

Diseases of Dairy Replacement Heifers¹

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The diseases that account for most calf illnesses and deaths are septicemia, diarrhea, pneumonia and parasitism. Their frequency and distribution in and among herds reflects a complex interaction between the calf's immune defense mechanisms, environmental influences, and the capacity of various infectious agents to produce disease. The best solutions for herds experiencing excessive calf loss lie in differentiating those management practices which are beneficial from those which are detrimental or of little value in promoting health and preventing disease. For example, treatment of all newborn calves with hyperimmune serums or antibiotics is costly and of questionable value. While these may be advised for short-term problems, they are by no means a good substitute for environmental sanitation and early colostrum intake. Antibody-rich colostrum coupled with the highly absorptive gut of the newborn calf provides an unparalleled level of immunity to neonatal disease. Today's progressive calf programs are founded upon health management practices which augment this natural system and not on systems which rely primarily on treatment or vaccination schemes to control disease.

The following are some of the more common infectious diseases of calves from birth to weaning.

SEPTICEMIC COLIBACILLOSIS

Septicemia is the presence of bacteria and their toxins (poisons) in the bloodstream. It is caused by a wide variety of agents but when it occurs in calves under five days of age the most probable causes are invasive strains of *E. coli*.

The normal gut of calves and other animals is populated with millions of *E. coli* which live harmoniously with their host. Under certain conditions, however, this delicate balance is upset and the disease-producing strains increase. These organisms and their toxins multiply, cross through the intestinal wall and move into the bloodstream where they are distributed throughout the body. In unsanitary calving pens, invasive strains of *E. coli* can also cause systemic infection by entering through the navel of newborn calves.

Calves affected with septicemic colibacillosis become rapidly depressed and weak. Diarrhea may occur but is not a consistent feature of this disease. Mortality is usually high due to a severe endotoxic shock induced by circulating bacteria and toxins and calves may die within 12 hours of the onset of clinical symptoms. Death is often so sudden that it may be the only sign of disease observed.

Calves which survive the initial septicemic episodes may subsequently develop joint infections; hence, the syndrome of swollen inflamed joints caused by non-fatal cases of this disease are known as joint ill. The infected joints are painful and become arthritic. Severely affected calves may not make profitable herd replacements. In herds with a high incidence of septicemia, early culling of severely affected young calves may be necessary.

Septicemic colibacillosis should be suspected when there is excessive mortality in calves under five to seven days of age. Successful treatment depends upon prompt diagnosis. However, therapy is the least effective way to deal with this disease. Calves

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deficient in colostral antibodies are most susceptible; dairy farmers who do not emphasize colostrum management often lose many calves to the disease. Calves born in a clean, dry calving area and given an adequate amount of colostrum soon after birth are less likely to suffer septicemia. Properly disinfecting the navel and moving the calf to a clean, dry individual pen will help ward off septicemia.

DIARRHEA (SCOURS)

Diarrhea is common, if not universal, in calves under one month of age, and certainly not all cases demand aggressive treatment. However, diarrheic calves should be observed closely until stools return to normal consistency. Diarrhea can be caused by a variety of bacteria, viruses, and protozoa or may also result from improper feeding practices as discussed under "Starting the Nutrition Program." The following discussion will be limited to the infectious causes of diarrhea in young calves.

ENTEROTOXIC COLIBACILLOSIS

While septicemia and rapid death are the distinguishing features of septicemic colibacillosis, enterotoxigenic colibacillosis is characterized by diarrhea, dehydration, and toxemia of varying severity. It is caused by enterotoxigenic (intestinal toxin producing) strains of *E. coli* (ETEC). These organisms do not enter the bloodstream but attach themselves to the wall of the upper small intestine where they multiply and produce large amounts of enterotoxin (poison produced in the intestine). These toxins drain fluid and electrolytes from the blood and other body tissues. This results in severe dehydration and a metabolic imbalance that will lead to death if not corrected. Enterotoxigenic colibacillosis is one of the most common forms of colibacillosis in calves under one week old. Death can occur suddenly before the development of diarrhea. Most infected calves develop a watery diarrhea. The tail, buttocks, and legs of an infected calf will usually be stained or soiled with diarrheic manure. These calves may refuse to suck, depending on the degree of toxemia and dehydration, and may lie down and refuse to rise as they grow weaker.

Whenever outbreaks of diarrheic diseases occur every attempt should be made to isolate the affected from the unaffected susceptible calves. As new calves are born they should be housed as far away as

possible from sick calves. If possible, assign separate work crews to feed and care for each group so that the cross contamination potential can be minimized. Separate buckets or bottles should be used for feeding rather than using the same for all calves. Sanitation is a must in the control of diarrheal diseases. Provisions to insure that newborn calves receive colostrum are particularly important for resistance to these diseases. Promising results have been obtained from research trials on immunization of the pregnant dry cow against colibacillosis in calves. Vaccination of the cow within 2-4 weeks of calving with vaccines produced from strains of ETEC stimulates the production of a greater concentration of specific antibodies that, when given in colostrum at birth, provides an extra margin of protection against ETEC. More recently, with the development of a vaccine containing monoclonal antibody to the pilus antigen of ETEC, problem herds can get immediate protection for calves in the face of colibacillosis outbreaks. This must be administered as soon as possible following birth (within the first 8 to 12 hours at least) and is not effective as a treatment for calves which are already infected. It can only prevent the disease.

ROTA AND CORONAVIRUS

Rotavirus is a frequent cause of diarrhea in calves under 2 weeks of age; coronavirus more often affects calves aged 2 to 4 weeks. As primary pathogens these viruses generally induce only a mild diarrhea, but when combined with secondary bacterial infections they may become major contributors to mortality in calves one month old and younger. Both viruses occur throughout the United States and in many foreign countries. Recent studies in the U.S. indicate that these viruses are present in most, if not all, herds and that the majority of calves eventually become infected by them. These viruses survive in feces for long periods. After ingestion they attack the epithelial cells lining the small intestine. The loss of this cellular barrier increases susceptibility to invasion by other infectious agents. A vaccine against these viruses is available for pregnant cows and newborn calves and should be used where the viruses are particularly troublesome. Some dairy managers have found that feeding colostrum continually for a week after birth reduces the incidence of serious diarrhea caused by these viruses.

SALMONELLA

Salmonellosis causes at least three clinical syndromes in cattle: septicemia, enteritis, and abortion. Septicemic salmonellosis is most common in calves, and typically occurs at 3 to 4 weeks of age (septicemic colibacillosis is more common in calves under 2 weeks of age.). Infected calves become weak and occasionally show signs of incoordination, suggesting involvement of the nervous system. The disease may end in death within 24 to 48 hours of the onset of illness. The typical mortality rate is 25%, but it may approach 100%.

Methods of treatment are controversial, but regardless of the therapeutic regimen chosen, treatment must begin early in the course of the disease. Control during outbreaks requires strict environmental sanitation and isolation of affected calves. Calves should be kept in individual pens, and feeding utensils should be routinely disinfected. Prevention using vaccines for salmonella have yielded mixed results and cannot be universally recommended at present.

SUDDEN DEATH SYNDROME (ENTEROTOXEMIA)

The sudden death of an apparently healthy calf is frequently due to enterotoxemia caused by *Clostridium perfringens*. These organisms occur naturally in the soil and may be found in the gut of normal calves. Under certain conditions, clostridial organisms multiply while in the intestinal tract and produce a potent enterotoxin that damages blood vessels in the brain as well as other tissues. Death usually occurs suddenly.

Overfeeding of grain and/or milk is one cause for the rapid proliferation of *Clostridia*. Calves consuming considerable amounts of grain while still receiving a full feeding of milk are most likely to develop this disease, thus the incidence of sudden death is generally highest for calves 3 to 8 weeks of age. Since most calves are fed free choice and feeding errors are sometimes made, dry cows and calves should be routinely vaccinated with *Clostridium* C and D toxoid. For dry cows being vaccinated for the first time, two injections should be made 2 to 3 weeks apart. For calves, vaccinations should be made at 1 to 2 weeks of age and repeated in 2 to 3 weeks.

PNEUMONIA IN CALVES

In cool climates, calf pneumonia is usually associated with poor ventilation. In Florida, however, calf pneumonia often occurs around weaning time when calves are moved from individual to group pens. The commingling of calves into group pens increases the potential for their exposure to disease organisms. Problems are compounded by stress associated with pecking order establishment rituals. Consequently, calves should be grouped according to breed and body size and groups should contain no more than 10 to 12 calves.

Some dairy farmers make the stress to calves worse without meaning to by scheduling vaccination, dehorning, and deworming procedures too close to weaning for the sake of convenience or because it may seem like the most appropriate time. It is preferable to perform these procedures at least 1 to 2 weeks before or after weaning.

The infectious agents which most usually cause respiratory disease in calves are the bacteria *Pasteurella* spp., *Corynebacterium pyogenes*, and *Mycoplasma* spp.; and several viruses including infectious bovine rhinotracheitis (IBR), parainfluenza-3 (PI3), bovine virus diarrhea (BVD), and bovine respiratory syncytial virus (BRSV). Calves are exposed to these pathogens as they are put into group pens where they share feed and watering facilities. Calves are more likely to resist infection if weaning stress is minimized. Vaccinating cows with IBR/PI3 and BVD protects newborn calves who are fed colostrum of from vaccinated cows (CAUTION: do not use modified live vaccines for IBR and BVD in pregnant cows). The intranasal IBR/PI3 vaccine may provide calves additional immunity to disease. Several respiratory disease complex vaccines are now being developed. *Pasteurella hemolytica* vaccine, which has been developed recently, may also be helpful in preventing infection where this organism is a major cause of pneumonia.