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## EARLY DEATH LOSS IN CALVES FROM DIARRHEA

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Death loss in the calf crop is associated with the cost of the calf, labor, lost cow production, and stress on the ranch or farm management. One should be aware that the cause of death in most diarrheic calves is metabolic acidosis and/or dehydration (1). Many calves will survive the common pathogens causing diarrhea when proper supportive therapy is provided.

The diarrheic calf can be treated without knowledge of the specific etiological agent, however, a definitive diagnosis can assist in the development of helpful prevention and management practices (2). Identifying the causative agent can be helpful in selection of the proper therapeutic products.

Table 1 lists the diagnostic findings from neonatal calf diarrhea accessions to the South Dakota Animal Disease Research and Diagnostic Laboratory (3). Cryptosporidia and coccidia are single celled protozoal parasites commonly found in cattle populations. Cryptosporidia has commonly been associated with infection of 2- to 4-week-old calves. Coccidia is commonly associated with calves older than 6 weeks of age. Unlike coccidia, there are no known preventative, control, or treatment products for cryptosporidiosis.

Rota, corona, and bovine virus diarrhea (BVD) are the most commonly isolated viruses from neonatal calves. Usually these viruses are isolated from calves 10-days-old or older. Coronavirus is more frequently isolated from older calves than rotavirus. BVD virus is commonly isolated from diarrheic calves under 2 months of age. Antiviral drugs are not available for the treatment, control, or prevention of viral infections in cattle. Maternal immunity is the most commonly used preventative practice.

E. coli Salmonella, and clostridial bacteria are the most commonly found bacterial pathogens in the diarrheic calf. Pharmaceutical products can be helpful in the treatment, control, and prevention of these infections. Maternal immunity is successfully used to control herd problems with E. coli and clostridial infections.

Before one considers treatment of the diarrheic calf, it is helpful to become aware of some physiological facts related to the young calf. White blood cells, which are used by the body to fight infection, are decreased in the newborn calf for the first 48 hrs (4). After 5 days, they are similar to the adult cow. When calves are stressed at birth, glucocorticoids are released and WBC are suppressed even more.

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Table 1. Neonatal Calf Diarrhea Accessions, SDADRDL  
July 1, 1990-June 30, 1991

|                   |     |
|-------------------|-----|
| Cryptosporidiosis | 305 |
| Rotavirus         | 235 |
| BVD               | 175 |
| Coronavirus       | 155 |
| <i>E. coli</i>    | 68  |
| Salmonellosis     | 65  |
| Coccidiosis       | 30  |
| Clostridium perf  | 26  |

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It has been found that neonatal calves that had experienced the stress of dystocia were 3.8 more times more likely to experience illness. It was also found that neonatal calf morbidity created an 11 kg lighter calf at weaning. This is an added cost to diarrhea not frequently identified (5).

The blood glucose level in the calf is higher than in the adult. The kidneys of the calf are mature at birth. The urine is concentrated at 4X an isotonic solution and this helps conservation of electrolytes which assists the diarrheic calf's survival (4). Scott Brown (6) claimed the premature calf's kidneys are slow in development and tubular secretions take longer and, therefore, the drug clearance will be slower.

The body composition of the newborn calf is 75%-80% water, as compared to 60% as adults; 50% of this is extracellular as compared to 20% in the adult. The larger the volume of water, the more diluted the drug will be in body fluids. Sulfa treatments given to newborn calves may require larger doses/body weight, but given less frequently than to adult animals (6).

Fat and muscle constitute a lower percent of the total body weight in the calf than the adult bovine. Parental absorption is altered because of blood flow to the IM/SQ sites (6).

Open gut absorption of maternal Ig antibodies occurs during the first 48 hrs. This is also true for poorly absorbed drugs. Absorption has been shown to be better on day 1 than 21 postpartum. Treatment of central nervous system has proven to be easier in the neonate because the blood brain barrier has not developed. Continuous fed colostrum will decrease infection even though the antibodies are not absorbed because they tie up bacteria in the gut (7).

Immune deficiencies can be created from developmental, physiological, inherited, and infectious reasons.

The underdeveloped newborn cannot generate a normal immune response. The developed calf does not develop the ability to respond to *Salmonella* until 3- to 4-weeks-old and to BVD until 28-100 days of age.

The calf is born with 1/3 the adult amount of complement illumination of bacteria (7). The use of bacterial static drugs is not as effective in neonatal calves as they rely on an immune system to clear the animal of the pathogen. One should consider the selection of bacteriocidal drugs when treating the very young calf (6).

The premature calf may be immunologically immature, dystocia or environment may lead to fetal stress, and either the inability to consume or an inadequate supply of colostrum are physiological reasons the immune system may fail.

Genetic susceptibility to neonatal infections have been shown in some breeds that are lymphocyte T- or B-cell deficient.

Acquired immune deficiencies include failure in passive immunity, viral infection, chronic infection, and pharmacological products such as corticosteroid.

Viral infections such as BVD infections destroy lymphocytes and compromise the immune response to increase the susceptibility of the calf to other infections. BVD, bovine papilloma viruses, and Johne's are caused by immunodepressive pathogens (7).

Examine all diarrheic calves' navels, joints, lungs, and abdomens. Calves with complicating problems such as pneumonia may require long term antibiotic therapy of 5-10 days.

When treating the diarrheic calf, correcting hypothermia, acidosis, and dehydration should be primary considerations. There may not be a correlation between the level of dehydration and acidosis, so they should be considered independently (10).

Hypothermia is defined as subnormal body temperature. Providing external sources of heat such heat lamps and heating pads may be helpful. Administration of warm IV or oral solutions are important considerations.

The loss of body fluids leads to a state of dehydration. The level of dehydration dictates of the most effective route to administer needed fluid therapy. Oral, subcutaneous, or IV routes of administration can be effective. IV administration provides a faster response to rehydration and/or acidosis correction. The IV route is preferred when dehydration is 8% or greater. This can be determined by grasping a fold of skin in the neck area and, if it takes over 8 seconds for it to return to its normal position, the calf may be 8% or greater dehydrated. Anophthalmia is when a gap is evident between the eyeball and the eyelid. When this is evident, the calf is usually experiencing dehydration of 8% or greater.

Oral electrolyte treatment is ineffective in calves with severe clinical illness. Oral solutions may produce more diarrhea than IV solutions; as much as 60% of the solution may not be absorbed (10).

Sodium bicarbonate is the alkalizing agent of choice in correcting acidosis in the calf (2). Acidotic calves become hypercalcemic and high blood levels and low cellular levels of

potassium develop. The addition of potassium can be helpful, however, should not be done in the severely compromised calf (2). Correction of the acidosis should always be a primary consideration. Calves over 8 days of age are more apt to become acidotic than younger calves. Frequently, these calves will respond to fluid treatment only to relapse in a few days. It appears these calves have only been marginally alkalized. These calves should be observed closely after returned to their mothers.

If a calf has been on IV5 for a day and orally treated prior to turn back, the cow should be striped out. Some calves will not tolerate milk. If the calf is not returned to its mother, reintroduce milk at 5% of its body weight. Increase the amount of milk to 10% of body by day 4.

Most homemade oral formulas are not good. One should avoid the use of antibiotics with oral electrolyte solutions. Some treatment regimens get undue credit as many calves live in spite of our treatments.

All oral electrolytes contain 1/2 the metabolizable energy of milk. A calf receiving only oral electrolytes needs at least 6 liters/day to meet energy requirements.

Milk feeding while rehydrating may make diarrhea worse and some calves become anorexic or won't eat. Fasting reduces osmotic diarrhea in the malabsorption state, but leads to increased weight loss (8). Fasting is not recommended for more than 48 hrs. It is not recommended to mix milk and electrolytes. Do not mix bicarbonate solutions and continue to feed milk. Bicarbonates interfere with milk curd formation. Citrate or acetate solutions will work with milk, however, they are hard to find. Terramycin administered orally in milk will have little absorbed because the terramycin ciliates calcium.

Milk feeding promotes weight gain and indirectly may improve intestinal healing. Feeding beef calves oral electrolytes and allowing them to nurse may promote growth, improves immunity, and produce the perception of a self-limiting condition. This treatment should only be used on calves that are bright and strong.

High risk cattle herds for calf scours include large herds and herds with a high percent of heifers. The ages of cattle groups have a significant effect on resistance to scours. If over 25% of a calving group are heifers, the group is classified as high risk. If the group is composed of under 15%, it is a low risk group. First and second calf heifers should be calved separate from the older cows and not commingled until the youngest calf is 30-days-old (2). Heifer groups should utilize maximum vaccination protocol to assist in disease prevention. Inadequate nutritional management of any aged cow could lead to poor quantity or quality colostrum production.

Density of cow/calf herd should be considered and a well drained, dry sheltered area, free of contamination should be considered. Keeping groups of cows to 50 or less significantly decreases disease potential. Once the environment becomes contaminated, each new case of scours significantly increases the number of environmental pathogens. Many times producers provide a lot of space but limited feeding and bedding areas. Disinfectants containing phenols are very good as they are not inactivated by organic matter. Bleach is a good disinfectant, if the

surface is cleaned first. In reality, cleaning is probably more important than disinfection.

Cryptosporidia can be controlled by aldehyde disinfectants. These are extremely toxic disinfectants. The cryptosporidia oocyst is sensitive to below zero temperatures.

Vaccines for prevention of viral infections have been shown to be of questionable benefit, but colostrum intake has been shown to be essential. A producer may want to check the colostrum with a colostromitor (2). This diagnostic tool does not lend itself to routine cow evaluation. It should be used for stored or questionable colostrum.

It has been shown that the commonly recommended practice of navel dipping may increase the risk for calf scours. The size of the calf was also found to be positively correlated with increased scours. Many experts have noted the significance of adequate colostrum consumption in the first 12 hours after birth for the calf to obtain the ability to resist disease. Research in Ohio found supplemental colostrum feeding was not positively or negatively correlated with calf scours (9).

## CONCLUSION

Many pathogens are widely distributed in the environment. As long as the environment remains the same, a pathogen will emerge to create a scours problem. With little or no treatment and control measures available for many of the more common calf diarrhea pathogens, producers are not going to find many long term solutions in a bag or bottle. Control of diarrhea problems in the cow herd depends on management of the herd and environment.

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