

*Bovine Pediatrics

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Bovine pediatrics is a topic that could encompass the entire symposium. Therefore, most of my discussion will be confined to problems with the calf up to six weeks of age on the range, understanding that there will be some overlap with calves in confinement.

One problem encountered by most cow-calf producers, and the one that can lead to many problems, is associated with colostrum intake.

Early colostrum intake is important from two aspects:

1. Antibody absorption.
2. Source of nutrients.

Antibodies transmitted by the colostrum are of great importance in helping the calf survive. The high levels of lactoglobulins give the calf a passive antibody level equal to or higher than its mother. The calf is capable of absorbing these antibodies for up to 36 hours, provided other proteins have not been consumed which can interfere with absorption.

It has been shown in baby pigs that transmissible gastroenteritis virus and *Escherichia coli* are readily absorbed by the neonatal intestinal epithelium and interfere with the absorption of immunoglobulins from the colostrum (1).

It is, therefore, very important that calves nurse early while the absorptive mechanism is still open and before the epithelial cells mature to the point of no absorption.

Calves that are delivered in a barn, pulled, or delivered by Caesarean section are good candidates for feeding colostrum. Milk the cow and feed the calf; one pint helps a lot. It gives the calf early antibodies and quick energy.

Colostrum contains 10-100 times more vitamin A, five times more alphanatocopherol and two times more calcium, phosphorus and magnesium than milk (2).

Energy requirements of calves are increased under stress. Whole milk is the best diet for young calves. Calves born on the range are usually left with the cow and should receive sufficient amounts of milk for normal growth during early life. The calf is essentially monogastric until about three weeks of age; therefore, it cannot synthesize amino acids.

Vitamin A

Calves are born with low reserves of vitamin A (3). Colostrum is an excellent source of vitamin A. Lack of

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vitamin A causes the transformation of normal epithelial structures to stratified keratinized epithelium. The mucosa of the respiratory tract, buccal cavity, salivary glands, eyes, lacrimal glands, intestinal tract, urethra, kidney, and vagina are affected by vitamin A deficiency. Those structures then become more susceptible to infection. Diarrhea, loss of appetite, and emaciation are common features of deficiency. The newborn calf needs at least 10,000 IU of vitamin A per day.

This level can be taken in and provided for the calf if the cow has had an adequate intake. The cow normally stores enough vitamin A for her and her calf for three to six months. In areas where the range dries up in July and no supplemental vitamin A is provided, calves can show a deficiency.

This can be injected at birth. One-half to one million units of water miscible vitamin A are usually adequate to get the calf off to a good start.

Vitamin E

White muscle disease (WMD) has been found in calves depending mainly on milk for nourishment. A deficiency of selenium or some interference with selenium or vitamin E metabolism may result in WMD. Calves with access to feeds containing high levels of fish oil have been found with WMD.

There are two types of WMD recognized: hyperacute and subacute. The hyperacute is usually due to myocardial damage and is characterized by sudden onset, dyspnea, weakness, and frothy blood-tinged nasal discharge. Death follows onset within a few hours (4).

The subacute type is usually due to skeletal muscle damage. Muscular weakness, stiffness of legs, difficult nursing, and normal temperature may be seen (5).

Cardiac or skeletal muscle lesions are constant, but their distribution varies widely in different calves. Muscle lesions range in size and have a bleached appearance. Hemorrhage and edema may be present.

WMD may be diagnosed from history, clinical signs, necropsy findings, and histopathology. Serum concentrations of SGOT increase markedly and appear to be proportioned to the extent of muscle damage. Normal values in calves were less than 100 units per ml. Signs of WMD usually occur in calves with 295 to 890 units per ml (6).

If lesions are not too extensive, injections of selenium and vitamin E (Bo-Se) will help recovery.

Phosphorus

Phosphorus is deficient in most range areas. Phosphorus content of forage may go down to 0.03% during the dormant season. The National Research Council recommends that beef cows should receive a diet containing 0.15% phosphorus.

A deficiency of phosphorus is manifested by lengthening or retarding the estrous cycle, depraved appetite, lameness and increased susceptibility to fracture. A pregnant cow receiving a low phosphorus diet may produce a weak calf which gains very poorly.

Many cows on a low phosphorus diet will be receiving a diet low in vitamin A, also. This appears to compound the problem of weak calves.

It has been suggested that this is the cause of the weak calf syndrome described in western United States.

Abomasal Ulcers

This condition usually occurs in calves from ten days to six weeks of age. The best doing calves appear to be the ones most commonly affected.

There are usually no symptoms, maybe some kicking at the abdomen. Usually the calf is found dead. There is usually some bloat soon after death.

On necropsy there is an extensive peritonitis with abomasal contents in the peritoneal cavity. The perforated ulcer is usually on the greater curvature of the stomach. The ulcer may be from $\frac{1}{2}$ to three inches in diameter. The incidence has been up to 4% in some herds.

Cultures have been made from the area of the lesion. Fluorescent antibody tests have been run for IBR, BVD, and reo and corona calf scour viruses, but the only consistent finding is an *E. coli* from the area. A fungus has been isolated out of some of these at Colorado State University.

Bloating

This spring many calves have bloated. Usually no scours have been observed prior to bloating. These calves are from seven days of age on up. Most of the time the gas cannot be relieved by stomach tube. At necropsy, gas is found throughout the intestinal tract.

Mineral oil and carminatives seem to help some. Death may occur prior to obtaining relief.

A causative agent has not been identified.

Diarrhea

Neonatal calf diarrhea causes more financial loss to cow-calf producers than any other disease-related problem they encounter.

Diarrhea is not a disease—it is a clinical sign of a disease which can have many causes. In all diarrheas, the intestine fails to absorb fluids and/or secretion into the intestine is increased.

A calf is approximately 70% water at birth. If a calf begins to lose body fluids and electrolytes through diarrhea, an acidosis is produced and severe depression follows. Regardless of cause of scours, steps must be taken to combat dehydration and electrolyte loss if the calf is to survive.

Even though an infectious agent may be the primary cause of damage to the intestine, death from scours is usually due to the loss of fluids and electrolytes rather than invasion by an infectious agent. The cause of scours is important, however, from the standpoint of prevention.

Age of the calf when scours begins is an important factor in survival. The younger the calf the greater the chance of loss.

Viral Diarrhea

Reo Virus Scours (7)

A reo-like virus can cause scours in calves within 12 hours of birth; however, when the infection is first introduced into the herd, it can affect calves up to 30 days or older. Infected calves are severely depressed. There may be slight excess salivation and a profuse watery diarrhea. The feces may vary in color from yellow to green, depending upon the age of the calf and the contents of the intestinal tract. Calves lose their appetite and death rate may go up to 50%, depending on the secondary bacteria present and the intensity of the treatment regime.

Diagnosis depends upon an accurate history, clinical signs and proper specimen collection and submission. The reo-like virus infection alone may cause no gross lesions in the small intestine other than an increased volume of fluid in the small and large intestines.

Treatment should be directed toward preventing dehydration, acidosis, and toxemia by using massive fluid therapy. Antibiotics should be administered both by injection and orally to prevent secondary bacterial build up in the intestine.

A reo-viral scour vaccine, Scour-vax Reo, is specific for reo-viral scours. It is given by mouth as soon after birth as possible. If other agents are inducing the scours, this vaccine will not be effective.

Corona Virus Scours (7)

Corona virus usually causes scours in calves over five days of age. When the infection first starts in a herd, calves up to six weeks of age may scour. These calves are not as depressed as those infected with reo virus. Initially, the fecal material may have the same appearance as that caused by reo virus; however, as the calf continues to scour, the fecal material may contain considerable amounts of mucus. Diarrhea may continue for several days. Mortality from corona virus scours ranges from one to 25%. Corona virus seems to be more cyclic than the reo virus. Herds may have a positive corona viral infection one year but no problem for two to three years; then it hits again. The reo-like virus, however, may be present year after

year.

Gross lesions may be similar to those of the reo virus. The intestine is often full of liquid feces. If lesions are observed in the intestine, they are the result of secondary bacterial infection. The majority of the microscopic lesions seen with this disease are in the large intestine.

Many herds have been found infected with both the reo and the corona viruses. South Dakota reports that of 247 specimens examined by fluorescent antibody, 22% were positive for viral agents; 7% corona only, 11% reo only, 4% reo and corona, 12% total corona, and 15% total reo (8).

Treatment for the corona scours is the same as for reo virus scours. Research is in progress on an oral vaccine which contains both reo and corona virus. This will be a modified live vaccine and will be given orally to the calf at birth in the same manner as the Scour-vax Reo.

Research is also focused on a combined reo-corona virus vaccine which will be given to the cow by injection 60 days and 30 days before calving starts in the herd. This is a killed vaccine. Preliminary results look very promising; however, additional work will be required before this vaccine is released for sale.

Diagnosis of Reo Virus and Corona Virus Scours

Identification of the type of viral agent causing scours is important when considering the use of a vaccine for control. Facilities for identifying these viruses by a fluorescent antibody technique are available through most of the diagnostic laboratories. **Proper collection, preservation and submission of samples for identification is very important for proper diagnosis.** Different samples are required for identification of the two viruses.

Reo virus:

A. Fecal samples are the specimens of choice.

1. Collect directly from the calf. A thermometer or a gloved finger inserted into the anus helps stimulate defecation. Pressure on the abdomen may help.
2. Collect sample in a clean container. Small baby food jars or plastic cups can be used.
3. Freeze this fecal material as soon as possible. Freezing stops the bacterial action which tends to break down the cells. Submit frozen samples to the laboratory.

B. Selection of calves to sample.

1. Choose calves in early stages of diarrhea. If a calf has scoured for more than six hours, it may be too late. False negatives may result if the calves have scoured too long.
2. Sample eight to ten calves for herd diagnosis. Hold these samples in the freezer until all have been collected and then submit to the laboratory in a frozen condition.

Corona virus:

A. Fecal samples are not adequate to detect this virus by fluorescent antibody technique.

- B. A six-inch section from the middle of the spiral colon is the specimen of choice. Tie off both ends, freeze and submit frozen.
- C. Samples must be collected as soon after the calf dies as possible.

An accurate diagnosis cannot be made unless the above steps are followed.

Bovine Virus Diarrhea

The virus of bovine virus diarrhea can cause diarrhea and death in young calves exposed to it. Diarrhea begins about 28 hours to three days after exposure and may persist for a long time. Ulcers on the tongue, lips and in the mouth are the usual lesions found on the live calf. These lesions are similar to those found in yearlings and adult animals affected with BVD (9).

Diagnosis is by history, lesions and diagnostic laboratory assistance. Treatment is similar to that used in reo virus scours. Bovine virus diarrhea is controlled by vaccinating all the replacement heifers one to two months before breeding. Caution: **do not vaccinate pregnant heifers or cows with modified live virus.**

Bacterial Scours

Escherichia coli (Colibacillosis)

E. coli has been incriminated as the major cause of scours. Many times following routine bacteriological culturing this is the only organism identified. Experimentally, scours have not been produced consistently with this organism. But it is always present in the intestinal tract and can cause a secondary infection following viral agents or other intestinal irritants.

E. coli scours is characterized by diarrhea and progressive dehydration. Death may occur in a few hours without diarrhea. The color and consistency of feces are of little value in making a diagnosis. The course varies from two to four days. Severity depends upon age of calf when scours starts (10).

Upon postmortem examination, lesions are non-specific; however, the small intestine may be filled with fluid and the large intestine contain yellowish feces.

Diagnosis depends on an accurate history, clinical signs, and culture of internal organs for bacteria. Also, location of culture from the intestine is important.

Treatment consists of correcting the dehydration and acidosis caused by a loss of fluids and bicarbonate. This requires fluid therapy, orally or intravenously. Antibiotics should be given both orally and by injection. An antibiotic sensitivity aids in selecting antibiotics of choice.

Control of *E. coli* scours can be difficult once a severe outbreak is in a herd. All calves should receive colostrum as soon after birth as possible. This should give some immunity to the calf. Early isolation and treatment of scours helps to prevent new cases.

Salmonellosis

There are more than 1000 types of *Salmonella*. All types are potential disease producers. *Salmonella* appears to produce a potent toxin or an endotoxin within its own cells. Animals may be more severely depressed following treatment. Treatment may cause the bacterial cells to release the endotoxin, producing shock. Therefore, treatment should be designed to combat endotoxic shock (11).

Calves are usually affected at six days of age or older. This age corresponds very closely to the age of the corona virus infection. The source of *Salmonella* infection in a herd can be from birds, cats, rodents, water supply, or human carrier.

Clinical signs associated with *Salmonella* infection include diarrhea, blood and fibrin in the feces, depression, and elevated temperature. The disease is more severe in young or debilitated calves. Finding a pseudomembrane in the intestine on necropsy is strong evidence that *Salmonella* might be involved. In most cases, antibiotic therapy is more effective if used before diarrhea develops. Fluid therapy which aids in combating endotoxic shock may be more successful than high levels of antibiotics. *Salmonella* isolations should be checked by a bacteriologic sensitivity test to determine the antibiotics of choice. Under range conditions, *Salmonella* has not been a problem in succeeding years.

Enterotoxemia

Enterotoxemia can be highly fatal to young calves. Toxins produced by *Clostridium perfringens* organisms cause enterotoxemia. There are six types of *Clostridium perfringens* that may produce a toxin. Types C and D appear to be the most important in calves. The disease has a sudden onset. Affected calves become listless, display uneasiness, strain or kick at the abdomen. Bloody diarrhea may or may not occur (12). This is usually associated with a change in weather, change in feed of the cows, or management practices that cause the calf not to nurse for a longer period of time than usual. The hungry calf may overeat and cause a hypomotility of the intestinal tract which is conducive to the growth and production of toxins by the Clostridial organisms. In many cases, calves may die without signs being observed.

On postmortem, lesions are usually found in the small intestine. There may be large hemorrhagic or bloody, purplish areas where the tissue looks dead. This is usually attributed to type C. Type D may produce diarrhea without the usual postmortem lesions. These toxins may break down rather rapidly. The contents of the intestinal tract must be collected very soon after death and frozen if they are to be preserved. Finding hemorrhagic enteritis in a calf that has died suddenly can provide a tentative diagnosis.

The disease is best controlled by vaccinating the cows with toxoid 60 and 30 days before calving. A single booster dose of the toxoid should be given an-

nually thereafter before calving. If this problem is diagnosed in nonimmunized cow herds, antitoxins can be used in the calf. Toxoids in the calf may work better than the antitoxin in some herds. Administration of antitoxin and oral antibiotics are the only treatments that are effective.

Chlamydial Problems

The presence of chlamydial agents in feces of apparently normal calves was detected in New York in 1951. Since that time, researchers have implicated this organism in several conditions (13).

Pathological changes after infections have been described as catarrhal enteritis and petechial hemorrhages in the ileum and abomasum. Ulcers in the abomasum and fibrinous peritonitis with granulation formation on the serosal surface of the alimentary tract and peritoneal cavity have also been described.

Calves with chlamydial infections may be weak at birth and have an increased temperature and watery diarrhea with polyarthritis developing. Calves usually die two to ten days following infection.

This condition has not been found or recognized in Nebraska.

Coccidiosis

Coccidiosis can cause a problem of scouring calves. There are two species, *Eimeria zurnii* and *Eimeria bovis*, which are usually associated with clinical infections in cattle. This has been observed in calves from about four weeks of age and older usually following some stress, poor sanitation, overcrowding or sudden changes of feed. Clinical coccidiosis has been observed in calves from seven to 14 days after they are moved out of the calving lots onto the pastures.

Clinical coccidiosis is diagnosed by finding significant numbers of parasites in diarrheic feces. The results of the fecal examination must be related to the clinical signs and intestinal lesions. Occasionally, clinical coccidiosis will be present with bleeding and very few parasites in the fecal material (14). Histopathology may be required for diagnosis in this instance. Typical signs of coccidiosis in young calves are diarrhea with fecal material smeared over the rump as far around as the tail will reach. This may or may not contain blood. Mucus and stringy masses of tissue may be present in the fecal material. In young calves, severe straining is not as frequently observed as in older animals. Death may occur during the acute period or later due to secondary complications.

Sulfonamides have been the treatment of choice for coccidiosis for many years. Amprolium has been cleared for use in calves as a preventative. This should be supplied at the rate of 5 mg/kg of body weight for a period of 21 days to cover the critical time period in which this disease is seen. If a few calves are found with clinical coccidiosis and creep feed is being used, amprolium can be given in the creep feed. Good feeding practices, management, and sanitation are the control methods of choice.

Pneumoenteritis

The etiological agents of pneumoenteritis are very complex. About all the respiratory, viral, and bacterial agents have been incriminated in this complex.

This can be a highly contagious disease, usually occurring where calves of different ages are housed together. Predisposing factors include stress, insufficient colostrum, vitamin deficiencies, and wet, drafty housing conditions (15).

Symptoms of pneumoenteritis usually start out with diarrhea, dyspnea, loss of appetite, depression, weakness, dehydration, with a mucopurulent nasal discharge. Temperature ranges from subnormal to 107° depending upon when it is taken. Calves usually die in 3-7 days or recover to become chronics.

Treatment consists of oral and systemic antibiotics along with supportive therapy.

We see very few cases of pneumoenteritis through the diagnostic laboratory. Most of the cases we see in baby calves are enteric diseases only.

Starvation

This should always be considered when calves are down showing CNS disturbances and with a bright eye. Usually these calves are somewhat emaciated but not really dehydrated as in the scouring calf.

At necropsy the stomach is empty with no sign of curd in the abomasum. The entire intestine is usually empty.

Starvation can be caused by desertion by the mother, sore teats, or mastitis to where she refuses to let him nurse. This usually occurs before the calf is one week old.

Nutritional Scours

Under range conditions, a calf adopts a pattern of nursing that fills his needs. Nutritional scours can be caused by anything that disrupts this normal habit. A storm, strong wind or the mother going off hunting for new grass disrupts the normal nursing pattern. When the calf does get up to nurse, he is overly hungry and the cow has more milk than normal; the calf may overload resulting in a nutritional scours. This is usually a white scours caused by undigested milk passing through the intestinal tract. Nutritional scours occurs in calves from very young up to six weeks of age or older. This type of scours usually presents little problem in treatment. Many of these calves, if they are still active and alert, do not require treatment. If the calf becomes depressed or quits nursing, treatment should be started. Any of the intestinal antibiotics can be used for this treatment.

General Considerations for Treatment of Calf Scours

Treatment of calves for calf scours is very similar regardless of cause. Treatment should be directed toward correction of dehydration, acidosis and electrolyte imbalance. Antibiotic treatment can be given simultaneously with the treatment for dehydration. Dehydration can be overcome with simple fluids

given by mouth early in the course of the disease. If dehydration is allowed to continue, intravenous fluids become necessary.

The clinical signs of dehydration first occur when the fluid loss reaches 5 to 6% of the body weight. Ten percent loss of fluid results in depression, sunken eyes, dry skin, and a calf will probably be unable to stand. A 15% loss of fluids usually results in death. Oral fluids used early in the scouring process have been quite successful.

A simple fluid can be mixed and dispensed for oral use, as suggested by Dr. Radostits of Canada: salt (NaCl) – four ounces, potassium chloride (KCl) – five ounces, sodium bicarbonate (NaHCO₃) – 5.5 ounces, and potassium phosphate (K₂HPO₄) – 4.5 ounces. Add one ounce of the above electrolyte mixture and 250 grams or one-half pound of dextrose to one gallon of water. Feed as the sole nutrient for one to four days.

Another formula that can be used: one can of beef consomme (grocery store soup section), three cans of warm water, and one heaping tablespoon of baking soda. Give one quart at four-hour intervals.

Return the calf to the cow that has been milked out as soon as the calf is able to follow its mother.

Oral fluids can be given by the bovine esophageal feeder or stomach tube. If the stomach tube is used, do not pass it into the rumen because this will put the material in the nondeveloped rumen rather than utilizing the esophageal groove to pass the material into the true stomach. If the calf appears to be having respiratory difficulty following administration of fluids, reduce the quantity and give it more frequently. Antibiotics should be used both orally and by injection whenever treating calves for diarrhea. Withholding milk will help to prevent the bacterial build up that might develop if scours continue.

Encourage ranchers to identify their calves by ear tag and keep a record on the treatment administered. This aids in evaluating treatment and utilizing follow-up treatments as necessary. Valuable information can be obtained by having the cows indentified, and identifying each calf at birth. If an outbreak of scours occurs, persistent treatment and records are essential for success.

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