INTRODUCTION

Mortality during the neonatal period averages 5 to 6% in beef herds but may exceed 50% during years when explosive outbreaks of diarrhea occur. Dystocia, stillbirth, weak calves and maternally neglected calves are major causes of perinatal mortality. Death caused directly by or resulting from injuries and conditions caused by dystocia account for the single largest loss category in the first 96 hours after birth. (Also see glossary)

The following classification of the diseases of the fetus and the newborn (the perinatal period) is presented to assure that the meanings are definite.

1. **Fetal diseases**, Diseases of the fetus during intrauterine life, e.g. prolonged gestation, congenital defects, abortion, and fetal death with resorption or mummification.

2. **Parturient diseases**, Diseases associated with dystocia causing cerebral anoxia, and skeletal or soft tissue injury.

3. **Early postnatal disease** (within 48 hours of birth), e.g. malnutrition due to poor mothering, hypothermia due to exposure to cold, low vigor due to malnutrition, and special diseases like navel infection and colibacillosis.

4. **Delayed postnatal diseases** (2-7 days of age), e.g. mismothering, starvation, and increased susceptibility to infection due to low gamma globulin levels (colibacillosis).

5. **Late postnatal diseases** (1-4 weeks of age). White muscle disease and enterotoxemia.

Diseases of the newborn and neonatal mortality are a major cause of economic loss in Nevada livestock operations. This discussion is intended to provide producers with practical economical information to minimize disease and mortality.

The predisposing factors contributing to the various expressions of neonatal calf weakness are depicted in Figure 1.

Figure 1: Predisposing factors contributing to the various manifestations of neonatal calf weakness.
**BEEF CALF MORTALITY**

Total beef calf mortality from birth to weaning in herds with spring calving can reach 25% to 50%. The major risk factors causing excessive mortality are an increased incidence of calving difficulty because of underdeveloped two year old heifers, use of bulls that sire heavy calves, severe weather conditions, changes in management, disease epidemics, or sometimes unknown causes. Patterson et al. reported on calf mortality in range beef cattle at the Miles City, Montana research station. They reported an average loss from birth to weaning of 6.7%. The majority of the calf deaths (57.4%) occurred within the first 24 hours after birth, with 75% occurring between days 0 and 7. Calf deaths from first calf 2 and 3 year old dams accounted for 41% of the total mortality. Thus dystocia is the most important risk factor associated with perinatal calf mortality and weakness. Pneumonia and diarrhea are the second most important causes of death reported by Patterson, accounting for 12.85%, followed by 5.6% resulting from cold exposure.

**DIAGNOSIS AND MANAGEMENT OF ABORTION**

An abortion rate of up to 2% is usually of no health concern. The cause is usually not determined. An abortion rate above 2% suggests one of the common causes of infection abortion such as infectious bovine rhinotracheitis, leptospirosis, trichomoniasis, or bovine virus diarrhea virus. It is assumed that the herd is free of brucellosis. Foothill abortion is a major problem in some geographic areas of Nevada.

Producers are encouraged to submit aborted fetuses and portions of placenta to the diagnostic laboratory when the abortion rate is above 2%. Paired serum samples should also be collected from cows that have aborted. The examination of portions of placenta increase the diagnostic rate.

*Reproductive Failure in Great Basin Beef Cow Herds* is the title of a paper in the 1992 Cattlemen’s Update proceedings. To obtain copies of that paper contact any of the authors of this paper.

**NUTRITION ASPECTS OF REPRODUCTION**

The challenge is to provide an adequate and economical diet to pregnant cattle, especially during winter months. The goal should be to minimize weight loss and produce healthy, vigorous calves that receive adequate levels of colostrum. Such a ration will also result in a high pregnancy rate during a restricted breeding season for the following calf crop. This may be accomplished by a plan including the following:

- The heifer development nutritional program should be formulated so those heifers reach their target weight.
- Heifers and cows should not lose weight in the fall of the year.
- First calf heifers, young cows, and mature cows should be divided into groups for winter feeding programs. The effect of an energy deficiency is much greater in heifers than in cows.
- The wintering diet of pregnant cattle should provide nutritional requirements for **maintenance and pregnancy**. Monitor the nutritional status of the herd by utilizing body condition scoring and adjust the energy level to maintain a desirable body condition.
- In areas where specific mineral and vitamin deficiencies are known to occur supplementation with the necessary nutrients is necessary.

The genetic background of the cowherd, management, amount and quality of feed, and the degree of shelter provided all contribute to body weight loss.

**NUTRITION & NEONATAL MORTALITY**

Protein deficiency in late pregnancy may be a factor contributing to neonatal mortality. Cows fed on 0.37 kg crude protein daily during the last trimester had a gestation period of only 274 days and decreased weight gains compared to controls fed 0.96 kg. Dystocia or prematurity caused calf mortality in the low-protein group.
PHYSICAL & ENVIRONMENTAL RISK FACTORS

As a result of dystocia, which may or may not be assisted, physical trauma to the calf can occur. Often intracranial hemorrhages take place causing damage to the brain. Up to 70% of non-surviving neonatal calves that die at birth, or within 7 days of birth, have been shown to have corresponding hemorrhages. The highest incidence was found in calves of high birth weight.

When a prolonged birth occurs edema of parts of the body, such as the head and tongue, may occur. The principal problem relative to neonatal disease is the effect of hypoxia (lack of oxygen) to which the calf is subjected during a prolonged birth. Hypoxia will produce a stillborn calf, or the calf may be alive at birth but not survive because of brain damage. Death in the uterus due to prolonged parturition is also common.

Hypoxia or anoxia is thought to be the most important cause of the so-called weak calf syndrome. These calves are fully developed at birth and may be born with or without assistance. They do not make an effort to sit up and usually cannot stand even when assisted. They are dull and inactive, are reluctant to suck, and have a subnormal temperature. They are often stained yellow due to a release of meconium into the uterine fluids when the calf struggles before birth. They may die within 10-15 minutes after birth or live for several hours or a few days. Weak calves respond poorly to supportive treatment. The provision of warmth, force feeding colostrum and fluid therapy are logical approaches.

The prevention of hypoxia is accomplished by breeding heifers to bulls with a low birth weight EPD. In addition observation, and timely assistance when needed, at calving is necessary. Heifers and cows that do not continue to show progress should be examined for evidence of dystocia, and assistance provided if necessary.

Two environmental factors that predispose to infection and cause mortality are low ambient temperatures and starvation leading to inadequate gamma globulin levels and low blood sugar.

Calves that are hypothermic need to be rewarmed. Producers must determine the body temperature with a rectal thermometer. If the temperature is 99°F or below the calf must be rewarmed. There is no advantage of one method of rewa rming over another. Calves have a remarkable ability to resist and overcome the effects of severe cold temperatures. However, there is a relationship between the occurrence of cold weather and calf deaths, including those due to the weak calf syndrome.

Once the calf is born alive, the most important consideration is the ingestion of liberal quantities of colostrum within a few hours after birth and the development of the cow-calf bond. That bond should begin immediately after birth and be established by 12 to 24 hours after parturition.

How physical and environmental risk factors can result in illness and death in neonates follows:

Malnutrition of calves caused by:
- Poor maternal nutrition reducing milk flow.
- Cold weather preventing sucking or mothering of the calf.
- Old cows with poor milk producing ability or cows with mastitis.
- Prolonged parturition exhausting the cow.
- Dystocia causing hypoxia and/or hypothermia.

Reduced vigor of the calf caused by:
- Malnutrition.
- Dystocia causing hypoxia and/or hypothermia.
- Small or heavy weight calves.
- Intrauterine and postnatal infections.
- Cold or hot weather.
- Multiple births.
- Predation.
COMMON NEONATAL DISEASES

BIRTH TO 7 DAYS OF AGE

Stillbirths, injuries, and fetal infection: This is the major cause of calf mortality in the immediate postpartum period. These conditions are usually the result of hypoxia in calves from heifers with prolonged parturition. Or fetal infection in late gestation. Possible fetal infections include infectious bovine rhinotracheitis and bovine viral diarrhea. These calves must be force fed colostrum and kept in a warm, protected area for a few days or until recovery occurs.

Hypothermia: This is a result of hypoxia or birth during very cold weather. Calves abandoned by their dam will chill even when the weather is not inclement. This condition requires careful observation during the calving season.

Coliform septicemia in calves that do not ingest sufficient colostrum within hours after birth: Force-feed colostrum to calves that do not suck the dam within a few hours after birth.

Starvation of calves from heifers that lack sufficient colostrum or milk: Mismothering, mastitis can also cause this, or from older cows that produce little milk. Force-feed colostrum and milk until a foster dam is obtained or hand feed on milk.

Hypoglycemia in calves with diarrhea and no nutrient intake: Calves with scours should not be deprived of milk for more than 36 to 48 hours.

Acute diarrhea caused primarily by E. coli: Dehydration and acidosis cause death in these calves. These calves must be provided fluids and electrolytes in order to survive.

Congenital defects: These could be inherited, nutritional, infectious or environmental in origin. They should be examined by a veterinarian to obtain a diagnosis.

ONE WEEK TO 2 MONTHS OF AGE

Acute diarrhea: Rotavirus, coronavirus, coccidiosis, bovine virus diarrhea virus, and other viruses can cause this. Treatment for dehydration and acidosis is necessary.

Acidosis without dehydration: Some calves receive adequate amounts of fluids but not enough bicarbonate. These calves will appear hydrated but are weak, will not nurse, and will respond to intravenous bicarbonate therapy.

Navel infection and resulting complications: This is caused by unsanitary calving conditions. The infection affects the liver and bladder. Daily antimicrobial treatment is usually not effective and calves remain toxemic and unthrifty.

Arthritis, spinal cord covering infections, and other infections associated with a bacterial infection in the first week of life: Some will respond to antimicrobial therapy. Prevent by improved sanitation and management.

White muscle disease: This can be prevented by dietary supplementation of selenium to the pregnant cows or by injections of selenium to the neonate. There can also be a deficiency of vitamin E.

Enterotoxemia and Clostridial infections: These are preventable by timely vaccination of the cowherd with Clostridial vaccines and assuring adequate colostrum consumption.

Abomasal ulceration: The cause is unknown and no specific control measures are available.

REDUCING PERINATAL CALF WEAKNESS AND MORTALITY.

Reducing perinatal weakness and mortality requires a multifactorial problem solving process to clarify the causes by herd history and necropsy. Most important is a thorough evaluation of the management procedures. Procedures for reducing neonatal morbidity and mortality include:

1. Selection for increased calf survivability. Cull cows with dystocia or for failing to wean their calves and by using bulls with a history of easy calving.
2. **Good maternal nutrition.** Heifers should reach target weight and be managed well before being mated. Heifers and cows must receive adequate nutrition during the last sixty days of gestation to increase calf vigor and survivability, increase the amount and quality of colostrum, and to enhance their mothering ability.

3. **Difficult or prolonged births.** About a third of calf losses occur at parturition. Dystocia should be relieved by providing early assistance when fetal membranes or part of the fetus becomes visible.

4. **Adequate colostrum intake.** Calves consume colostrum to 7-8% of the body weight daily for the first 3-4 days. Providing shelter during periods of cold weather and assisting newborn calves with nursing minimizes the risk of failure of passive transfer resistance factors.

5. **Preventive vaccination programs.** Vaccinate the cows in late gestation to improve the quality of colostrum with specific agents known to challenge newborn calves.

6. **Necropsy.** Dead calves should be examined as soon as possible in order to arrive at a diagnosis to identify the causes of excessive losses

### SUMMARY

The most critical period for beef calf loss is within the first several days after delivery. The majority of losses occur during the neonatal period (first 3 to 4 weeks of life).

Dystocia is the number one contributor to calf death. Dystocia can affect calves severe enough to cause mortality directly, or can contribute to other problems indirectly increasing calf morbidity and mortality. Heifers have a higher incidence of dystocia than mature cows, and calves from heifer dams have increased death loss. Environmental conditions such as cold, wind, and moisture increase calf death. Calves affected by dystocia, or from cows with other maternal health problems such as deficient or excessive body condition, adapt poorly to life outside the uterus and are more likely to succumb to environmental problems. Poor maternal nutrition reduces calf vigor, calf body heat production, and diminishes calf immunoglobulin absorption. Infectious disease problems increase in calves with dystocia and infectious disease is the most important cause of death in calves greater than three days old. Recognizing the cause or causes of neonatal calf problems and changing management procedures to reduce the predisposing risk factors involved can reduce neonatal calf weakness and death.

### REFERENCES


GLOSSARY

ACIDOTIC-A condition of decreased alkalinity of blood and tissues, a result of excessive acid production.
AERATION-Supplied with oxygen by respiration.
ARTHROGRYPOSIS-Permanent flexure of a joint.
CEREBELLAR HYPOPLASIA-Arrested development of the cerebellar structure of the brain.
COLIBACILLOSIS-infection with or disease caused by the colon bacilli Escherichia coli.
COLOSTRUM-Milk secreted for a few days after parturition having a high protein and antibody content.
CONGENITAL-Acquired during development in the uterus and not through heredity.
DYSFUNCTION-Abnormal function of an organ of the body.
DYSMATURITY-Immature or not fully developed.
DYSTOCIA-Difficult birth often unrecognized.
EPIDEMIOLOGY-A branch of medical science that deals with the incidence, distribution, and control of disease in a population.
HYDRATION-The condition of having adequate fluid in the body tissues.
HYDROCEPHALUS-An increase in the amount of fluid within the cranial cavity, often accompanied by enlargement of the skull and especially the forehead (domed head) and atrophy of the brain.
HYPOGAMMAGLOBULINEMIA-A deficiency of gamma globulins, the immunoglobulins in the blood. Immunoglobulins raise disease resistance.
HYPOTHERMIA-Subnormal body temperature (below 99 degrees F).
HYPOXIC-Deficiency of oxygen reaching the tissues of the body.
Ig-Abbreviation for gamma globulins.
IMMUNOGENESIS-Production of immunity (raising the resistance).
KYPHOSIS-Abnormal backward curvature of the spine.
MALFORMATION-Irregular, abnormal, or faulty formation or structure.
MENTINOENCEPHALITIS-inflammation of the brain and the meninges (the three membranes that envelop the brain and spinal cord).
NEONATES-A newborn animal (less than one month of age).
OMPHALOPHLEBITIS-Inflammation of the umbilical vein, navel ill.
PERINATAL-Occurring in, concerned with, or being in the period around the time of birth.
POLYARTHITIS-Arthritis involving two or more joints.
SCOLIOSIS-Lateral curvature of the spine.
SEPTICEMIC-Invasion of the bloodstream by disease causing organisms from a focus of infection.
TERATOGENS-Something causing a developmental malformation or monstrosity.
TOXEMIC-Toxic substances in the blood.