Frozen Teats . . . Prevention and Post-Care Considerations

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The maxim `no udder no cow' summarizes the importance of maintaining udder health in any cow, especially the dairy cow. Protecting the udder and teats is imperative to assure a cow's longevity in the herd as well as uphold milk quality. Damage to the mammary gland in any form can be devastating to the usefulness of the dairy cow. Winter time in the North presents just such a challenge when cows are exposed to the climatic elements of extensive cold and wind. This is further aggravated by unwanted moisture, leaving the teats vulnerable to damage caused by extensive cold weather conditions.

Hypothermia

The effects of abnormally low temperatures are generally most pronounced in newborn calves, but feeder cattle, mature cows, and mature bulls can also suffer temperature *per se* is not necessarily harmful to cattle, but problems arise when an animal's wet haircoat and wet skin are exposed to high-velocity winds during unseasonable cold weather to which cattle have not become accustomed. Because of the variables involved, it is impossible to state a minimum safe temperature for all cattle. Despite the existence of these variables, some estimate is needed regarding injury to cattle due to cold weather. Currently a "stockman's warning" is issued according to the criteria in Table 1.

The general nature of housing for dairy cattle does not preclude the farm situations where dairy cattle must tolerate cold conditions. Lactating dairy cows suffer frostbite to teats and eventually mastitis when teats are dipped in an aqueous disinfectant solution following milking and the cows are then driven from the milking parlor to a very cold environment. Furthermore, the inability to keep the housing area dry and free of manure or the lack of clean dry bedding only magnifies the problems associated with frozen teats.

Table 1. Procedure for determining when to issue a "Stockman's Warning."

1. Determine from month of year and moisture conditions the critical temperature.

	Critical Temperature (F)	
	Dry	Wet
November	400	500
December	300	500
January	300	500
February	300	500
March	400	500

2. From table below, find the wind-chill factor.

Wind Speed (mph)	Dry Bulb Temperature (F)						
	0	5	10	15	20	25	30
Calm	0	5	10	15	20	25	30
5	-5	1	5	10	15	20	25
10	-8	-6	-4	4	9	14	19
15	-16	-11	-6	-1	4	9	14
20	-20	-15	-10	-5	-1	3	8
25	-27	-22	-17	-12	-9	-2	3
30	-36	-31	-26	-21	-16	-11	-6
35	-50	-45	-40	-35	-30	-25	-20
40	-66	-62	-58	-53	-48	-43	-34

Treatment

Frostbite is an uncommon injury among healthy, well-nourished animals, although all species are susceptible. The areas most commonly affected by cold injury include the ears, tail, teats, scrotum, and distal portions of the limbs.

Frozen tissue must be handled gently and thawed rapidly in warm water 100.2 to 111.1 Fahrenheit (38 to 44 degrees Celsius) as soon as possible after it is known that refreezing can be prevented. Tissue damage is markedly exaggerated if thawing and subsequent refreezing occur (freeze-thaw-freeze-thaw syndrome). Tissue thawing is painful, and analgesics should be administered. Slow thawing is less painful than rapid thawing but results in far greater tissue damage. Frozen tissue should not be massaged during warming. Damaged areas are best left exposed during the healing process rather than covered with occlusive dressings, and premature removal of dead tissue should be avoided, since more tissue may be vital than is initially apparent.

Treatment of frostbite is usually ineffective in cattle because the injury is rarely noticed before irreparable damage has been done. If frostbite is discovered early, the injured part should be warmed immediately, being careful not to rub or overly manipulate the damaged tissue. Frozen teats should be coated with an emollient to lubricate them and lessen pain at milking. It must be recognized, however, that mastitis is likely to occur, and severely affected dairy cows may have to be salvaged.

Post-Care

The injured patient must be given good supportive care, including a high-protein, high-calorie diet with vitamin supplementation. In addition, restraint is often necessary to prevent self-mutilation. Where possible, management practices should be changed to prevent recurrence. Tissues previously damaged by freezing are more susceptible to cold injury when re-exposed to subnormal temperatures.

In the situation where injury has occurred, loss of at least the teat-end is likely. In this case, the first line of defense, the sphincter muscle which closes the teat canal off from intrusion, was lost with the sloughed tissue. This predisposes that quarter to inevitable infections, affecting the cow's health and the herd's milk quality. There's perhaps little reason to keep such a cow in the herd, except for gaining another calf before her departure. Certainly any future milk production potential is lost with the injury.

Naturally, culling has to be a decision of the farm manager, made with regard to the circumstances around the injured cow. For whatever the reason, there remains little the farm manager can do except to house the cow in a clean, dry environment. Sanitation will be imperative in order to prevent subsequent mammary infection.

This damaged quarter may be dried off. In the case of high milk flow, it's probably best that the quarter is allowed to drain. Granted the milk is lost, emptying the udder cistern is more likely to remove infection pathogens than sealing off a lactating gland.

Prevention

The key is prevention. Avoiding injury is more economical than treatment. Unfortunately, mammary injury of some type is inevitable in many dairy operations. Man is the key to "man"agement. The best recommendations are those of basic animal husbandry. Keeping the dairy cow 1) clean, 2) dry and 3) out of the wind are imperative to avoid frostbite. To control mastitis, regardless of injury, the dairy farm operator has to control what gets on those teat ends, which means sanitation. A healthy loafing or free stall bedding area must be cleaned regularly. Eliminate the fecal material and provide clean bedding daily.

Keeping the housing area dry in cold weather is paramount. The insulation provided byclean bedding is also important. Successfully housing cows in a cold area not only means clean bedding, but lots of it! If cold, exposed conditions are your only housing choice, make the necessary arrangements for plenty of straw or other bedding material and an effective windbreak.

Winter Teat End Lesions

Winter teat end lesions can be confined to the teat orifice right after a cold snap typically occurring in late December. Lesions on teats lead most producers to incriminate weather (frostbite) or milking equipment (high vacuum, fast pulsation). As a result, many producers quit dipping and proceed to use salves and also lower vacuum and slow pulsation (slower milking – greater unit on time). These are potentially the WORST things to do.

Observations of lesions at Iowa State University in 1993 and 1994 were found to be mainly pseudocowpox (herpes-like virus) that breaks under cold stress. An initial winter cold snap triggers viral lesion expressions. The signs and symptoms characterized by the virus, as well as treatments and control recommendations he suggests are as follows:

Visual Signs:

Initially

- Small white circular or horse-shaped ring on teat orifice.

Later

- Either 1) eversion or protrusion of teat end with vertical cracking followed by a dark scabbing over and inside the teat orifice, or 2) no eversion – just teat end scabbing (looks like mild frostbite on teat end)

Characteristics

- CONTAGIOUS only when visually observed.
- Herpes-like virus which seems to be triggered by the harshest, cold conditions on the teat).
- No immunity – recurrent year to year.
- Self curing after teat adjusts to stress conditions.
- Increased cell count and number of infected cows due to secondary bacterial infection.

Treatments/Prevention

- Your objective is to: control the virus; control secondary bacterial infections; keep the teat soft and healthy; control the spread of the pathogen; and minimize animal stress.
- Post-milking teat dipping with Iodine or Chlorhexidine that contain skin conditioners in the dip formulation. If severe, include a pre-dip as well. However, teats must be DRIED TO AVOID RESIDUES. Avoid water use when possible!
- Milking hygiene – similar to controlling staph mastitis. Use individual towels, clean hands, etc.
- Assure a well functioning milking machine with clean pulsators, air hoses and change inflations. Make sure pulsators are workingproperly. Don't slow down the milking process. This just prolongs milking stress on the teat end.
- Milk infected animals last or separately.
- Avoid salves – they provide an excellent spread mechanism to all teats via greasy hands.

If the lesions are lingering longer than previous experiences it's probably attributable to erratic weather. If the temperatures stay cold, the teats and animals can adjust. The lesions should regress and disappear. Erratic weather causes considerable stress, not only on teat ends, but to animals and humans in general as evidenced by the many health problems that erupt during stressful weather conditions.

Understanding The Problem

- Be aware of this virus, and the prevention and treatment steps.
- Understand that the virus is always there – it just needs to be triggered by stress.
- Remember that temperate weather may make teats more prone to having the virus trigger during the next cold snap. That's what makes the first two points so crucial.

Prepare For The Future (Next Winter)

- Be aware that the virus is present and lesions will trigger when the cold weather strikes.
- Use the first few cows that show lesions as an early warning signal and implement prevention steps immediately.

Teat Dipping

Clean cows entering the parlor require little or no water during preparing the udder for milking. It is especially important the teats are clean and dry when the teat cups are attached. Water left on the udder will drain downward, picking up additional micro-organisms as it flows toward the teats. If the teat cups have been attached, the water will collect at the mouth of the liner, eventually being drawn into the teat cup as the quarter milks out. The water can contribute to squawking teat cup liners and organisms contained in the water and will contribute to mastitis and reduce milk quality.

Teat dips are proven effective in controlling mastitis. However, how dip is applied is just as important as how it's used. Regardless of whether you dip or spray, it is recommended that the entire teat surface be covered.

During extremely cold weather (below 10 F), and particularly when conditions are windy, extreme care should be exercised to avoid chapped or frozen teats. The National Mastitis Council offers some "cold weather" hints as follows:

- In very cold weather it may be advisable to dip just the teat end.
- When teats are dipped, dip only the end and blot off any excess with a single service paper towel.
- Teats should be dry before turning cows out of the barn.
- Warming the teat dip reduces drying time.
- Windbreaks in outside holding areas provide some protection.
- Fresh cows with swollen udders are more susceptible to chapping.

There are many variables that impact teat dipping during winter, including housing design, weather conditions, and degree of teat exposure. Nonetheless, consistent use of an effective teat dip is a very important mastitis control procedure and should not be abandoned.

Winter conditions in the northern states often present severe challenges for proper teat dip management, especially in cold, free-stall dairies. In some regions of the northern United States, the complete cessation of teat dipping during cold winter months has allowed the spread of contagious mastitis pathogens. A preferable option is to teat dip every cow regardless of the weather, BUT under severe cold conditions (see Figure 1) , allow 30 seconds of contact time and then wipe teats dry prior to letting the cow leave the parlor. This procedure would add approximately 20 seconds per cow more time each milking, depending on parlor design and milking routine. However, the consistently proven benefits of teat dipping in the reduction of intramammary infection could be realized.

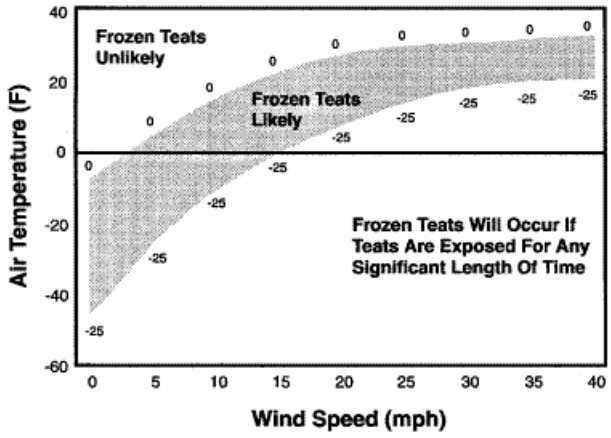

Figure 1. Wind chill effect on exposed skin.

The two most important risk factors for frozen teats are wind chill and wet teats. Generally, teats are not at risk of freezing in the typical cold free-stall housing if teats are completely dry.

That means the wind chill index is the dairy manager's best guide to frostbite risks. Yet,there are no absolutes – any cow's ability to resist frostbite will depend on several factors, including health, level of exercise, and sunshine. The index in Figure 1 was extrapolated from human data and takes into account the fact that normal body temperature for a dairy cow is 101.5 F.

The chart shows that any time the wind chill ranges between 0 F and -25 F, frostbite is a possibility. Below that threshold, frostbite is a certainty if exposure is prolonged. Note that at wind speeds of 5 mph or less, temperatures as low as -20 F can be tolerated. However, with high winds (35 mph), wind chill could be a problem even if temperatures are as high as 15 F.

Any time cows exit a parlor into conditions in which the combination of cold and wind result in wind chills of -25 F, preventive steps need to be taken. Ample amounts of dry bedding material should be placed in free-stalls. Construction of effective wind breaks is very helpful in minimizing the effect of cold on teat skin.

Also, special precautions need to be taken to protect debilitated cows or those with udder edema from severe cold. Cold and wind alone can chap skin, and the irritating nature of the disinfectant in some teat dips may hasten chapping, so some dairy managers might think it's a good idea to apply a salve in place of dip during cold weather. But salves are not better and may make matters worse.

Washington State University research studies indicate that salves were no more effective in healingchapped skin than was no postmilking treatment of teats. Moreover, the use of a salve on chapped teats was associated with increased *S. aureus* colonization of the teat skin as compared with no dip or the application of a commercial iodine dip (1%) with a skin conditioner (10% glycerin). There was less *S. aureus* skin colonization of chapped skin with dipping than with salves.

Summary

Prevention is the key to minimizing injury and illness. Various sources of injury and illness exist under everyday herd conditions. Cold tolerance varies with specie of animal and stage of lactation. Adjust your management and work with your family members and/or employees to do the best job possible, including working with your veterinarian to fine-tune your herd health program. Prevention of frostbite for all cattle consists of protecting them from extremely cold weather, high winds, and moisture. They should also be supplied with a constant supply of nutrients and enough dry bedding.

Acknowledgements

Moschella SL, and Hurly HJ: Dermatology, ed 2, Philadelphia, 1985, WB Saunders Cp, pp 1679-1682)
Reneau, J., 1994. unpublished data. Extension Animal Scientist, University of Minnesota.
Timms, LL, 1994. personal communication. Extension Dairy Specialist, Iowa State University

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