Section 4

Development of the **Calf Digestive System**

Introduction

A primary objective of calf-rearing systems is to get the calf off of milk and on to solid feed as early as possible. In other words: moving the calf from the pre-ruminant to the ruminant phase. Much of the skill in calf rearing is making this diet transition as smooth as possible, without set-backs to the calf's performance.

1. **Pre-ruminant digestion.**
2. **The transition phase - development of the digestive system.**
3. **Ruminant digestion.**
4. **Ingredients to initiate rumen development.**

Development of the **Calf Digestive System**

1 Pre-ruminant digestion.

Newly born calves are pre-ruminants. They have the same four stomachs as an adult but the rumen is significantly smaller. In the calf, the largest part of the digestive tract is the abomasum (fourth stomach), making up nearly 70% of the digestive tract. At this point, the immature digestive metabolic systems function similarly to those of a young monogastric animal, and the calf depends on milk or milk replacer as an easily digestible source of carbohydrate and protein.

The act of sucking by the calf causes a fold of muscle to develop in the wall of the rumen called the **reticular or oesophageal groove**. As the calf sucks, the oesophageal groove delivers milk directly to the abomasum where it is digested most efficiently.

In the first weeks of life, rennin is the predominant enzyme in the digestive system of the calf. Rennin allows the calf to efficiently utilise the proteins in milk. In time, as the level of the enzyme pepsin increases, the calf is able to utilise non-milk sources of protein. For this reason, milk replacers that contain non-milk protein should not be fed to the calf in the first three weeks of life.

For the first three to four weeks of life the enzyme lactase also predominates, meaning the calf can effectively utilise lactose, the important carbohydrate in milk. The calf is unable to utilise starch at this stage.

2 The transition phase - development of the digestive system.

The transition phase (period covering the move from the pre-ruminant to the ruminant phase) occurs between four and eight weeks of age, when the rumen begins to take over the main digestion of feed.

When a calf consumes water and starter concentrates, bacterial fermentation is initiated in the rumen. This generates large amounts of Volatile Fatty Acids (VFAs) in the forms of acetate, butyrate and propionate. This production of VFAs is responsible for rapid rumen development.

The time it takes for the calf to change from using just the abomasum to efficiently using all four stomachs depends on the type of food it is fed. If milk is freely available for a long time, the calf will have only a small appetite for dry feeds and rumen development is slow.

If the feed management encourages the calf to eat solid feeds, rumen development is enhanced and the calf reduces its dependence on liquid milk as a source of essential nutrients.

KEY POINT:

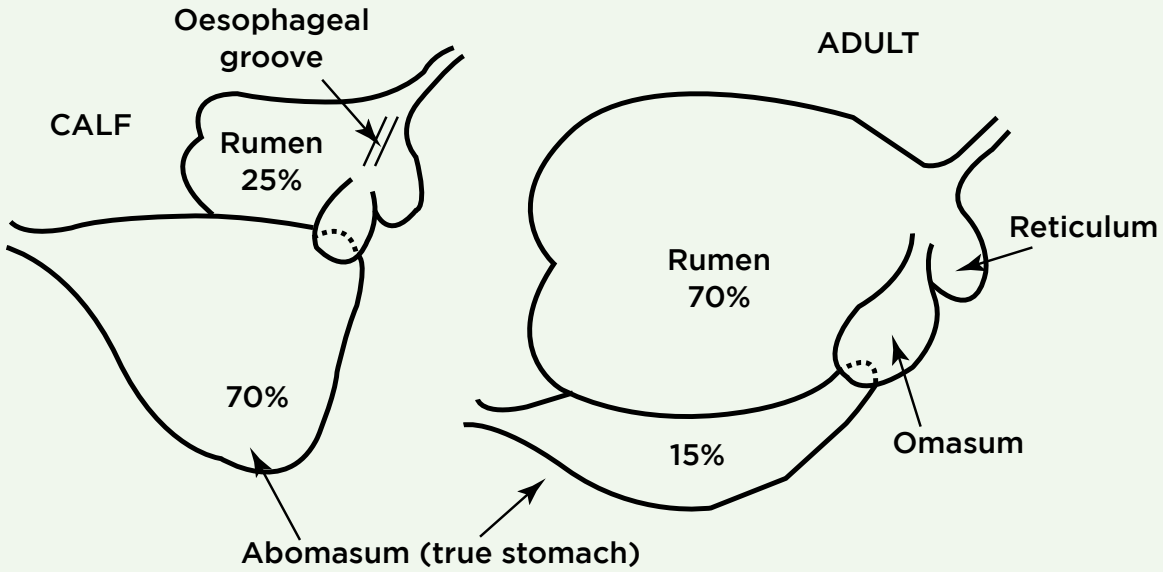
- By one week of age the calf should be encouraged to eat some concentrates and hay/straw.
    - At this time the rumen, reticulum and omasum will begin to develop.
- By one month of age calves should be eating substantial quantities of concentrates and hay/straw.
    - Calves will become less dependent on milk, risk of scours is reduced, calves can be weaned earlier, and labour and rearing costs are lowered.

If the calf is on a restricted liquid diet and has access to solid feed, this transition from pre-ruminant to ruminant digestion can be completed at about six weeks of age.

3 Ruminant digestion.

Ruminant digestion is based on the function of the rumen, where micro-organisms transform carbohydrate, protein and all other fermentable substances into volatile fatty acids, ammonia, methane, carbon dioxide and microbial protein.

The ruminant phase begins at about six to eight weeks of age. At this point, dry feed is the sole source of feed, and the rumen accounts for approximately 70% of all stomach compartments. A calf will usually have full rumen development at 12 weeks of age and its ability to eat and digest dry food will then be more or less similar to that of an adult animal.



4 Ingredients to initiate rumen development.

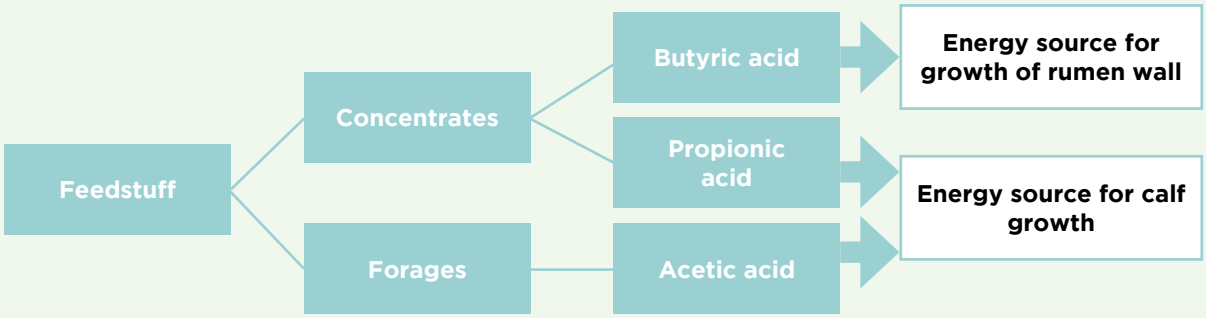
Rumen development is defined as the development of the epithelium and it is critical to successful weaning and good calf growth rates. There are five key ingredients that are required to initiate rumen development:

I. *Bacteria*

Rumen bacteria are absent when a calf is born and are introduced as the calf begins to eat calf starter concentrates. Bacteria help the digestive process. Bacterial end products of digestion (VFAs) cause significant changes in the rumen. The type of VFA produced is crucial. Calf starter contains carbohydrates in the form of starch which is fermented by bacteria that produce propionic and butyric acids. In contrast, when forages are digested the primary end product is acetic acid.

Acetic and propionic acids are absorbed through the rumen wall and are converted into metabolites that the calf uses as energy sources. Butyric acid is not absorbed through the rumen wall and is instead converted into an energy source used by cells in the rumen wall.

The production of VFAs lowers the pH of the rumen and establishes an ideal growing environment for bacteria, especially for bacteria that digest starch and produce propionic and butyric acids.



Development of the Calf Digestive System

II. *Liquid in the rumen*

Liquid in the rumen provides an ideal environment, combined with the absence of oxygen, for the rapid growth of bacteria. As milk bypasses the rumen, it does not provide enough liquid for optimal rumen development and therefore the calf must have access to 'free water' (see chapter 14).

Offering water from three days of age helps to increase calf weight gain, promotes starter intake and reduces the incidence of scour.

III. *Muscular movement - outflow of material from the rumen*

Feedstuffs that enter the rumen must be able to leave it. Therefore the development of rumen activity, such as contractions, pressure and regurgitation, is necessary. This muscular movement also helps mix the feedstuffs.

When the calf is born, the rumen has little muscular activity, few contractions and no regurgitation. As the calf's dry feed intake increases, rumen contractions begin. If calves are fed milk, hay, and starter from shortly after birth, normal rumen contractions can be detected as early as three weeks of age. In contrast, if calves are only fed milk, normal rumen contractions may not be measurable for extended periods.

IV. *Absorptive ability of the tissue*

From a structural point of view, the rumen is made up of two layers: the muscular and the epithelial, the latter is responsible for absorption of VFAs.

At birth, the epithelium does not have any ability to absorb. It is the production and subsequent absorption of VFAs in the rumen, from the fermentation of starter feedstuff that stimulates epithelium development by increasing the surface area through the development of the epithelium into finger-like projections called papillae.

V. *Availability of feed stuff in the rumen*

The key factor to promote early rumen development, and thereby early weaning, is dry feed intake. As concentrates are fermented to propionate and butyrate, they are a good choice to ensure early rumen development. Offer clean, fresh, starter at three days of age which is both highly palatable and meets the nutrient recommendations for dairy beef calves.

KEY TIPS:

A concentrate to roughage ratio of 8:1 by weight is necessary to avoid the development of 'pot belly' condition in calves and to optimise rumen muscle tone.

Diet: Milk only | Diet: Milk and hay | Diet: Milk and grain

Rumen development at six weeks. When fed milk only (left) the rumen has no papillae and is white in colour (no blood circulation), meaning there is little feed absorption possible. When fed milk and starter (right) the rumen at six weeks shows developed papillae and is dark colour, allowing for significant feed absorption. Source: Penn State University.

Section 4

Concentrate
Feeding and Feed Additives

Introduction

The intake of calf starter concentrates is the single most important factor in the development of the rumen, which is very small and undeveloped at birth. Starter intake is important in ensuring a smooth transition from milk feeding to an adult diet at weaning without setbacks to growth. In general, calves are fed a 'calf starter' ration up to 12-16 weeks of age. From there they are switched to a 'calf grower' ration.

1. **What are the important qualities of a calf starter?**
2. **Coarse ration v pellets - which is better for calf performance?**
3. **What ingredients do coarse rations usually contain?**
4. **When should you start feeding concentrates to calves?**
5. **What allocation of concentrates is recommended?**
6. **What are the factors affecting calf starter intake?**
7. **Calf starter nutrient specification.**
8. **Vitamins and minerals.**
9. **Feed additives.**

Concentrate
Feeding and Feed Additives

1 What are the important qualities of a calf starter?

It is essential that any calf ration is:

Palatable - the calf should be willing to eat the ration, starting as early as possible.

High quality - the ration should be highly digestible in energy and protein and contain the necessary amount of other nutrients.

Competitively priced - the cost per kg gain must be favourable.

2 Coarse ration v pellets - which is better for calf performance?

A coarse calf ration has ingredients of similar size (e.g. rolled barley, flaked maize), with no dust or fine meal present.

The young calf will accept a coarse ration more readily than pellets. A course ration encourages more chewing and saliva secretion. In addition, calves fed coarse starter mix eat more and have been shown to have higher weight gains than those fed pellets. The coarseness also benefits growth of the muscle layers in the rumen wall.

Therefore, calf concentrate feeding should begin as a coarse ration (approximately 2,000μm). After a few weeks, pelleted starters can be gradually introduced. Pellets that are either too hard or too soft will adversely affect the calf's concentrate intake.

Dusty meals can pose a problem, leading to increased incidence of respiratory disease. Finely ground ingredients increase the incidence of digestive disorders. Adding molasses (approximately 5%) helps to control the dustiness of rations and can also improve ration palatability.

Calves prefer a prefer a high quality coarse ration of uniform size (left). A dusty ration (right) will reduce feed intake.

3 What ingredients do coarse rations usually contain?

Most coarse rations contain ingredients such as flaked maize, rolled barley, peas, processed soya, beet pulp, linseed flakes, molasses and a pelleted protein balancer. Each ingredient must be palatable in its own right to prevent the calf from selecting out individual components of the ration. Because flaked/toasted cereals are more expensive than the same cereal in ground form, coarse rations tend to be more expensive than pelleted rations.


Flaked maize


Toasted flaked peas


Toasted full fat soya


Pelleted protein balancer


Toasted barley


Hipro soyabean meal


Pelleted sugar beet pulp


Calf starter concentrate

Concentrate
Feeding and Feed Additives

4 When should you start feeding concentrates to calves?

Calves should have access to clean, palatable starter concentrates from **three days of age.**

From three weeks of age calves will begin to eat considerable amounts of starter concentrates. From then on, the higher the quantity of milk fed, the lower the amount of concentrates they will consume.

5 What allocation of concentrates is recommended?

When it comes to stimulating calf starter consumption in young calves, always remember *"less is more."* At first, a small handful of concentrate should be offered after milk is fed. The ration should be placed in front of the calves in shallow troughs/buckets to encourage the calf to 'nose around' in it. By two weeks, the allocation should be increased to two handfuls. The idea is to encourage consumption while not overwhelming the calves or wasting feed.

The ration offered should be changed daily, keeping it fresh and encouraging the calf to eat. Use a measure for meal dispensing as it helps to prevent overfeeding which can lead to digestive upsets and scouring.

Concentrate should be increased gradually, with calves consuming at least 1kg of concentrate daily by weaning. It is vital to check that the calves' dung does not loosen too much as the ration allocation is increased.

Farmers should use a measure for meal dispensing to prevent overfeeding and waste.

6 What are the factors affecting calf starter intake?

There are a number of variables that contribute to differences in calf starter intake. These include:

- Milk feeding programs; the amount being fed, protein and fat percentage of MR.
- Water intake/availability.
- Calf starter formulation and its physical form.
- Calf genetics, gender, birth weight.
- Calf housing, management and environmental conditions.
- Starter quality - dusty, mouldy, off-flavours will reduce palatability.

7 Calf starter nutrient specification.

A ration that meets the calf's nutrient specifications, as well as their preference for texture, taste and smell, will encourage early intake.

To promote growth and maintain health, calf rations must contain:

- **Energy** for growth and functions like breathing, walking and grazing.
- **Protein** for all basic metabolic processes and growth.
- **Fibre** for rumen function and to ensure cud chewing.
- **Vitamins** for metabolic processes, bone formation and disease resistance.
- **Minerals** for carbohydrate metabolism, cartilage and muscle function.

Protein content	Calf rations should contain **18% crude protein** (CP) on an as-fed basis.
Energy content	Calf starter should have adequate energy supplied from a grain base. Energy values of 13-14 MJ ME/ kg dry matter are acceptable (12MJ/kg DM minimum). A target energy density of 0.95 UFL is recommended.
Oil content	The oil content of a starter can be up to 4%. The ration should not contain added fat.
Fibre content	A fibre content of 8-10% is sufficient to prevent digestive upsets.

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8 Vitamins and minerals.

Calves are born with very low reserves of vitamins A, D and E and are very dependent on colostrum to supply these vitamins. Most milk replacers and concentrates have enhanced levels of these vitamins because of their importance to calf health.

The milk-fed calf is also unable to synthesise its requirements for the complex of B vitamins and these are normally added to milk replacers. However, once the calf has a fully functioning rumen, it is capable of supplying its own B vitamins. Therefore these are not normally added to concentrate mixes.

Calcium (Ca) and phosphorus (P)

The main function of both calcium and phosphorus is skeletal growth. Nearly 99% of the calcium in the body is found in the skeleton, while 80% of the phosphorus is in the bones and teeth.

The remaining Ca is extracellular and plays a role in nerve conduction, muscle contraction, blood clotting and immune system activation. The remaining P is involved in energy utilization and transfer, acid-base and osmotic balance, and for cattle is required by ruminal microbes for growth and cellular metabolism.

Deficiency of Ca and P is rare in milk fed animals. Calf starter should contain 0.7% Ca and 0.45% P. This meets the recommended Ca:P ratio of approximately 2:1.

Selenium

Selenium plays an important role in the antioxidant system as a component of the enzyme glutathione peroxidase. Selenium deficiency can result in the development of White Muscle Disease in calves, which results in the degeneration and necrosis of both skeletal and cardiac muscle. In addition, un-thriftiness, weight loss, and diarrhoea are other signs of a deficiency. A calf starter should contain 0.3ppm selenium.

Copper

Copper deficiency can result in fragile bones, anaemia, sudden death due to heart failure and reduced immune response. Calf starter should contain 10ppm copper.

Vitamin A

Vitamin A is important for development of a calf's vision. It also contributes to the calf's basic growth and development because it plays a role in the maintenance of cell tissue. A typical calf starter should contain 4,000 IU/kg.

Vitamin D

Vitamin D is partially responsible for good bone development, as it is required for Ca absorption. Insufficient vitamin D results in sub-optimal bone development and therefore sub-optimal growth. A calf starter should contain 600 IU/kg. Vitamin D.

Vitamin E

Vitamin E is an important antioxidant in the body. A deficiency of vitamin E in young calves results in White Muscle Disease. Affected animals may show stiffness, lameness, or even cardiac failure. The typical calf starter should contain 25 IU/kg Vitamin E.

Table 1. Typical nutrient requirement for a calf starter.

Nutrient Specification	
Minerals	
Crude Protein	18%
Calcium	0.7%
Phosphorus	0.45%
Magnesium	0.10%
Sodium	0.15%
Potassium	0.65%
Chlorine	0.20%
Sulphur	0.20%
Iron	50 mg/kg
Zinc	40 mg/kg
Manganese	40 mg/kg
Copper	10 mg/kg
Iodine	0.25 mg/kg
Cobalt	0.10 mg/kg
Selenium	0.30 mg/kg
Vitamins	
Vitamin A	4,000 IU/kg
Vitamin D	600 IU/kg
Vitamin E	25 IU/kg

Source: NRC, 2001.

Concentrate
Feeding and Feed Additives

Key points when feeding concentrates:

- The calf should have access to concentrates from three to four days to stimulate rumen activity. The rumen is usually functioning well by 10-12 weeks.
- Concentrates should be introduced by placing a small amount in a shallow bucket. When the calf finishes drinking, rub a little concentrate on its muzzle to encourage the calf to taste it.
- Calf concentrates should be highly palatable, coarse-textured, high in energy and protein and low in roughage (> 15%).
- By three weeks a calf should be able to digest small amounts of grain, meal and hay.
- Any feed changes must be introduced slowly.

Calves should have access to concentrates from three to four days of age.

KEY FACTS:

Calves can be weaned once they are consistently consuming 1kg of concentrates per day. This level of intake can be reached by eight weeks if access to palatable starter and water is available *ad lib*.

9 Feed additives.

A number of feed additives can be added to calf rations to help improve calf digestion, health and support optimum growth and performance. These include probiotics, prebiotics, yeast, and yucca extracts.

I. Probiotics

Probiotics are live bacteria that are fed to, and benefit, the animal through improvements in their microbial gut flora. Feeding beneficial lactic acid bacteria is thought to inhibit the growth of pathogenic bacteria by:

I. Decreasing the pH in the large intestine through the production of lactic acid.
II. Competitive attachment to the digestive tract lining.
III. Competition for nutrients.
IV. Stimulation of the host's immune system.
V. Direct antagonism between lactic acid bacteria and the pathogenic bacteria.

Following colostrum feeding, calves can be fed probiotic orally. This is commonly done through milk replacer feeding. Some benefits of feeding probiotics to calves include:

- Protection of young animals against gastrointestinal disorders.
- Assistance against digestive disorders due to stress.
- Improved feed efficiency.
- Improved growth rate/weight gain.
- Reduced faecal *E.coli* count in pre-ruminant calves.
- Improved immune system.

However, there is also research showing the failure of probiotics to produce beneficial effects. This may be due to one or more of the following reasons:

a) Some probiotics don't contain enough viable bacteria or they contain the wrong strains of bacteria.
b) The bacteria are unable to survive in the stomach and small intestine.
c) The bacteria fail to competitively exclude harmful bacteria.
d) The animals already have a correct microbial balance between the lactobacilli and coliforms in the intestinal tract.

II. Prebiotics

Prebiotics are carbohydrates which are not broken down in the small intestine. They are fermented in the large intestine, acting as a feedstuff for the growth of beneficial bacteria. Mannanoligosaccharides and β-glucan are commonly used prebiotics that are able to prevent pathogenic bacteria sticking to the lining of the digestive tract. Prebiotics can also decrease the coliform numbers in the large intestine and colon of calves.

Through these mechanisms, prebiotics can improve average daily gain and reduce faecal

E.coli counts in calves.

III. Yeast products

There are two types of yeast products on the market: live yeast products and yeast cultures.

I. Live yeast products contain viable yeast (such as *Saccharomyces cerevisiae*) and the media on which the yeast is grown.
II. Yeast culture contains the media in which the yeast was grown, the metabolites made by the live yeast cell during the manufacturer's fermentation process, and dead yeast cells.

Direct feeding of yeast products has become a popular trend in cattle rearing. It is claimed they stimulate rumen fermentation and bacterial growth, and thereby increase dry matter intake and consequently improve animal performance. In calves, feeding yeast has been shown to:

- Reduce the incidence and duration of diarrhoea.
- Increase rumen development measurements e.g. VFAs.
- Increase ADG and feed intake.
- Lower faecal scores.
- Reduce *Salmonella* intestinal colonisation of the intestine and faecal shedding.

However some research studies have found only limited effects of yeast on both intake and gain efficiency. This suggests that the response of calves to yeast cultures can be both variable and inconsistent.

IV. Yucca extract

Yucca extract is prepared by processing the cactus plant *Yucca schidigena*.

Yucca inclusion in the diet of pigs and poultry is common practice with a significant reduction in ammonia levels found.

For calves, the inclusion of Yucca extract in their diet can improve rate of gain and feed efficiency. This may be due to the reduction of rumen fluid ammonia levels and increases in microbial growth, resulting in increased microbial protein synthesis and increased protein availability in the small intestine.

Section 4

The importance of **Water and Fibre**

Introduction

Water is often the most overlooked aspect of calf-rearing. Water consumption is important for the development of the rumen and to allow for timely weaning of calves off milk. Ruminants require quality fibre in the diet to maximise production and maintain health by sustaining a stable environment within the rumen. If the calves you are rearing are to achieve maximum milk or beef production from pasture, then the importance of setting the rumen up for life with quality fibre early cannot be overemphasised.

1. **Why is early 'free water' consumption important?**
2. **When should water be offered and how much?**
3. **Keeping water fresh and clean.**
4. **Why is fibre important?**
5. **When should fibre be introduced?**
6. **How important is fibre quality?**
7. **What type of fibre should be fed?**
8. **Turning calves out to grass.**

The importance of **Water and Fibre**

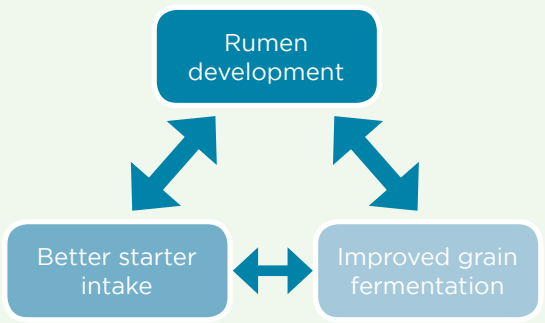
1 Why is early 'free water' consumption important?

'Free water' is pure water that is consumed by the calf. This water goes directly into the rumen and creates the ideal environment for fermentation by rumen bacteria. It is this fermentation of grains that leads to the development of the rumen.

The water that is in milk or milk replacer does not contribute to this 'free water' requirement as milk bypasses the rumen and goes directly into the abomasum, the largest compartment of the young calf's stomach.

'Free water' should be constantly available.

Early water consumption is important for the following reasons;



KEY FACTS:

Research has shown that calves that have free access to water eat more starter concentrates and have enhanced rumen development.

- Calves offered water eat 31-60% more dry feed.
- Calves gain 38% more weight from birth to four weeks of age (each extra litre of water leads to a 56g increase in weight gain per day.
- Calves achieve 31% higher ADG from 0-10 weeks of age.
- Calves offered free-choice water have fewer scour days.

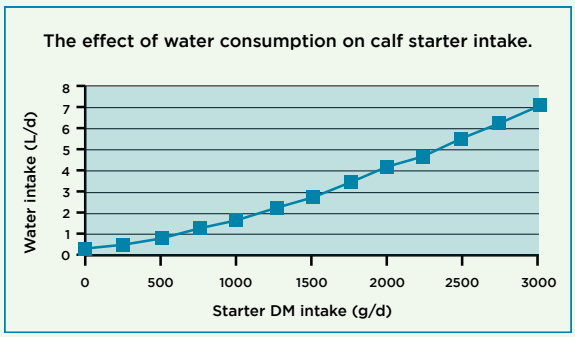


Figure 1. The correlation between water and starter concentrate intake. Source: J. Quigley, 2001.

2 When should water be offered and how much?

From 3-4 days of age, fresh water should be offered to all calves. However, ideally water should be made available to calves from birth. Water should be available *ad lib.*

KEY POINT:

Calves need to drink five litres of water in addition to their milk feed for each one kg of dry feed they consume.

3 Keeping water fresh and clean.

- Separate buckets – Feed buckets should be separated from water buckets to prevent grain from getting into the water and vice versa. Separation improves both starter and water consumption.
- Routine cleaning – Frequent rinsing of water buckets increases daily bodyweight gain.
- Water quality issues (elevated mineral levels or microbial contaminants) are a good reason to regularly test the water given to calves. As a minimum, the water should be tested annually for minerals, nitrates, total dissolved solids and pH, as well as contaminants such as bacteria.

Water and concentrates should be rigorously separated.

KEY POINT:

There are two important factors which encourage water consumption:

- **Quality – water should be high-quality and kept fresh.**
- **Quantity – adequate water should be offered to promote healthy growth and rumen development.**

4 Why is fibre important?

In a calf's diet, fibre promotes the growth of the muscular layer of the rumen and helps maintain the health of the rumen lining through its abrasive effect (preventing papillae clumping together).

5 When should fibre be introduced?

The initial solid feed should contain 10-20% roughage in the dry matter. Offering chopped forage of 3-4cm in length is ideal.

The ideal time for hay or straw to be introduced depends on the type of starter concentrates that you are feeding. In particular, if fine ground pelleted rations are fed, additional roughage will be necessary to aid the development of the rumen.

In general, fibre/roughage may be introduced by day three and should be available to all calves by two weeks of age.

It is important to not over-feed fibre. Too high an intake of hay in young calves decreases the intake of starter concentrates, leading to the development of 'hay bellies'. In this situation, the rumen is stuffed with hay which cannot be properly digested and rumen development is delayed.

The importance of **Water and Fibre**

Hay and straw work equally well as a source of fibre.

6 How important is fibre quality?

Fibre quality is very important for calf performance. Poor quality fibre creates a fill effect, especially if long stemmed, and is indigestible to a young calf. Poor quality fibre decreases the calf's appetite and limits concentrate intake due to the delay in passage out of the rumen.

Fibre should be fresh to minimise rejection. If the fibre source is heavily contaminated it should be discarded.

7 What type of fibre should be fed?

Studies have shown that providing pre-weaning calves with a chopped forage source separately to starter concentrate, such as oat or ryegrass hay, triticale silage and barley straw, improves their average daily gain, final bodyweight at weaning and their starter intake compared to calves not receiving forage and those receiving alfalfa hay.

Table 2. Effect of different forage sources on performance and feeding behaviour of Holstein calves.

	Control	Alfalfa hay	Ryegrass hay	Oat hay	Barley straw	Triticale silage	Corn silage
ADG (kg/d)	0.72	0.76	0.84	0.93	0.88	0.88	0.82
Final BW (kg)	84.5	86.4	91.6	96.1	93.2	93.6	89.8
Starter intake (kg of DM/d)	0.88	0.76	0.99	1.14	1.06	1.17	0.98

Source: Castells *et al.*, 2012. Journal of Dairy Science.

The source of fibre roughage that is fed should, if possible, be different from the bedding. For example, if straw is used as both bedding and feed, calves may eat contaminated bedding and consume pathogenic organisms at the same time.

Calves tend to prefer hay over straw, however both improve rumen function. Calves prefer long versus chopped hay, whereas they show no significant preference between long versus chopped straw.

KEY POINT:

The most influential factor promoting solid consumption is the ease with which it can be eaten by calves. Differences in particle size may contribute to the range in performance and intakes observed in calves receiving different forage sources.

8 Turning calves out to grass.

Calves should be put out to grass when they are strong enough and when the weather has settled and become milder (i.e. there is less chance of very cold, wet days). Continue to feed concentrates for at least one month after turn out. The amount fed will depend on the age/ weight of calves at turnout and the quality and quantity of the grass available. Generally about 1kg per calf per day is adequate.

With the exception of the first week or so after turnout in spring, the autumn born calf does not require any concentrate feeding at pasture.

If grass management is poor, both spring and autumn calves will require continuous feeding at grass if performance is to be maintained at an acceptable level.

Calves are selective grazers, so maintaining a high quality grazing sward is important to maximise performance. Operating a leader-follower system will help to maintain calf performance and intestinal health.

Calves are choosy grazers so a high quality sward is essential.

The leader-follower system.

In this system farmers allow the younger animals onto a paddock, strip or block before the adults. This allows the younger animals to get the best quality grass while helping them to avoid picking up intestinal parasites.