime through to day 50. Subsequently the individual rations were reduced to 2.5 l over 20 days. On the other hand, feed was freely available for the trial group calves up to day 35. The automatic feeder limited the maximum amount of feed that could be offered per visit to the machine and imposed a waiting period of two hours before the next access to feed. Following the intensive phase, calves were automatically placed onto a restrictive feeding regime. The weaning plan began with 18 l and reduced this to 8 l/day within five days. This amount of feed was then kept the same for the next 10 days. On reaching day 50 the trial group members also experienced reduction of feed over 20 days, down to 2.5 l daily. At an age of around 31 days the animals were moved to another pen. At this point the animals were receiving only milk replacer via automatic feeder. With an automatic concentrate feeder it was possible also to determine the amount of concentrate feed given to each animal.

Results and discussion

Feed amount

The feed consumption with restrictively fed calves during the complete feeding period lay by 5 l milk per day. The trial calves drank an average of 11 l milk/day during the phase of

Fig. 1



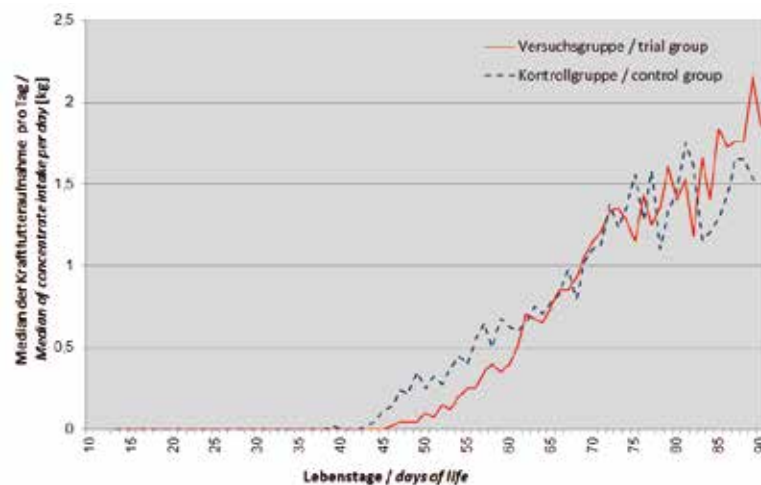
Feeding plan of trial- and of control group

Fig. 2



Median of milk intake per animal and day, of trial- and of control group

Fig. 3



Median of concentrate intake; trial and control group

unrestricted feed consumption and afterwards an average of around 8 l daily, representing a total of some 236 l over 3 weeks (**Figure 2**). During this time the trial group calves showed marked individual fluctuations in daily feed consumption.

During the trial, calf number 73 achieved the highest feed intake per day at 22.2 l. The lowest average amount fed to a calf over the feeding period was 7 l milk/day by calf number 82. Uniform feed intake came after reintroduction to restrictive feeding. The control group calves were limited regarding variability of their feeding behaviour from the start. They almost always consumed the amount that was made available.

Visits

It was clear through observing the regularity of calf visits to the automatic feeder that restrictively fed calves visited an average 40 % more than the intensively fed calves. During the entire feeding period the restrictively fed calves went to the automatic feeder an average 17 times per day with feed actually dispensed at four of these visits. Conversely, the intensively fed calves averaged 12 visits daily with just 6 visits daily during the ad libitum period. Feed was dispensed by the automatic feeder in nearly all of these visits. When feed limitation was introduced with the trial calves on day 36 the frequency of visits with no feed dispensed balanced out between the groups. With the starting of the weaning phase on day 51 no significant difference between the groups could be found regarding frequency of visits to the automatic feeder. A high number of visits without feed entitlement could be seen as an indicator for hunger, increased stress and reduced resting periods for the calves [6]. Compared with the restrictively fed calves, the number of visits by the intensively fed calves to the automatic feeder only increased at a later point of time. From this it can be assumed that these, in the meantime older, animals could already better cope with stress.

Concentrate feed

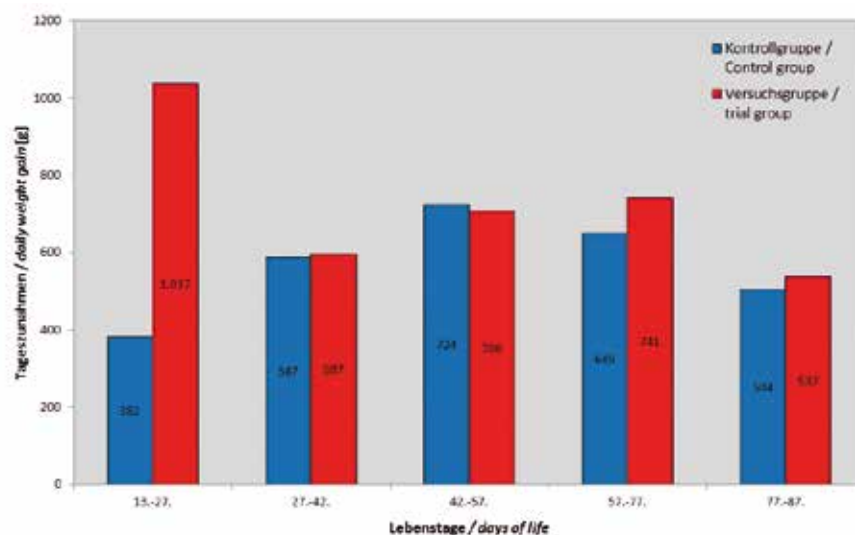
Over the total trial period the restrictively fed calves consumed an average 536 g concentrate feed daily, the trial calves 487 g. A significant difference between both groups could only be recognised up to 50 days. With the end of the feeding phase concentrate consumption increased in both groups (**Figure 3**).

The amount of concentrate feed consumed during the first 40 days was very limited for both groups. However, individual animals began to eat concentrate as early as the point of penning. But in average terms it was clear that concentrate consumption began for 50 % of the control group on day 43 and 50 % of the trial group calves on around day 46. By day 63 the concentrate feed consumption with the trial group had reached the level of the control group. One of the reasons for this is the feeding plan that was followed. Through the restriction in amount of feed offered to the control group calves from day 35 the calves were encouraged early to start eating concentrate.

Weight development

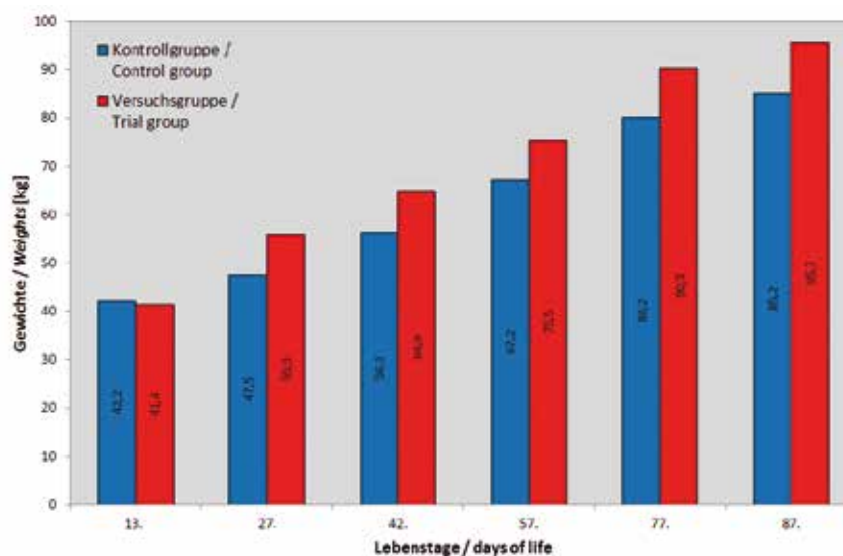
Through the intensive feeding regime of the trial calves their daily weight gain as assessed on day 27 was, with 1037 g, markedly higher than 382 g achieved by the control group calves (**Figure 4**). The calves in the latter group weighed approx. 48 kg which indicated an increase over the period averaging only 5 kg (**Figure 5**). In comparison, the weight of the animals on the intensive feeding regime was already 56 kg. With this 15 kg gain they had gained three times as much weight as the control group calves. After day 27 a higher daily weight gain was also realised by the restrictively fed animals. At this point of time their average weight lay by 56 kg while the trial calves had already reached 65 kg. By end of trial, the trial group calves average end bodyweight was, at 96 kg, around 10 kg more than the mean of the control group calves. The weight advantage achieved by the trial group calves during the intensive feeding

Fig. 4



Average daily weight gain per animal between weighing dates

Fig. 5



Average weights per animal at the respective weighing days

period was not caught-up with by the restrictively fed calves by end of trial, although the advantage was not increased. Observing daily weight gain from first penning to end of trial showed that the trial calves with 742 g were 150 g over the control group performance with 590 g. As already clear from the amount of feed consumed and the number of visits to the automatic feeder, the daily weight gain performances were a further indication of the clear advantage for the trial group calves during the free availability of feed.

Comparison of feed and concentrate intake with weight at end of trial

The weight at end of trial of the trial group calves was between 75 and 115 kg, that of the control group calves between 65 and 103 kg. Considerable fluctuations were observed within these weights. As expected, the calves on intensive feeding had the possibility of more individual feed intake and, through this, achieved markedly higher bodyweights by the end of trial. The limited differences in individual feed intake by the restrictively fed calves meant it was difficult to see how this could have any marked influence on individual weight gain but there was still no explanation for the differences in liveweight at end of trial. The relationship between feed intake and the weight at end of trial for each animal is shown in **Figure 6**.

The concentrate intake of the animals (**Figure 7**) showed large individual variations in both groups but despite the markedly higher bodyweights at end of investigation there were no significant differences. With ad libitum fed animals as well as with restrictively fed calves, those with higher bodyweight at end of trial had also high concentrate feed intake at the dispensers. Contrary to the results with the trial group calves, the regression analysis for the control group calves showed no significant relationship between feed or concentrate intake and weight at end of trail. This also applied to the overall calculation. Thus only with the trial group calves, and not those in the

control group, could the relatively greater proportion of daily weight gain or end weight be explained by feed or concentrate intake. Quantitative data for the intake of forage feed is unfortunately not available.

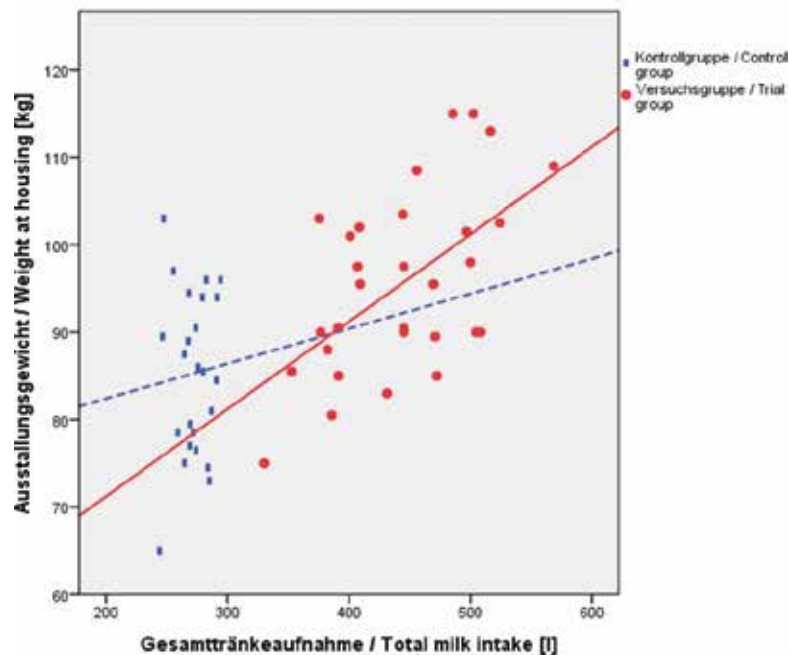
Disease levels

With regard to the frequency of disease, no significant differences could be determined between the two groups. No data were available regarding disease intensity. Similar frequencies of diarrhoea or respiratory diseases were recorded with trial group and control group animals. However, looking at the weight development with diseased and with healthy animals there were differences to be seen. Daily weight gain recordings during the ad libitum feeding phase showed that trial group calves, despite illnesses, still achieved a higher daily weight gain than healthy control group calves. Also the weight at end of investigation of diseased calves in the trial group lay markedly over the weight of diseased control group calves on restrictive feeding. These results allow the assumption that an intensive feeding regime supports and improves recovery from disease. Weight losses that can occur during illness can be better compensated for through higher feed, and therefore energy, intake.

Conclusions

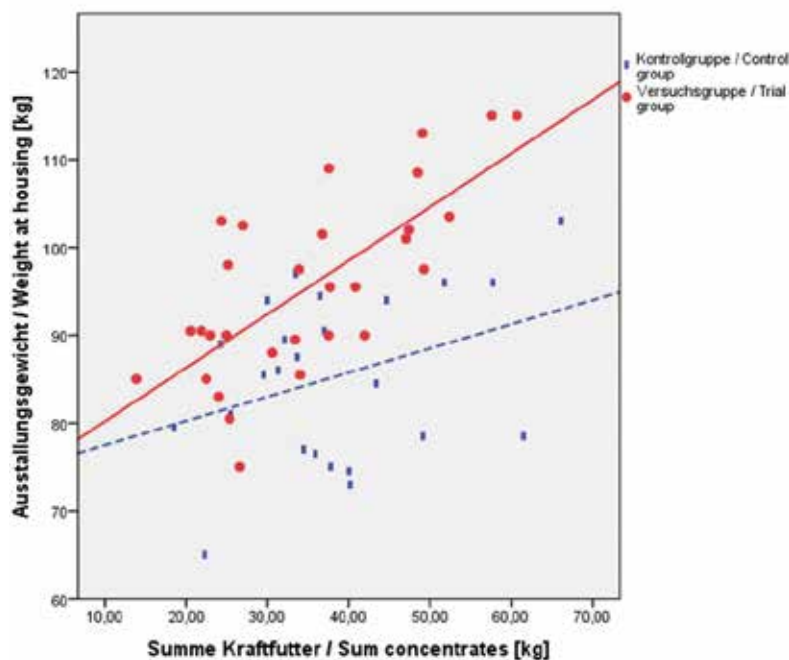
Increased feed consumption in the first weeks of life has a markedly positive effect on successful calf rearing. Intensive feeding during the first 30 to 40 days appears to be sufficient for exploiting growth potential. This intensive phase should be followed by a restrictive feed availability phase during which the calves are subject to a controlled and continual reduction in availability. In this way growth rate depressions can be avoided and concentrate feed intake encouraged. The combination of initial ad libitum and then restrictive feeding has proved in many respects to be advantageous and is to be recommended. From the results

Fig. 6



Comparison of milk intake and weight at housing per animal: no significant correlation within control group

Fig. 7



Comparison of concentrate intake and weight at housing per animal

and subsequent recommendations from this trial has resulted the "40FIT" feeding plan from Förster-Technik GmbH. According to this, an intensive phase of feed intake takes place up to day 35. Afterwards it is recommended that calves up to day 70 be subject to progressively reduced daily amounts of feed in order to avoid stress reactions. By using modern automatic feeding it is possible to establish a feeding method that meets more

adequately the natural requirements of calves in the first weeks of life. This enables, on the one hand, outstanding reductions in required labour and, on the other, leads to improved rearing results. With the installed herd management program on the trial farm the calves were further monitored in their development. Alongside the development of the animals the effects on later performance as dairy cows are to be also investigated.

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Authors

M.Sc. Nina Berberich is a staff member of Förster-Technik GmbH, Gerwigstraße 25, 78234 Engen, e-mail: nina.berberich@foerster-technik.de

Dr. habil. Hartmut Grimm is lecturer at the Institute of Agricultural Engineering, University of Hohenheim.