Calf Rearing and Colostrum

Replacement costs from home reared animals are generally hidden in the overall costs of the dairy enterprise. Managing the birth to weaning period of dairy replacement calves can have significant benefits in terms of immediate and long term health, overall growth rates, rearing costs and subsequent impact on profit levels.
Why is colostrum important?

A calf is born with no immunity, and relies on the transfer of antibodies from colostrum transferred through the gut wall to maintain health in the first weeks of life. The calf’s own immunity does not start to fully develop until three weeks of age. Colostrum provides energy (fuel) and disease prevention.

Colostrum contains immune cells (specific to the farm), antibodies (immunoglobulins – Ig) as well as other elements which are less well understood.

Immune cells and Ig are important as they protect the calf from bacteria, parasites and viruses as well as stimulate the development of the calf’s own immune system.

Colostrum typically provides two times the solids (when compared to ordinary milk), proteins for digestion, and minerals and vitamins, which are important for starting the calf’s metabolism and the development of the digestive system.

What affects colostrum quality?

- Age of the cow – typically heifers and second calvers have lower quality colostrum than third calvers
- Dry period – very short dry periods reduce the level of immunoglobulins available
- Vaccination programme of dam – e.g. Rotavirus, IBR, Leptospirosis, etc.
- Time after calving – decreases quickly with time

How do you measure colostrum quality?

Concentration of immunoglobulins (Ig) in colostrum can vary significantly. Research has shown that colostrum can range from less than 20 to over 100mg/ml. Differences between cows can mean success or failure for passive transfer of immunity to the calf. The ideal aim is that colostrum of at least 50mg/ml is fed to the newborn calf. Assumptions on colostrum
quality based on colour; creaminess or thickness are not a good guide from a quality point of view.

At farm level, ‘Hydrometers’ (colostrometer) or ‘Brix refractometers’ are quick and easy tools to identify the quality of the colostrum being fed. Once tested, colostrum containing more than 50mg/ml of Ig can be fed to newborn calves or stored/frozen for future use. Lower quality colostrum can then be fed to calves that are at least two days old, or mixed with feeding milk.

Colostrometer

A colostrometer is a measuring device that measures relative density. A tube is filled with colostrum, with the colostrometer then placed in the tube (or bucket) and allowed to float. The colostrometer is marked with traffic light colouring and depending on how deep it floats indicates the quality of the colostrum. Colostrum that tests green contains more than 50mg/ml of Ig, yellow contains 20-50 mg/ml and red contains less than 20mg/ml of immunoglobulin.

Colostrometer readings are affected by liquid temperature, therefore, when testing colostrum quality, the colostrum should be at room temperature (22.2°C). At lower temperatures, the colostrometer overestimates the Ig concentration, whilst at temperatures above 22.2°C immunoglobulin values will be underestimated.

The cost of a colostrometer is typically around £45-50.

Brix Refractometer

A Brix refractometer is a more robust tool that can be used to measure colostrum quality. A few drops of colostrum are placed on the tool, a sample cover is lowered and the refractometer is then held up to a light source. A value is then read from a scale. A value of 22% corresponds to 50mg/ml.

There are many makes of Brix refractometers available as either digital or optical versions, however some scale readings between versions are different. The aim should be for a scale that starts at zero and goes up to 35.

Typical costs of Brix refractometers for use at farm level range between £30-60.
Colostrum management to ensure quality

- Place colostrum in clean containers with clean lids.
- If colostrum is not required or is going to be frozen, chill immediately, and if freezing, place into ‘lie flat’ bags that give a larger surface area when defrosting.
- Bacteria start multiplying after taking the colostrum off the cow and can double in number every 20 minutes, meaning that speed of use and/or freezing is critical.
- Ensure all feeding bottles, buckets, and stomach tubes are cleaned and disinfected daily to reduce bacterial contamination.

**Colostrum quantity**

The aim should be to feed at least 3 litres of colostrum in the first two hours with a total of up to 5 litres being fed within six hours after birth. Speed of initial feeding is critical, as over time the calf’s ability to absorb the immunoglobulins decreases rapidly (typically halves within three hours after birth).

Generally if calves are left to suck colostrum from the cow themselves, they will not drink adequate quantities in the required time to provide maximum immunity levels.

Figure 1: Absorption of Ig within the first 24 hours in colostrum-deprived calves.
Colostrum administration

- Natural – calf drinks from cow – risk of not drinking enough
- Bottle – colostrum hand milked from cow into bottle or cow machine milked
- Stomach tube – immediate delivery

As with any of the above methods, cleanliness of the individual and utensils feeding the calf is paramount, as is care and attention when using stomach tubes.

Stress

The freshly born calf has gone through significant stress during the birthing process, and even more so if the calf has had to be manually delivered. Stress increases cortisol levels, which can impair immunoglobulin delivery. Therefore calm and gentle feeding methods are a must.

Measuring success of immunoglobulin transfer

The success of immunoglobulin transfer can be tested for by the farm vet taking a blood sample within one week of birth and undertaking a Zinc Sulphate Turbidity Test (ZST). This is a useful tool to identify farm effectiveness on colostrum delivery and is a useful way of checking if immunity levels are a problem.

Pasteurisation

Due to the presence of Johne’s disease, the risk of feeding pooled colostrum on many farms is too great, not forgetting the risk of passing on other bacteria.

On-farm pasteurisers are now available and are designed to kill 98% of bacteria. On many farms where in use, farmers are reporting positive results with improved growth and less sickness due to a significantly reduced bacterial level in the milk.

Costs of pasteurisers are typically £4,000+.

If you do have a Johne’s challenge on your farm, ensure you draw up a control strategy with input from your vet.

Recommended start to life

Upon birth, dip navels in 10% iodine solution and remove calves from the cow into a clean disinfected calf pen. Dip navels on every subsequent move from the calving pens, and administer 3 litres of colostrum within the first two hours of birth.
Feeding levels

• Feed whole milk from the second milking (24 hours after birth), and continue with whole milk from day two (at three litres per feed – six litres per day), or move onto a calf milk replacer. If feeding milk replacer, ensure that mixing methods (level of powder and water) are correct, and feed at the correct temperature (37°C).

• Calves should have access to fresh clean water at all times as this will drive dry feed intake.

• Ensure all feeders are kept up off floor level to reduce any feed contamination.

• Ensure that all feeding equipment is cleaned and disinfected each day so that bacterial growth is limited.

• Ensure a good quality starter pellet is available. At this stage in life, the calf is at its most efficient stage of feed conversion.

• Grow at 800-900g/day to ensure that birthweight is doubled by weaning.

• Wean when eating a minimum of 1.5kg/day of solid feed.

Impacts of temperature

A young calf is impacted significantly by temperature. The calf will work to maintain its body temperature within a specific zone. The thermoneutral zone can be defined as the range of temperature within which the animal uses no additional energy to maintain its body temperature. For a calf, this is between 10°C and 20°C. When temperature drops below zero, a calf’s energy requirement is 25% higher for maintenance alone. A great way to reduce temperature pressure (cold) on calves is to use calf coats until weaning. These ensure that optimum growth rates are achieved. These typically cost £25-£30/calf and are re-usable between calves after being washed or cleansed and disinfected.

Rearing costs

Rearing the calf in early life should be looked upon as an investment rather than a cost. Well grown calves meeting the correct age and weights at weaning will calve earlier, produce more milk and last longer, reducing overall rearing costs for the dairy herd.
Key points for effective calf management

- Dip navels in 10% iodine immediately at birth and each pen move
- Ensure cleanliness and hygiene are good to reduce levels of bacterial growth
- Three litres of colostrum in first two hours of life
- Six litres milk (two feeds of three litres) per day to weaning from day two
- Starter pellets from start – aiming for intakes of 1.5kg/day at weaning

**Targets to aim for:**

- Mortality – less than 1%
- Scours – less than 10%
- Pneumonia – less than 15%
- Bodyweight at weaning (56 days of age) – doubling of birth weight

Getting this right can be worth up to 1,000 litres per heifer.

**Author:** Sam Evans, Kite Consulting