CALVING EASE

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Esophageal Groove

or

Where Does the Milk Go?

Why do we care where the milk goes in a calf as long as the calf doesn't die? Well, maybe we would like to cut down on our scours rate. Or, we would like to improve our rate of gain. When this physical structure inside a calf's gut works properly, better digestion of milk and/or milk replacers occurs - thus, we get more nutrients for each feeding into the calf's blood stream and less undigested milk into the small intestine.

Esophageal. Say, "ih-saf-ee-gee-el." (At least, according to Webster's dictionary.) Ever wonder where this esophageal grove was? What it looked like? Was it a hole somewhere in the calf's gut? If you have opened up a calf's gut you can't see anything like a pipe, groove or tube. Is it some sort of magic?

Dr. R. W. Blowey, writing about calf feeding practices in relation to health, actually uses the terms, "pipe" and "channel." In our language this is how he describes the esophageal groove.
First, the tissue that makes up the groove may be called the "lower esophagus." This tissue passes across the wall of the reticulum (the side toward the middle of the animal) and ends right where the reticulum empties into the omasum. (Remember the stomach names? Reticulum, rumen, omasum and abomasum.) As we stand next to a new-born calf (also standing), this layer of tissue runs almost vertically straight down. It goes down from the lower end of the throat (esophagus) to the omasum. The milk dumps directly into the abomasum when the tissue is curled up into a tube. It is estimated that only three to five percent of the fluid milk or milk replacer leaks out of this tube at feeding time with adequate groove closure.

No wonder we can't see it when we cut open a dead calf - the muscles are loose. All we see is a flat surface. That's because the muscles that fold the tissue into a tube aren't working. When a live calf is stimulated properly she has "esophageal groove closure." (What a mouthful!) What happens when the esophageal groove closes on a living calf? Blowey summarizes the changes like this: 1. horizontal muscles contract pulling the lips of the groove together; 2. vertical muscles contract shortening the groove; and 3. the right lip twists over the left one making a "pipe."

If you hold your hands in front of you with the palms facing the same way and thumbs together, you can see how this works. Just close all eight fingers. Your hands make a "pipe" from the edge of one hand to the other. Now, just imagine that same muscle action inside the calf's stomach with tissue rolling up from either side. First, to form a "U" and then one side overlapping the other to form an "O." Presto, esophageal groove.

Why Does Closure Make a Difference?

Why does this groove closure make a difference? It channels milk/milk replacer directly into the abomasum. It's an ideal place to digest milk. It's an acid envrionment. It's where the enzyme rennin occurs. When milk hits here it clots - forms lumps. The rest of the milk (we call this liquid whey) goes on to be digested and absorbed in the small intestine. The "clots" stay behind in the abomasum. So far, so good. **Even if we feed 100 percent whey-based milk replacer, better digestion is achieved by direct delivery to the abomasum.**

Two enzymes in the abomasum (pepsin for the protein called casein and lipase for the fat) eat away at these clots. The end result is nutrients that can either be absorbed directly or further digested in the small intestine.

What happens if these "clots" don't form properly? Whole milk gets into the small intestine. The protein, casein, can't be digested very well in the intestine. But, it's a great source of nutrients for bacterial growth. Oops! Scours! With whey-based milk replacers we also want to bypass the rumen and have the fluid milk replacer go directly into the abomasum.

Poor clot formation and poor esophageal groove closure go together. That is, with poor groove closure lots of the milk ends up in the rumen instead of going directly into the abomasum. (Remember that rennin that makes clots is in the abomasum, not the rumen.) Some experts estimate that milk dumped into the rumen may take as long as three hours before it finally makes its way into the abomasum. Now, BOTTOM LINE. What can we do as calf feeders to encourage better esophageal groove closure in young dairy heifer calves? It's to our advantage to get the natural processes to work for us rather than ignore them.

What Does Research Tell Us?

First, that sucking either from a nipple or a pail encourages closure. Second, that adrenalin (released into the blood stream when a calf is stressed) inhibits closure. Third, after the calf is 2-3 weeks old, milk has a stronger positive effect than water to encourage closure. Fourth, too cold or variable milk temperatures inhibit full closure. Fifth, irregular feeding times and/or feeding patterns inhibit full closure. Sixth, having the base of the feeding bucket lower than 12" (30cm) above where the calf is standing inhibits full closure. Well, that's a mouthful, isn't it?

Blowey says, "Groove closure is stimulated by sight, sound, taste and other stimuli associated with feeding." He suggests things like these:

(1) feed at the same time of day;
(2) feed calves in the same order;
(3)let the calf see and hear milk being prepared;
(4) have milk at proper feeding temperature;
(5)if feeding milk replacers, have it mixed according to the manufacturer's directions;
(6)reduce stress as much as practical;
(7)have your feeding bucket base at least 1 foot above where the calf is standing; and
(8)remove unconsumed milk so it doesn't get drunk cold.

He uses the term, "mothering." We often call it "tender, loving care - TLC" The more our calves are "mothered," he says, the more likely they will experience adequate esophageal groove closure at feeding time. And, we will get more nutrients absorbed in the blood stream. And, we will get less undigested mik into the intestine to encourage bacterial growth leading to scours.

CALF FEEDER'S TIP

Blowey's observation on how to tell if milk is warm enough when fed to calves. He has observed that when calves are fed milk that is too cold the fat collects on their muzzles. This fat causes the hair on the muzzle to fall out. This leaves a bunch of bare-nosed calves! We don't know how scientific this guideline is but you might try examining a few calf noses. Do the last calves fed have lots less hair on their noses than those that are fed first, especially in cold weather?

Reference: R.W. Blowey, "Calf Feeding Practices in Relation to Health," in Proccedings of BCVA, Summer 1994, pp.76-79. Dr. Blowey is from Gloucester, England.

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