

## **Ad Lib Milk Feeding**

### **Summary:**

- Ad lib milk feeding refers to freely available milk or milk replacer for the first few weeks of a calf's life.
- Ad-lib milk feeding mimics calves reared naturally on their mother.
- Total milk consumption can be up to 80% higher with Ad-Lib feeding, equalling a 35% increase in costs compared to conventional restricted feeding .
- Calves eat up to 16% less calf meal/pellets compared to conventional restricted feeding .
- Average daily growth rate increases can be 34% greater than conventional restricted feeding.
- Higher earlier growth rates resulting from ad lib feeding has a positive effect on mammary gland development, maturation of organs and animal health.
- Provided replacement heifers are fully fed post weaning the benefits of a higher BW at 6 weeks of age include increased first lactation milk production, higher conception rates and increased longevity.
- Labour requirements can be reduced with a well designed ad lib setup.
- Navel cross sucking is reduced considerably.
- Whether a decision is made for or against ad libitum feeding depends, in principle, on individual opinions and the operational conditions and an evaluation of the additional costs and benefits.

### **Ad Libitum Feeds**

The term 'ad libitum feed' refers to freely available feeds of milk or milk replacer. This type of feeding is limited to the first weeks of life. The recommendation to administer the ad libitum feeds over the first three to four weeks is based on the fact that the digestive system of the calf is designed to recycle milk at the beginning of its life. The change to solid feed, and accordingly to a ruminant portion, takes its time. Nevertheless, the calf must be able to absorb the necessary nutrients, because otherwise the calves' susceptibility to various diseases increases and their optimal development may be impaired.

### **Restrictive Feeding**

With restrictive feeding, the calf receives a feed quantity that is allocated to it according to a fixed feeding plan. Due to a particular feeling of hunger created in this way, the calf is encouraged to start eating solid feed as soon as possible. Initially, only small amounts of feed are consumed, but they do, however, play a particularly important role in the formation of the enzymes required for digestion.

Depending on the feed quantity and milk replacer concentration, restrictive feeding may result in the calf not being able to meet its energy requirements with the quantity

allocated to it. This can lead to lower weight gain if no high-quality supplementary feed is offered by way of compensation, or the calves do not consume sufficient quantities.

## **Costs**

The cost of ad libitum feeding should not be underestimated. Milk is a very expensive foodstuff. The intake of solid animal feedstuffs is delayed due to the high milk intake, so more money has to therefore be invested in feeding. Whether a decision is made for or against ad libitum feeding depends, in principle, on individual opinions and the operational conditions.

## **How Much Does A Calf Need?**

In order to cover the average energy requirements of calves in the first weeks, approx. 1 kg of milk replacer must be fed daily. With 6l feed quantity and 125 g milk replacer/l water, this target is not met. With a feed quantity of 6l at a concentration of 160 g/l water, the amount of milk replacer required is therefore 960g per day. Standard feeds often look quite different from this. The concentration is often limited to 120–140g/l. The situation is different with ad libitum feeding.

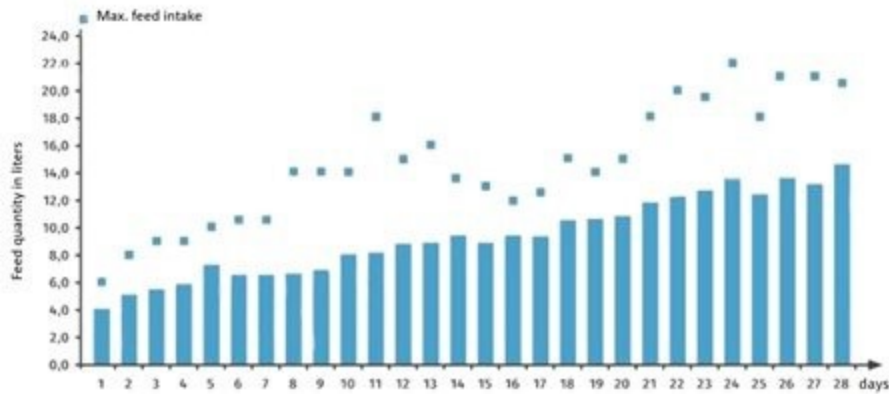
Experiments have shown that the feed intake of ad libitum-fed calves being fed according to these procedures reaches an average of 14.5 litres of milk per day. It is particularly important that milk is always available to the calves. They should never have the feeling that they cannot drink their fill, because otherwise they will take up the milk too hastily the next time and digestive problems may occur.

The fact is, you can raise calves using either method. With restrictive feeding, care must be taken to ensure that the concentration of the milk replacer is sufficiently high. With ad libitum feeding, there must always be enough milk available during the first few weeks so that it can be consumed at will.

It is always important that the calves quickly start to eat solid food so that the rumen can develop well. Therefore, the calves should be offered solid feed as early as possible, even if intake is still limited in the first few days. Special calf mueslis are particularly suited to this, because they are very tasty and well received by the calf.

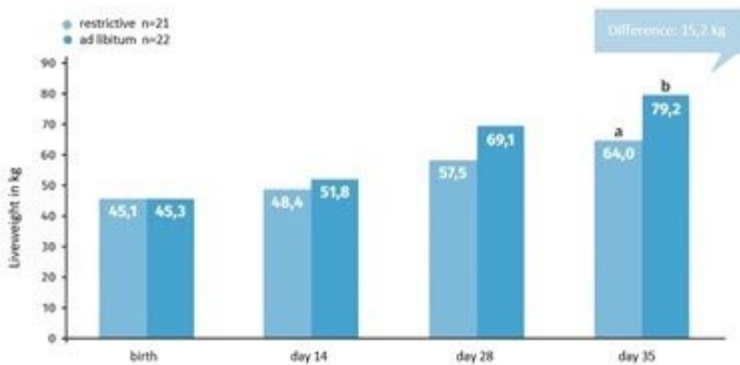
## **Ad Libitum Feeding In Calf Rearing**

### **- Does It Pay Off?**



*Average feed intake in litres/day, Weihenstephan-Triesdorf University of Applied Sciences (Johe 2018)*

**Milk intake:** In an experiment carried out by JOSERA in cooperation with the Weihenstephan-Triesdorf University of Applied Sciences the average milk intake of an ad lib fed group increased to 14.6 litres per day in the first four weeks. Individual animals had up to 22 litres per day in the fourth week of life.

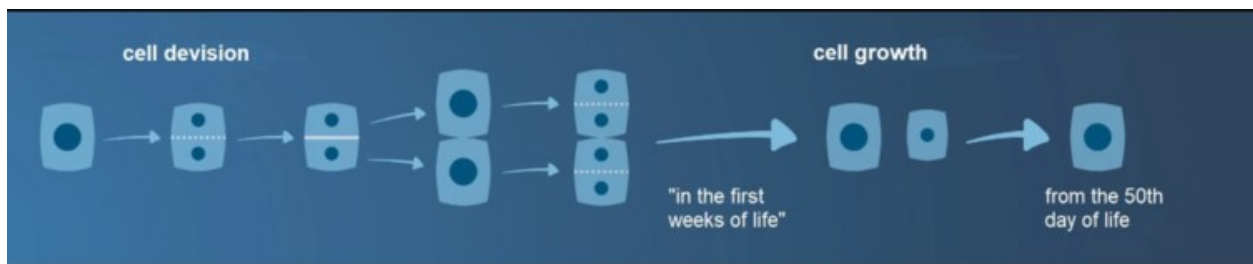


*Weight development, a and b, differ significantly from each other, (Johe 2018)*

**Development of animal weight up to the age of 35th day of life:** At comparable birth weights, ad libitum-fed calves showed significantly higher body mass development. From the 28th day of life, the differences in weight were significant, with a weight difference of 11.6 kg.

**New Research:** Over the last several years, demonstrations of the remarkable improvements in growth and feed efficiency that are obtained by feeding greater quantities of milk or milk replacer have stimulated renewed interest in early calf nutrition.

One of the most exciting current areas of research concerning accelerated feeding has documented long-term effects of early nutrition on subsequent productivity.



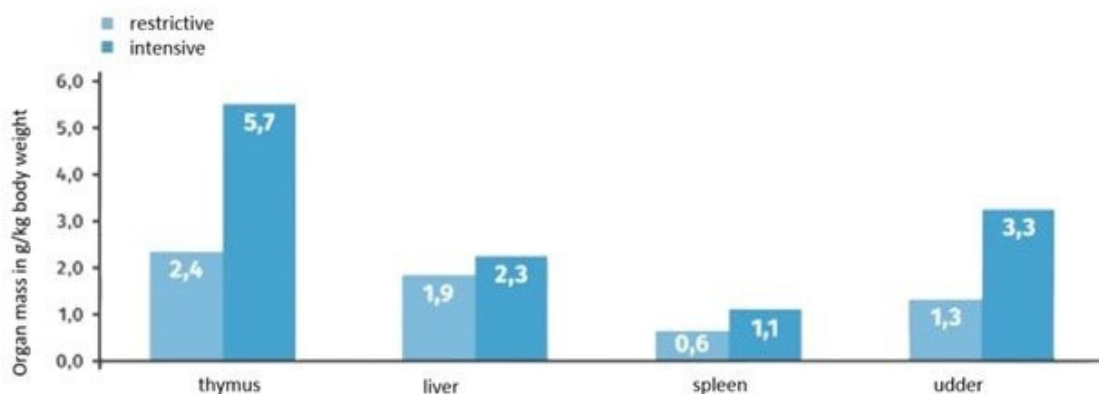
Cell division and growth. The nutrient supply regulates the cell division rate in the early growth phase, so that organ development and thus the performance of the dairy cow in later life is “programmed” via the intensity of feeding. This effect is called metabolic programming.

Calves that are reared with a limited nutrient supply may reach the desired size at a later stage due to compensatory growth, but this does not have a positive effect on subsequent performance. This is due to the fact that this subsequent growth takes place in the subsequent cell growth phase and not during the primary cell division phase. The compensatory growth therefore helps to correct the body weight, but has no impact on the organ systems, the development of which is primarily influenced in the first weeks of life.

As more and more lactation data become available for calves fed differently after birth, it is becoming clear that improved growth rates and early nutrition translate into greater milk production.

### How can a higher milk yield be explained as a result of intensive calf feeding?

During the first 50 days of life, intensive self-multiplication of cells takes place in the inner organs, whereas in the later rearing phase, growth takes place through cell enlargement.



Organ mass in g/kg liveweight, (Geiger et. al, 2016)

**Positive maturation of organs in calves.** The results of an American study at the University of Blacksburg illustrate the effects of metabolic programming.

### Content of the study:

Two trial groups were fed either restrictively or intensively over a period of 8 weeks.

**Result:**

The intensively fed calves were, by the 8th week of life, 24.5 kg heavier than the restrictively fed animals.

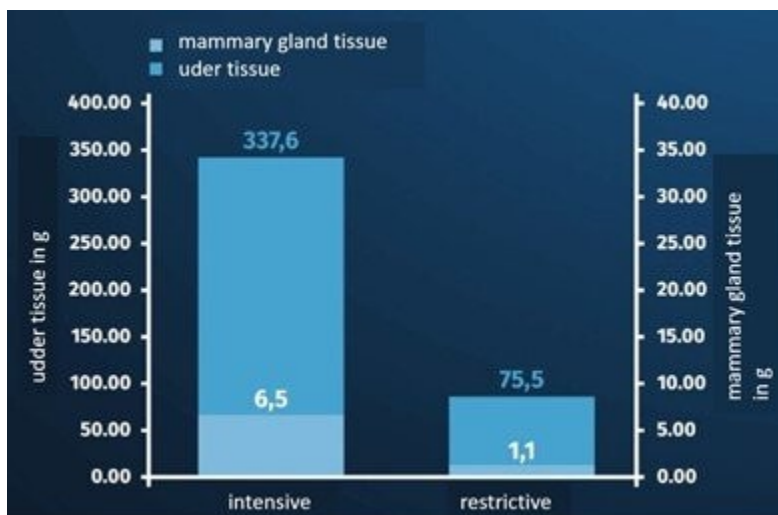
A comparison of selected organs showed a significantly higher organ mass per live weight kg in the intensively fed calves.

**Conclusion:**

This means that certain organs generate a higher cell growth in relation to the whole body during an intensive nutrient supply.

**Mammary gland development:** Other studies show that the mammary gland of the heifer in the period from 3 to 9 months of age is faster than that of the rest of the body and that feeding higher rates of milk pre-weaning result in:

- A significantly greater mass of mammary gland parenchyma in calves fed a higher plane of nutrition, pre-weaning.
- Mammary fat pad development is also significantly greater.
- Overall mammary gland development of dairy heifer calves is positively affected by providing a higher pre-weaning feeding plane.

***Udder and mammary gland tissue in g (Soberon and Van Amburgh 2017)***

Soberon and Van Amburgh (2017) were able to prove the effect of metabolic programming on the development of udder tissue.

**Content of the study:** Feeding trial with two trial groups, one of which was fed restrictively with 0.6 kg milk replacer powder/day and the other fed intensively with 1.3 kg milk replacer powder/day.

**Result:** The results of the histological examination clearly show that on the 54th day of life, in comparison to the restrictively fed animals, the intensively fed animals exhibited udder and mammary gland tissue that was significantly larger.

| Study                      | daily gains<br>restrictive | daily gains<br>ad libitum | more milk in the<br>1st Laktation |
|----------------------------|----------------------------|---------------------------|-----------------------------------|
| Foldager et al., 1997      | 600 g                      | 900 g                     | + 519 kg                          |
| Shamay et al., 2005        | 590 g                      | 880 g                     | + 981 kg                          |
| Ballard et al., 2005       | 440 g                      | 730 g                     | + 700 kg                          |
| Drackley et al., 2007      | 520 g                      | 750 g                     | + 835 kg                          |
| Terre et al., 2009         | 800 g                      | 900 g                     | + 624 kg                          |
| Moallem et al., 2010       | 730 g                      | 800 g                     | + 732 kg                          |
| Davis-Rincker et al., 2011 | 440 g                      | 640 g                     | + 416 kg                          |
| Korst et al., 2017         | 770 g                      | 808 g                     | + 612 kg                          |
| <b>Average</b>             | <b>611 g</b>               | <b>801 g</b>              | <b>+ 677 kg</b>                   |

Table 1

**Higher milk yield through ad libitum calf feeding?** Numerous scientific studies have confirmed the importance of intensive rearing and the associated higher profitability in dairy cattle farming. It essentially comes down to a change in attitudes in practice. Investments in a new-born calf, especially in the first weeks of life, are always worthwhile.

Table 1. shows the link between the higher daily gains during the first 35 day feed phase and the higher milk yield in the 1st lactation.

Other studies have also shown that pre-weaning average daily gain is positively correlated with first lactation milk yield. For example, one study showed that for every 1kg increase in preweaning average daily gain, heifers produced 850 kg more milk in their first lactation and 235 kg more milk for every 1 Mcal of ME intake above maintenance.

These findings are supported by a meta-analysis that reported an average improvement in first-lactation milk yield are in the range of 450kg to 900kg of milk.

Data also indicate that calves fed at a higher plane of nutrition are more resistant to disease than calves on more conventional milk feeding programs. The available evidence suggests that improvements in health are due to improved overall nutritional status rather than to any specific alterations in immune system characteristics or function.

## Conclusion

- High feed quantities of up to **22 litres per animal and day** are possible using milk or milk replacer powder and causes no health issues.
- Ad lib feeding can result in an average increase of 986g growth rate per animal per day.
- The higher milk cost is compensated for by the 35th day as a result of less meal/pellets consumed and an increase in an average of 15kg live weight.

- Calves need to be eating 1.5 - 2kg of concentrated meal/pellets for 4 - 5 days prior to weaning from milk to a pasture only diet to avoid a check in growth rates.
- Provided proper management post weaning is followed, higher weaning weights with ad-lib feeding persists through to first lactation of heifer replacements with increased milk production, higher conception rates and increased longevity.
- Each kg of BW at 6 - 8wks of age has shown to increase milk production in the first lactation by 20.1 kg. In nearly all cases calf BW at 6 or 8 wks of age was a more reasonable predictor of future milk production than calf ADG. (See Calf Note 194 - Does more "growth" equal more milk?)
- The correlation of ADG and BW to higher milk prod is highly variable and depends on a number of additional factors. (See Calf Note 194 - Does more "growth" equal more milk?)
- It is essential there is a focus on the entirety of the calf's life pre-calving to allow her to produce to her genetic potential if we are to benefit from the higher costs of ad lib feeding. (See Calf Note 194 - Does more "growth" equal more milk?)

### **Checklist For Ad Lib Feeding:**

- In NZ ad lib feeding involves placing 60 - 100 - 200L drums fitted with four to six teats/drum in mobs of around 20 calves.
- Drums are filled with cold milk once or twice day.
- Ensure the new born calf receives adequate colostrum before transferring to an ad lib pen.
- Equipment used to store, transport and feed milk must be cleaned daily.
- Drums should be cleaned every 2-3 days
- Fresh milk must never be added to old/stale milk.
- Adding citric acid to the milk will reduce bacterial growth and extend the life of the milk in hot weather. (Add 55grams citric acid/10litres cold milk/milk replacer. Dissolve the citric acid in cold water before adding to the milk)
- Calves are generally fed ad-lib for 35 days before weaning commences.
- Calves can be weaned by gradually diluting the milk with water, the amount of water increased by 10% of total volume at each feeding so that on the morning of d 42, calves receive 100% water. Alternatively calves can be slowly weaned over 10 days by gradually taking milk away for a certain period of the day, with the total milk feeding period becoming shorter over a set period of time .
- Meal/pellet should be on offer from the second week. Calves will need to be eating 1.5 to 2kg of starter feeds before milk is fully taken away.
- Weaned correctly growth rates decline at weaning at the same rate as conventional feeding meaning that the higher weight difference should be maintained.

*References:*

*Calf-rearing/ad-libitum-feeding-in-calves-as-much-as-the-calf-wants* <https://www.josera-agriculture.com/>

*Does more "growth" equal more milk?* <https://www.calfnotes.com/>