



Mimic nature to maximise milk-feeding success

We outline the physiology of the calf's digestive system and why milk feeding systems that mimic natural suckling are key to rearing healthy well-grown calves.

TEXT RACHEL QUEENBOROUGH

The physical way young calves drink milk, and the speed at which they drink it, are two things that producers should keep in mind when feeding calves.

"Young calves have a muscular channel, called the oesophageal groove, which runs from the oesophagus along the front surface or anterior wall of the rumen and to the abomasum – the 'milk stomach,'" says Milk Bar's Anna McIntyre.

"When a calf suckles, this triggers a reflex action that closes this groove to form an enclosed tube," she explains.

"This groove directs milk from the oesophagus into the abomasum where it can be digested.

"Importantly, this means it bypasses the rumen – and the reticulum and the omasum – where there are no enzymes to digest milk."

The oesophageal groove is small and can only channel a minimal flow of milk. When calves suckle their dams, milk flow is always controlled. "But problems can occur in commercial situations when calves drink milk quickly, and the milk flow is too fast for the channel. Milk can then overflow out of the groove and into the rumen," adds Mrs McIntyre.

Saliva production

The rumen does not contain any enzymes that can break down the milk, so any milk that enters the rumen will stay there and ferment, producing lactic acid and gas (volatile fatty acids). Volatile fatty acids can cause bloat and will also cause rumen pH to fall, causing acidosis.

"So ensuring the oesophageal groove reflex has been triggered, and that milk flow is not too fast, are both key to protecting calf health," she stresses. As well as triggering the oesophageal groove reflex, suckling stimulates the production of saliva, which has several beneficial functions for the calf.

"Saliva is rich in lactoferrin and lactoperoxidase, an enzyme system with antioxidant and antimicrobial properties that boosts calf immunity," explains Mrs McIntyre.

Anna McIntyre:
"Calves should drink with the teat at 'udder height'"



"It contains a pre-gastric lipase, an enzyme required for the digestion of fats. These fats provide an essential energy source for growing calves.

"Saliva also alters the pH in the abomasum to aid the digestion of the lactose in the milk," she adds.

Saliva is alkaline, with a pH of 8.2, and milk is almost neutral, at 6.7. Before milk feeding, conditions in the abomasum are acidic, with a pH of around 5.6.

"As the calf suckles, the milk and saliva mix together to form an alkaline mixture," says Mrs McIntyre. "When this mixture meets the acid in the abomasum it coagulates into a milk curd. The lactose in the curd is broken down to glucose and galactose, which are absorbed into the bloodstream.

These form the major energy source for young calves.

"But without sufficient saliva production the optimum pH for coagulation is not met, and this prevents proper curd formation in the abomasum," she explains. "This can lead to raw milk, lactose, entering the intestines. Here it provides nutrient source for bacteria, such as E coli, to feed on and multiply. This is the leading cause of nutritional scours in pre-weaned calves."

Bucket feeding

Where calves are bucket-fed milk there is no suckling to generate saliva. This means the pH in the abomasum is unbalanced and coagulation (curding) is not sufficient. Calves also drink with their heads down, and esophageal-groove closure is not activated.

"Bucket-feeding has also been shown to result in between 10% and 15% of milk entering the rumen directly," says Mrs McIntyre. "Because it cannot be digested here, aside from the risk of acidosis, bloat and scours, this represents a loss of nutritional energy being fed, making it difficult to achieve good average daily liveweight gains, even when young calves are fed recommended milk volumes," she says.

The correct feeding height is also important to promote the closure of the oesophageal groove to channel milk to the abomasum. "Calves should drink with the teat at 'udder height', which is between 60cm and 65cm from the ground, until weaning."

Cross-suckling between calves is undesirable. When heifer calves cross-suck on the immature udders of their pen mates, this can lead to premature removal of the keratin teat plugs that protect the udder from mastitis infection. Cross-suckling can also lead to navel and skin infections.

"As one of their natural survival mechanisms, calves are instinctively 'wired' to suckle for a set period of time to ensure they drink enough milk," explains Mrs McIntyre.

"So the length of time calves spend cross-suckling is linked to the speed at which they have drunk. A calf fed four litres at 'nature's speed' should take between 12 and 15 minutes to drink. After this she will be quiet and settled because her suckling urge has been satisfied.

"But a calf fed using fast-flow teats, or by bucket, will drink four litres in eight minutes or less, then she will spend the next four or five minutes cross-suckling."

Mrs McIntyre stresses that the natural act of suckling and the resultant saliva production are both vital factors in the efficient digestion of milk by the young calf.

"Feeding milk to calves in systems that produce both a controlled flow of milk and increased saliva production will help ensure that milk bypasses the rumen and is delivered to the abomasum," she says. |

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For more information, contact:

Sales Manager
Anita Davies, 07970 000581

Area Sales Manager
Simon Marsh, 07970 000522
Hughie Williams, 07970 000582
Tim Nixon, 07970 000583