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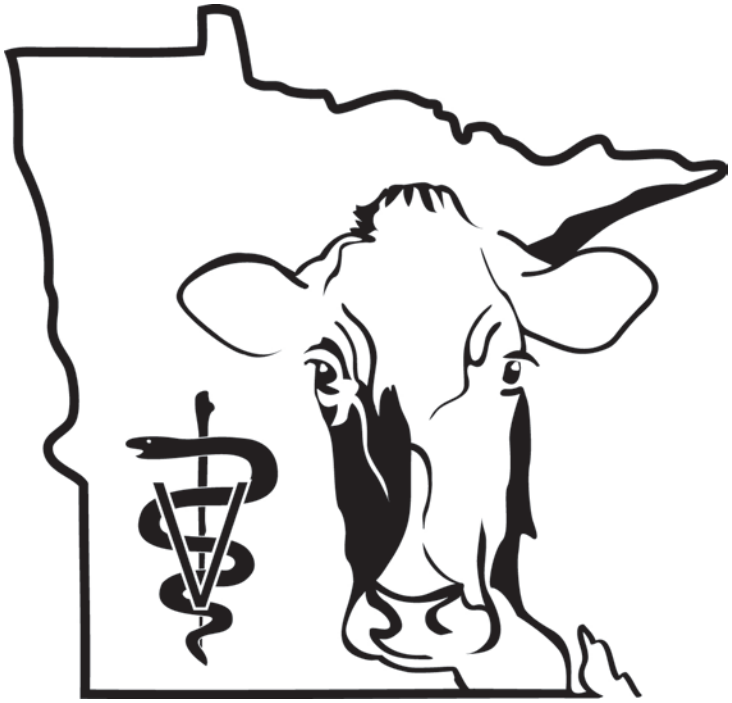

ST. PAUL, MINNESOTA
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They were killing their calves!

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This 550 cow well managed herd calved their cows in an outside lot with workers on hand from 5 AM until 6 PM. Calves born during the day (day-calves) were put in an uncovered outside straw built stall then moved to hutches placed in one of three locations on the farm. Pooled fresh colostrum was fed within 2-4 hours of birth. Calves born between 6 PM and 5 AM (night-calves) received colostrum within 12 hours of birth. Colostrum was collected in 5-gallon plastic fuel containers and transported to the hutch area prior to feeding. The calving lot had become quite muddy and calves born during the unattended night hours were exposed to other pre-partum females beside their dams. The combination of cold damp weather, mud and exposure was believed to have increased the under 2-months of age death loss from disease from less than 5% to almost 30%. Most deaths occurred prior to 7 days of age. There was no difference in the death rate between day-calves and night-calves. When the initial death loss reached 10% in order to reduce death loss the farm had been instructed by a feed company consultant to fortify the colostrum with a powdered supplement, two types of electrolytes, a coccidiostat and an antibiotic. The addition of all of these additives only made the problem worse.

In order to determine if colostrum feeding was adequate serum proteins were run on several calves, **Table 1**. Results show that 30.7% were borderline low on serum protein (<5.5 >5.0) but none were below the critical level (<5.0).

Table 1

Serum protein levels collected between 24-72 hours of age.					
Calf I/D	***Total Protein***	***Calf I/D***	***Total Protein***	***Calf I/D***	***Total Protein***
S-929	5.8	971	6.2	**1696**	**5.4**
1693	**5.2**	972	5.5	1697	6.6
1694	7.0	973	5.8	**1698**	**5.4**
1692	6.2	**974**	**5.4**		
S-930	6.6	1695	6.0		

Fecal swabs were collected for culture and along with dead calves were submitted to the state diagnostic lab for workup. Culture results showed smooth colonies of *E. coli* and *Salmonella.* Growth on the culture plates did not suggest that the bacteria were highly pathogenic even though they showed resistance to most commonly used antibiotics. The milk replacer did contain low levels of tetracycline and neomycin.

Colostrum was collected from the first milking of fresh cows at the milking parlor. It was transported as pooled colostrum to the calf raising area in 5 gallon spouted plastic gas cans. Most colostrum was fed within 6 hours of collection. Colostrum was not refrigerated. The transport cans were rinsed after each use and washed with the wash cycle water from the milking system cleaning. Colostrum from these cans was sent to the University of Wisconsin-Madison veterinary school for culture. Results of the culture are shown in **Table 2.**

Calves receive their initial gut inoculation from the environment including colostrum. Micro-organism levels below 100,000 CFU/ml are acceptable for gut inoculation and considered fairly safe for calf consumption. The table 2 results show that all samples were higher than desired with two

cows having excessive coliform counts and one cow having excessive environmental Streps. The workers were instructed to improve their cleaning of the colostrum transport jugs and to cool the colostrum between the time of collection until it was fed.

Table 2

Colostrum culture results*					
Count CFU/ml	***Cow 880***	***Cow 1184***	***Cow 345***	***Cow 1224***	***Goals****
Total Bacteria	600,000	2,750,000	400,000	255,000	<100,000**
Fecal coliforms***	5,000	50,000	110,000	0	<10,000
Other gram negatives	0	0	210,000	0	<50,000
Strep non-ag	400,000	2,600,000	50,000	135,000	<50,000
Coag Neg Staph	200,000	100,000	0	115,000	<50,000
Other	0	0	10,000 Bacillus	5,000 Bacillus	<5,000
*** High levels of bacteria in colostrum may interfere with antibody absorption.** Acceptable levels of bacteria in colostrum are the source of normal gut flora for the calf. *** High numbers of fecal coliforms indicate manure in the colostrm which means more Salmonella, Cryptosporidium, rotovirus, Johnes, etc.**					

Feeds and additives used on the calves were as follows:

1. Pooled colostrum
2. Commercial milk replacer (Nurse Chow 100)
3. Colostrum supplement (Lifeline)
4. Proprietary electrolyte solution (Calf Insure)
5. Commercial electrolyte solution (Entrolyte H E)
6. Coccidiostat (Deccox)
7. Antiobiotic (Baytril 100)

The feeds were given in different mixes depending on the severity of the calf and the weather conditions. Combinations along with their osmolality[A] are shown in **Table 3 and 4.**

Table 3

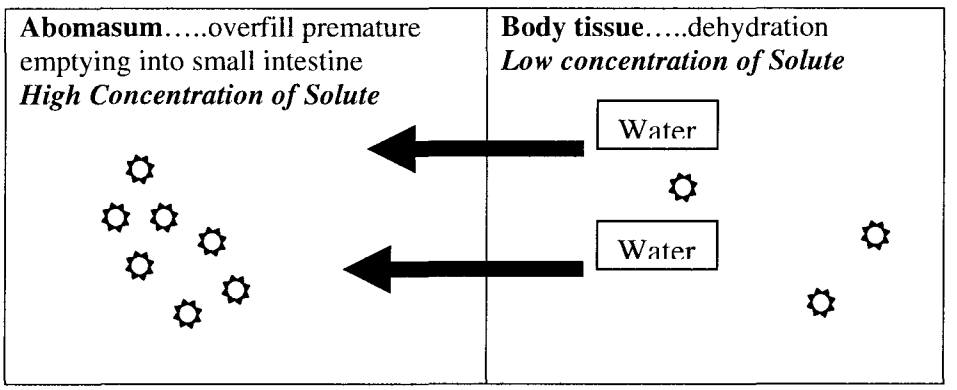
Feed mixes from numbers above and their Osmolality.					
Combination	***2+4+6***	***2+3+2***	***5+7***	***2@150%***	***Goals***
Sodium level	44	61	183	104	<120
Osmolality	383	541	913	547	<600
Serum is 280-290 mOsm/Kg					
1-pooled colostrum, 2=commercial milk replacer, 3=colostrum supplement, 4=electrolyte solsution, 5=commercial electrolyte solution, 6= coccidiostat, 7=antibiotic					

Table 4

Various feed combinations used by the farm				
	Winter day 1	Winter day 2	Scouring Calf	Sick calf
MR	*	*	*	*
CS(Life)	*			
Insure		*	*	*
O.E.S.			*	*
Baytril			*	*
MR = milk replacer, CS=colostrum supplement, Insure = electrolytes+oxytet+neomycin OES = oral electrolyte solution, Baytril = antibiotic (enrofloxocin)				

We determined that the amount of concentrate going into the same volume of water as was used with the normal milk replacer milk was producing a product with very high osmolality. A Wisconsin study showed that milk replacers may have sodium levels as high as 1210 mOsm per kg. Milk replacers are primarily whey protein concentrate and sodium hydroxide and sodium bicarb used in cheese making may contribute to the high sodium content of milk replacer. Sodium levels may vary from batch to batch of milk replacer. Labels do no require sodium levels in milk replacers to be shown. Normal serum osmolality is about 280-290 and the recommended level is ~300; the maximum level should not exceed 600.

The drawing below shows the mechanism by which fluids (water) flow from lower concentrations of solute to higher concentrations.



Samples of the different mixes used on the farm were sent to a lab for osmolality determination[B]. The oral electrolyte X Baytril combination had an osmolality of near 1000. This high osmolality causes the flow of tissue fluids from low concentrations of solute (in this case sodium) to high concentrations of solute. In these animals this flow of tissue fluid (water) resulted in over fill of the abomasum with premature emptying into the small intestine of partially digested milk replacer thus providing a meal for the gut bacteria, possibly Clostridium, to grow and produce toxins resulting in scours, dehydration and death.

This feeding regime was promoted by a feed company without regard to the physiological results of making high osmolality mixes by putting several products in a restricted volume of water. Any of the products used alone in the appropriate volume of water should be safe but when mixed may cause harm. For this reason it is not recommended to mix oral electrolyte solutions with milk replacer. Instead they should be mixed with the recommended amount of water and fed at least 30 minutes

after the milk replacer is fed. There should be some caution in winter feeding when extra milk replacer is fed to increase energy levels that high osmolality mixes are not the end result.

Summary

- Sodium levels in milk replacers vary
- Making milk replacer mixes more concentrated by adding other products may increase osmolality
- High osmolality mixes can cause dehydration and abomasal overfill
- Abomasal overfill can contribute to small intestine digestive problems
- Use caution in adding products to milk replacer
- Be aware that winter feeding of extra replacer powder in the same volume of water may increase osmolality
- Accelerated millk replacers may also have higher osmolality
- Feed oral electrolytes separate from milk replacer with at least a 30 minute delay

Outcome

The herd has expanded to 1052 cows with a 29,375 RHA and 1055 lbs fat and 869 lbs protein. A new calf barn in use for a year has resulted in a death loss less than 3% for calves born live. The uses of additives in milk have been stopped and if needed additives are given in a separate amount of water.

Footnotes and acknowledgements

[A,B] Osmolality determination and colostrum cultures: University of Wisconsin School of Veterinary Medicine Clinical Pathology Laboratory

A special thanks to Dr. Sheila McGuirk, School of Veterinary Medicine, UW-Madison for her diagnostic and therapeutic advice on this case.

NOTES