INJURIES AND DISEASES OF BEEF CATTLE ASSOCIATED WITH CALVING

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The pay-off for cow-calf producers is being able to sell a weaned calf. To get this calf to market you must first get your cow pregnant and have her deliver a live calf. There are several common problems that affect cows from late pregnancy through calving.Many of these problems that occur during calving have a rapid onset and require a rapid response, the good news is that if they are attended to early they often have no permanent effect on subsequent breeding.

This publication will present common reproductive problems affecting beef cattle, a short description, underlying causes and possible prevention and common treatment. These problems are presented generally in chronological order, from those conditions seen before calving starts, through the immediate post-calving interval.

1. PROBLEMS PRE-CALVING:

vaginal/rectal prolapse
ketosis

2. PROBLEMS AT CALVING:

dystocia
bruises, laceration, rupture
uterine prolapse
milk fever
obturator paralysis/downer cow
retained placenta
grass tetany

1. PRE-CALVING:

Vaginal/Rectal Prolapse

Causes

The tissue around the birth canal becomes relaxed as the cow starts the last third of gestation, increased pressure in the abdominal cavity will push the vagina or the rectum out. If the tissue is trapped outside the birth canal it will swell and may become infected. In some cases the bladder is also trapped and the animal is unable to urinate.

This condition is more common in older cows but may occur in first calf heifers.

There may be a genetic link.

Overly fat cattle and cattle on pasture with a high legume concentration are at higher risk.

Treatment

Epidural anesthetic is usually necessary.

Replace the tissue and suture in place.

Vaginal sutures must be removed before calving.

Prevention

Remove animals from the herd that develop this condition, don't keep animals that have pre-calving prolapses.

Don't allow cows to gain too much weight during the last trimester of pregnancy.

Ketosis/Pregnancy Toxemia

Causes

Cows are exposed to low nutrition during the last two months of pregnancy.

Cows that are overly fat or are carrying twins are at a higher risk.

Signs

Affected animals become depressed, stop eating and will often stand off away from the herd.

Some animals will have the odor of acetone on their breath.

As the condition gets worse the cow will develop muscle tremors (trembles) and then go down.

Treatment

IV glucose, B vitamins.

Propylene glycol given by oral drench.

Any animal that is down should be lifted by a hip hoist 2 or 3 times a day for 15 to 20 minutes.

In cattle that are in late pregnancy consider inducing calving or a C section.

2. PROBLEMS AT CALVING

Dystocia

Any time a cow is unable to normally deliver her calf a dystocia has occurred. There are many management practices that can be used to reduce the incidence of dystocia. Not all of them may be suitable to every ranching system.

Heifers have many special requirements so they will be discussed first.

Breeding Management

Cull heifers with small pelvic areas before breeding starts.

Select bulls to use on heifers based on the birth weight of the bull, not on his relative size. Use bulls on first calf heifers that will produce small birth weight calves.

Expose heifers to the bull so they will start calving 30-45 days before the adult cows.

Watch body condition during gestation; heifers must not get overly fat or lose weight.

Calving Management

Develop calving grounds. These should be separate from wintering areas, dry and have some shelter from weather if possible (anything from a shelter to trees for a wind break will help).

Separate first calf heifers from the cows.

In large herds the heifer group may need to be divided into subgroups of 40-50 animals.

Surveillance and calving assistance are provided on a 24 hour basis if possible. Restricting the breeding season to 42-60 days will allow personnel to focus their attention to assist in calving for a short, but intense, period.

Feeding at night (between 9-11 pm) will cause more animals to start calving during daylight hours.

The dam and calf should be moved from the calving area to a separate nursery pasture after the calf has nursed, is up and moving about and has bonded onto the dam. This generally takes 24-36 hours.

General Indications for Calving Assistance

The start of calving is indicated by the animal laying down and starting abdominal contractions. The water bag (part of the placenta) appears in the birth canal. The water bag will normally break after 30-60 minutes, and is often followed by a period of restlessness and several position changes. Abdominal contractions become more forceful and the feet appear in the birth canal. Birth is usually completed after 30-60 minutes of hard labor. If the animal has not made any progress after 60-90 minutes, assistance should be given.

The appearance of the head alone, the head and one leg, one leg alone or of the tail are all indications of an abnormal calf presentation and indicate the need for assistance.

Guidelines for Calving Assistance

Comfortably restrain the cow. A squeeze chute will work, but if an animal goes down during a contraction, she may not be able to get up. The best situation is to have a small pen with a head catch. After the animal's head is in the catch, a halter is applied; once the dystocia is corrected and traction is applied to the calf, release the head and allow the cow to lay down in the pen.

The basic guidelines are clean and gentle. Keep the area around the birth canal as clean as possible, keep your hands and arms as clean as possible and use lots of lubricant (mild liquid soap is fine).

The calf can only come out one of two ways,both front feet followed by the head or both back feet out together. If you are unable to correct the position of the calf to get it coming to one of the above presentations, get veterinary assistance. The three most common problems are not getting the head to come out with the front feet (head turning back) and second, having a calf that is too big to be delivered through the birth canal resulting in hip lock. The third abnormal presentation is a breach in which the tail is the only part of the calf visible at the vulva. The presence of any of these problems usually requires veterinary assistance.

When pulling a calf, direct the traction down and away from the birth canal, not straight out behind the dam.

Do not use excessive traction; if you are unable to deliver a calf with two men pulling on the OB chains or when using a calf puller, increasing the amount of traction on the calf won't deliver it; the calf is oversized for the birth canal and should be delivered by C-section.

After delivering the calf, always make sure that there is not a twin present. This is a good time to check the birth canal for

any tears and to put some antibiotic pills in the uterus (neomycin-sulfa works well).

Bruises, Lacerations and Rupture of the Birth Canal

Causes

Calving difficulties, rough handling of the calf and maternal tissues and careless use of obstetrical instruments by the operators during delivery of the calf.

Injuries occur more often in cows that have been in labor for several hours and when the birth canal is dry and non-lubricated.

Treatment

Give oxytocin (P.O.P.) immediately to shrink the uterus and control bleeding.

Pack the uterus with antibiotics to control infection and give systemic antibiotics (IM or IV).

Try to control bleeding with coagulant compounds.

Surgical repair may be required if the laceration penetrates completely through the uterine or vaginal wall.

Cows with severe blood loss will require treatment to control shock; fluids, steroids, calcium gluconate or blood transfusions.

Uterine Prolapses

This is the expulsion of the uterus through the vulva to the outside of the body. This condition is seen more often in older animals and occurs very soon after calving.

Causes

Difficult birth with injury or irritation of the external birth canal and severe straining.

Retained placenta.

Loose uterine attachment in the abdominal cavity. There may be an increased prevalence in some families.

Poor uterine tone post-calving. This may be related to low blood Calcium levels.

Poor body condition with malnutrition.

Treatment

An **emergency** condition; rapid treatment is important.

Keep the prolapsed uterus clean and moist.

Apply material to pull fluid from the uterine wall: sulfa-urea powder, urea powder, sugar.

For replacement epidural anesthesia is often required.

Replace the uterus or obtain veterinary aid immediately.

When replacing the uterus all of the organ must be replaced into the abdominal cavity and both horns must be fully everted. Failure to completely evert the uterine horns will cause the animal to continue to strain and prolapse again.

Treat the uterus with antibiotics and give systemic antibiotics.

Most operators will suture the vulva closed for 3-4 days.

Some cows will rupture the uterine artery during the prolapse. If this occurs the cow will hemorrhage internally, go into shock and die.

After Effects

No permanent problem if the uterus is quickly replaced.

Don't need to automatically cull a cow because of a prolapsed uterus but a severe injury such as freezing, drying or severe laceration may cause infertility.

Milk Fever

Cows that are starting to produce milk are unable to remove Calcium from their bones quickly enough. If blood levels of Ca fall below minimal levels the muscles of the body are unable to function and the cow goes down, is unable to rise and will become comatose and die.

Causes

Incidence of milk fever increases with age and number of calves.

Cows of the dairy breeds or dairy cross have an increased incidence.

High blood levels of estrogen inhibit Ca mobilization; this may be a factor on pastures that are high in legumes.

Clinical Signs

Cow is down post-calving, and will become depressed with a slow heart rate, decreased rumen activity, low body temperature and head turned to the side.

Without treatment most animals will become more depressed, then become comatose and die.

Treatment

Slow administration of IV calcium, usually 300-500 mls. of a commercial type.

Calcium solution is given over 20-30 minutes. Also a second bottle may be given under the skin at the same time.

Decrease the rate of milk removal, i.e. give the calf supplemental feeding so it will not nurse as much from the cow.

Cows that are down more that 12 hours require slinging from a hip hoist, 15-20 minutes twice daily, to reduce nerve and muscle injury.

Animals that do not respond to treatment should be checked by a veterinarian.

Prevention

Decrease Calcium intake during the last two months before calving by reducing legume forages. Cattle that are allowed to graze on a pasture with a high legume content will be at greater risk.

IM injection of Vitamin A/D pre calving, it may help change legume roughage to grass hay, two to four weeks prior to calving.

Obturator Paralysis/Downer Cow

Cattle that have had a difficult delivery will have a variable amount of swelling and tissue trauma around the birth canal. This swelling and bruising may damage the nerves from the spinal cord or those in the hip that supply the legs, preventing normal leg function. In some cases excessive traction while pulling a calf will fracture the middle lower bones of the pelvis.

Causes

Excessive pulling to deliver a calf, pulling a calf straight out from the cow rather than down and backwards or having the calf in the birth canal too long (several hours). Some cows may deliver normally but because of poor footing slip and "split out". Damage to the pelvis, in this case produces a downer cow.

Treatment

Steroids must be used to reduce swelling and assist in nerve healing.

Cows that are unable to stand should be hoisted 15-20 minutes twice a day.

Cows that split out but can stand, should be in a clean dry pen with hobbles, that prevent the legs from splaying out to the sides.

IM Vitamin E/Se may help.

Retained Placenta

Usually the placenta is passed in 3-8 hours after calving. If it has not passed by 8-12 hours the placenta is retained and the animal should be treated.

Causes

Dystocia, C-sections, fetotomy, twining or abortion will all increase the chance of a retained placenta.

Some infectious diseases such as IBR, Brucellosis, listeriosis and leptospirosis will cause abortion and retained placentas.

Malnutrition and feed deficiencies, especially low carotene, Vitamin A, Iodine, Selenium and Vitamin E.

Treatment

Slight manual traction, gently pull on the placenta. If the placenta resists, stop and pack the uterus with boluses or use fluid douches to keep antibiotics in the uterus. Be very sure to use good hygiene when treating the uterus or the problem will become worse.

Systemic antibiotics are useful, particularly if the uterus develops an infection (metritis).

Prostaglandins may aid in getting the uterus to reduce in size and in releasing the placenta.

Make sure the calf is nursing and treat any other problems that may have caused the retained placenta.

Oxytocin is useful only in the first 48 hours and may be used to reduce the size of the uterus. If used later than 48 hours, the uterus must be sensitized with estrogen.

Grass tetany

Similar to milk fever in that cattle in heavy post calving lactation are loosing large amounts of Magnesium (Mg) in their milk. Most types of mixed pasture grasses are low in Mg. If cows are exposed to cold weather stress during early lactation their blood Mg levels may drop low enough to cause grass tetany.

Clinical Signs

Early most affected cattle will appear restless, stop grazing and have increased activity with an unusual high stepping gait.

As the condition progresses the animal falls down, the legs are stiff and convulsions occur.

The eyes move in an erratic manner and may roll in the head.

The heart rate and body temperature are elevated.

Some animals may become very aggressive and attempt to charge or butt using their heads.

Treatment

IV Mg usually given with Ca.

Treatment is not as effective as with milk fever and many affected animals do not respond.

Prevention

Supplemental feed (hay) to lactating cows that are grazing lush pasture particularly during cold, wet weather.

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DISEASES OF BEEF CATTLE ASSOCIATED WITH POST-CALVING AND BREEDING

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Once a cow has delivered her calf the groundwork for the next year's calf crop must be laid. This publication will examine some of the more common problems that occur during the post-calving interval and at the time of breeding. Often these problems are subtle and a producer may not realize there is a problem until the cows are examined for pregnancy or until the next calving season. Once a problem has progressed to this point the individual animal is often culled from the herd or an entire calf crop can be significantly reduced.

1. PROBLEMS POST-CALVING

Metritis (Uterine Infection)

Cows will normally have a discharge from their birth canal for 8-14 days post-calving. The discharge is often thick and reddish in color and has no odor. If the uterus becomes infected from calving the cow has developed metritis.

Causes

Infection of the uterus by bacteria following calving. Often cows that have a difficult birth, retained placenta or have calved in a dirty environment will become infected.

Clinical Signs

Discharge from the birth canal that is thin, watery, with a red to gray color and has a foul smell.

The cow may become sick, and have increased temperature, depression, off feed, diarrhea and stop milking.

Treatment

Administer drugs to evacuate the uterus of infected contents. Usually oxytocin will only work in the first 48 hours after calving. Prostaglandins may be more effective in increasing uterine tone and opening the cervix to drain the uterus.

Antibiotics should be infused into the uterus.

Systemic antibiotics are useful especially oxytetracycline.

If the cow is sick supportive treatment is necessary; fluids, steroids, glucose and antihistamines.

Cattle may develop tetanus or other clostridial infections from metritis so vaccination or use of tetanus anti-toxin may be indicated.

After Effects

Chronic uterine infection, problem breeder.

Endometritis

This is chronic low grade infection of the uterus. The cow very seldom shows any outward signs.

Causes

Often follows metritis or retained placenta.

Often follows difficult calving, twins, abortions or C-sections.

Physical damage to the birth canal during calving or during breeding can cause endometritis.

Clinical Signs

Often no signs other than some flecks of pus in the mucus discharged during the heat periods.

Affected cattle will cycle normally but will not conceive.

Uterus may feel abnormal during rectal palpation.

Treatment

Evacuate the uterus using prostaglandins.

Treat the uterus with antibiotic flushes, best to treat the uterus during a heat to improve drainage.

Often no treatment is done because the problem is not discovered until pregnancy examination and the cow is culled for being open.

Prevention

Identify all cows with calving problems and watch for abnormal discharges.

Consider having a pre-breeding examination done on cattle with potential problems so they can be treated before breeding starts or identified to be culled.

Delayed Uterine Involution

Often associated with difficult births, twins, abortions, C-sections or retained placentas.

Cattle that have had metritis or endometritis often have sub-involuted uterus.

Clinical Signs

None, only found by rectal palpation.

Treatment

Similar to endometritis.

Pneumovagina (Windsucker)

In older cows the cervix and uterus extend forward over the brim of the pelvis, this pulls the vulva forward into the pelvis and allows air to be trapped in the birth canal. Tears or laceration from calving can also allow air to be trapped.

Clinical Signs

Air in the vagina after urination, defecation or after the animal stands up.

Urine is retained in the floor of the vagina, fecal material may also be present.

Because of contamination the affected cow is often a problem breeder.

Treatment

Correct tears and lacerations with surgery and treat the uterus for infection.

Pyometra (Pus in the Uterus)

The cow with pyometra has developed a uterine infection and the cervix has closed to prevent the accumulated pus from draining out. The uterus becomes enlarged and the cow will not show heat cycles.

Causes

Pyometra can result from any contamination of the uterus; problem calving, retained placenta or contamination during breeding.

In some cases cows are pregnant and the fetus dies and becomes macerated.

Clinical Signs

Cow fails to show heat.

Fluid filled uterus found on rectal palpation.

Discharged pus may be seen around the tail and vulva.

Treatment

Prostaglandins to drain the uterus.

Antibiotic flushes and manual massage.

2. Problems At Breeding

No Heat

Beef cattle will respond to environmental and nutritional stress by stopping normal heat cycle activity. Before the breeding season begins, observe the cow herd for signs of estrus activity. You should expect about 5% of the herd to be in heat on any given day. By watching for signs of estrus and getting a rough estimate of the percentage of cows showing heat you have a fair idea of the level of estrus cycle activity in the herd. If you find that the level of activity is lower than expected consider having a number of animals examined to determine if they are cycling or not.

The lack of cycling by individual cows may be the result of uterine problems, pregnancy or stress. Rectal palpation can quickly determine the cause.

Treatment

In most cases prostaglandins will bring a cow into heat if she is cycling normally already. If normal cyclic activity has stopped because of stress the pre-existing condition must be resolved.

Weak/Silent Heats

Often occurs 30-60 days post partum. Cow is having difficulty in establishing normal cyclic activity after calving.

Animals that are stressed will have a more difficult time in starting normal cyclic activity. Cattle that are at greatest risk are first calf heifers that are being bred for the second calf and older cows with poor teeth or chronic health problems.

Marginal deficiencies in copper may cause weak heats.

If a high percentage of cows show decreased heat activity, have several cows examined and check for serum copper levels.

Short term (48 hours) removal of calves may help herds where the cows are showing weak or absent heats.

Persistent Heat

In a small percentage of cattle the follicle that brings the animal into heat does not rupture and release the egg. In these cases the animal will show heats constantly or every few days.

Treatment

Cattle with persistent heats should be examined rectally and if a cystic ovary is found treated to induce ovulation. Cystic ovaries can also cause a lack of heats.

Prolonged Time Between Heats

A prolonged period between heat cycles will occur in a small percentage of cattle. The primary cause is the early death of the fetus, rarely because of congenital problems. A beef producer must be alert to two common diseases that will cause early embryonic death and therefore prolonged intervals between heats. These diseases are trichomoniasis and vibriosis. Both are veneral diseases carried by the bull and infect the cow during breeding. The resulting infection kills the embryo after 4-6 weeks and the cow will then return to heat. These diseases are a particular problem in range operations because infected bulls may be introduced without the owners knowledge.

If you observe an unusual number of cows returning to heat after 45-60 days of breeding, have several cows examined immediately.

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BLACKLEG AND MALIGNANT EDEMA CONTROL

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Blackleg and malignant edema are caused by bacteria of the genus *Clostridium*. Blackleg is caused by *Clostridium chauvoei* and occurs in cattle, sheep, deer and infrequently in swine.

Malignant edema affects most species of warm-blooded animals and is caused by *C. septicum*, although *C. novyi* produces a similar syndrome.

The clostridia are comparatively large, rod-shaped organisms which will not grow in the presence of oxygen. These organisms form microscopic spores which contain all the essential ingredients of the bacterium and are extremely resistant to heat, drying and disinfectants. Clostridia live normally in soil and in the digestive tract of many animals; they also enter the soil from the carcasses of animals which die of clostridial infection, often surviving there indefinitely. Because of their prevalence and their ability to survive under environmental conditions, clostridia must be considered as an ever-present threat to livestock health.

SPREAD OF THE DISEASE

When animals are infected by clostridia, the organisms usually do not spread throughout the body of the animals, but multiply in a localized area. In blackleg and malignant edema, the bacteria produce potent toxins which cause tissue destruction in the area of the infection; spread of the toxin through the blood stream often lead to general sickness and death.

Clostridium chauvoei probably enters the animal's body from the digestive tract, passing into the blood stream and settling in various muscles. Under certain conditions such as bruising of muscle, these organisms begin to multiply, producing the disease.

Malignant edema occurs in horses, cattle sheep and swine, and is somewhat comparable to gas gangrene (*C. perfringens* infection) in man. The disease occurs when a wound becomes infected by *C. septicum*.

Malignant edema and blackleg occur most commonly in animals less than two years of age but are not limited to this age group. Both diseases have been observed in animals over five years of age. These infections are most prevalent in warm seasons but may occur at any time.

SYMPTOMS

The presence of blackleg or malignant edema in a herd is often first indicated by sudden death of one or more animals. If infected animals are observed before death, one may note marked lameness, local muscle swelling and servere depression. Affected animals are often unable to rise. A high fever may be present early in the disease, followed by subnormal temperatures in later stages. Death usually comes within 24 to 48 hours after first signs are observed.

In early stages of the disease, the muscle area in which the infection locates is frequently swollen and hot. Later, the area becomes cold, and fluid and gas may be felt beneath the skin.

Failure to detect such lesions in the live animal does not rule out the possibility that malignant edema or blackleg may be present. Lesions are often small and may be overlooked or they may occur in areas where they are difficult to detect.

DIAGNOSIS

A preliminary diagnosis of blackleg or malignant edema may be made in the living animal on the basis of clinical signs and the presence of typical muscle swellings. Post-mortem examination may reveal areas of dark, discolored muscle with accumulation of bloody fluid and gas bubbles, although these findings may be inconclusive since decomposition of clostridium-infected carcasses progresses rapidly and lesions may be masked by it.

Lesions of blackleg are most often found in the upper part of a leg; although the infection may localize in any muscle of the body including the tongue, jaw, neck, heart or diaphragm. Malignant edema lesions may occur in any muscle but are usually associated with a wound.

In cases where the diagnosis is in doubt, and in order to determine the type of infection present, the examining veterinarian may submit specimens to a diagnostic laboratory. Blackleg and malignant edema must be differentiated from lightning stroke, anthrax, bacillary hemoglobinuria (another clostridial disease also known as redwater), and various acute poisonings.

CONTROL

Control of these diseases is based upon a proper vaccination program. Vaccines are available for most clostridial organisms and are effective if properly applied. Where the disease is known to be common, calves may be vaccinated at an early age; however, if vaccinated before six months old, they should be revaccinated. Calves vaccinated after they are six months of age usually are protected for several years.

Most vaccines currently available provide protection against both blackleg and malignant edema. Some contain blackleg in addition to other products, such as infectious bovine rhinotracheitis (IBR) or Pasteurella.

The prevention program in sheep ordinarily consists of vaccinating ewes about three weeks before they have their first lamb. Animals so vaccinated are usually permanently protected. Lambs born to immune ewes are resistant to the infections until about three weeks of age. Castration and docking should be carried out within this time in order to take advantage of this period of natural protection. Sheep vaccinated before one year of age should be revaccinated as yearlings.

TREATMENT

Treatment of animals affected by blackleg or malignant edema is seldom effective. Occasionally, massive doses of antibiotics given early in the course of the disease may save an animal, but clinical signs are seldom detected early enough to allow effective treatment. The key to preventing losses due to these infections is a good immunization program.

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NEONATAL CALF DIARRHEA

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Neonatal calf diarrhea (NCD), also known as calf scours, is a common disease affecting the newborn calf. The most critical period is in the first few days following birth of the calf. Greatest losses occur when calves are kept in close confinement, where the opportunity for transmission of the causative agents of NCD is enhanced by their build-up in the environment.

The diarrhea and other clinical signs seen with the disease are caused by the interaction of any of several possible infectious causes and predisposing factors such as lack of colostrum, failure to absorb colostral antibody, poor nutrition and environmental affects. NCD is a costly disease, with losses estimated to be over $250 million annually and death loss of up to 25% of the U.S. calf crop.

SIGNS AND EFFECTS OF NCD

Neonatal calf diarrhea is characterized by diarrhea (scouring), progressive dehydration and death. The neonatal or newborn calf with scours will have a watery yellow, gray or greenish diarrhea containing varying amounts of mucus which may be tinged with blood. Soiling of the hindquarters and tail with the diarrheic feces is common. Checking the litter in the calf pen may reveal the diarrhea. At first, the animal may appear alert and otherwise normal, but soon refuse's feed and becomes depressed, weak, and unable to stand. Dehydration occurs as a result of fluid loss resulting from the severe diarrhea and is characterized in the calf by sunken eyes, dry skin and weakness. If the disease is allowed to progress untreated, dehydration and electrolyte (ions of body salts such as sodium, potassium, chloride, and bicarbonate) loss will kill the calf. Body temperature readings will vary, depending to some extent on the disease agents involved. One consistent fact, however, is a subnormal body temperature in the terminal stages of the disease. Regular observation of calves several times a day will permit early detection of the disease.

The normally solid fecal mass is formed by absorption of water from the liquid intestinal content by the cells lining the large intestine. Diarrhea or scouring occurs when the capability of the intestine to absorb fluid is impaired. Interference with this absorptive function of the intestine may occur in two ways. Damage to the cells lining the intestine may result from cell destruction by certain infectious agents, resulting in loss of the digestive and absorptive capability of the intestine as well as inflammation. Other infectious agents produce toxins that cause the cell lining of the intestine to produce fluid rather than absorb it. Diarrhea, dehydration and electrolyte loss occur in both instances and have especially severe effects in the newborn animal.

CAUSES OF NCD

There are numerous infectious causes of NCD, which may be present either singly or in combination. The more common ones are described below:

A) Bacteria

Escherichia coli: *E. coli* is a very common and serious bacterial cause of NCD. NCD caused by *E. coli* is called colibacillosis. Several forms of colibacillosis occur with some variation in the symptoms produced. There are many strains of disease-causing (enteropathogenic) and non-disease-causing (non-pathogenic) *E. coli*, so it is essential that the disease-producing types be recovered from the diarrheic animal and properly identified in order for a valid diagnosis to be established. There are no distinctive clinical signs that differentiate scours due to *E. coli* infection from those caused by other infectious agents. Some types of *E. coli* produce toxins that cause the intestine to produce fluid rather than absorb it. Death loss from *E. coli* infection may be high, especially in calves under a week of age. Resistance to *E. coli* infection is acquired by the calf from the colostrum or first milk of the cow. Colostrum administration is very important in the prevention of this infection.

Salmonella: Disease in calves due to Salmonella infection is a common problem in Arizona, particularly in confined animals such as dairy calves. Signs of salmonellosis include fever, loss of appetite, depression, diarrhea, dehydration and often swelling of the leg joints. Salmonellosis is most severe in calves under a month of age. These organisms are the cause of paratyphoid infection in man and constitute a potential health hazard for people associated with calves affected with salmonellosis. Diagnosis of this problem requires isolation of the salmonella organisms from the feces or tissues of the affected calf.

B) Viruses

Rotavirus: Calves 1-7 days of age seem to be most often affected with this disease agent. The disease will appear suddenly and spread rapidly through a calf herd. The virus causes extensive damage to the intestinal lining, resulting in rapid fluid loss and dehydration in calves. Other organisms such as *E. coli* may infect the calf at the same time.

Coronavirus: This virus usually affects calves over one week of age. It is not possible to differentiate this virus infection from other virus infections producing the same signs. Feces and tissues from affected calves may be submitted to a veterinary diagnostic laboratory where the virus can be identified.

C) Other Causes

While usually less common, numerous other infectious causes of NCD exist, including protozoa such as *Cryptosporidia* and coccidia, and additional types of bacteria, viruses and virus-like agents.

Non-infectious causes, while not discussed in detail here, may also be important; these include improper diet or feeding practices, or poor quality milk replacer.

PREVENTION

In general the occurrence of NCD will depend on the level of contamination of

the environment by causative organisms and the level of resistance in the calf. Best results in preventing diarrheal disease will be achieved by reducing exposure of the calf to a contaminated environment and insuring adequate resistance by colostrum feeding soon after birth.

A) Reduce Exposure to Infectious Agents

1. Calves kept in confinement should be housed in individual calf pens for at least the first month of life. Portable calf hutches have proven to be very successful, as they afford isolation and can be moved to clean ground when necessary.

2. Clean pens thoroughly between calves.

3. Keep the calf pens clean and dry.

4. Provide overhead shelter for the calf pens.

5. Calves with diarrheal disease should be isolated from healthy calves and fed last.

6. Thoroughly scrub and sanitize feeding equipment after each use.

7. Do not overfeed. Milk intake should be restricted to 10% of the body weight daily for the first 7-10 days. Calves should be fed on a regular schedule with fresh whole milk or **good quality** milk replacer. Inferior quality milk replacer can cause or contribute to diarrhea, as can overfeeding.

B) Providing Resistance for the Calf

The resistance of the calf to disease depends predominately on the quality and amount of colostrum it receives from the cow during the first hours of life after birth, as there is no transfer of resistance from cow to calf before birth. Ideally it should receive colostrum within the first 6-8 hours after birth. Antibodies, which are substances which provide this resistance, are manufactured by the cow's immune system and are concentrated in the first milk, which is called colostrum. The calf's digestive system will absorb these antibodies in progressively decreasing amounts for only the first 24 hours or so after birth. It is absolutely necessary that the calf receive colostrum as soon after birth as possible for maximum absorption. Milking the cow and hand-feeding the calf is the best way to ensure that the calf receives colostrum. Two liters of colostrum fed soon after birth is recommended for dairy calves.

The types of antibodies present in the colostrum will depend on the previous exposure of the cow to disease agents. In order to provide maximum resistance to disease for the calf, a vaccination program must be developed for the cow herd in order to ensure that antibody specific to the disease problem is present in the colostrum of calving cows. A vaccination program should be based on a good diagnostic knowledge of diseases present in the herd. Qualified professional veterinary assistance should be sought in this regard.

TREATMENT

The most important consideration in NCD, regardless of cause, is prompt replacement of fluid and electrolyte (sodium, potassium, chloride and bicarbonate) losses. The calf with severe NCD suffers from dehydration

and shock, which progressively worsen and are ultimately responsible for the death of the animal.

The dehydration and electrolyte losses may be corrected by oral administration of formulas containing water, glucose and a mixture of electrolytes. The oral route is the safest and easiest way to administer the formula to the scouring calf.

An easy-to-prepare oral formula, recommended by veterinarians at Colorado State University, has proven to be effective in treating the scouring calf. It is prepared as follows:

1	*2-oz. package jam and jelly pectin*
2	*level teaspoons low sodium table salt*
2	*level teaspoons baking soda*
1	*10 1/2 oz. can beef consommé*
	water to make 2 quarts

Diarrheic calves should be taken off milk or milk replacer and bottle fed two quarts of the oral formula three times a day. After two days, mix half formula and half milk and feed for one day, then resume milk feeding. Mix formula only as needed, as spoilage will occur readily. Commercially prepared formulas are also available from veterinarians or animal health suppliers.

Diarrheic calves that will not nurse a bottle but are strong enough to lie in an upright position may be given formula by stomach tube or esophageal feeder. Esophageal feeders consist of a plastic fluid container and a stainless steel probe, which is passed into the esophagus, and formula is given by gravity flow. The manufacturers of these items usually supply directions for their use or instruction may be obtained from a veterinarian or other individual trained in their use. In general, esophageal feeders should be lubricated and inserted gently, as rupture of the esophagus can occur easily and will be fatal to the calf.

Calves severely dehydrated, down, and with subnormal (less than 100.5^{o}F) body temperature will usually require skilled intravenous therapy and often the results of treatment are poor.

The routine use of oral and injectable antibiotics cannot be recommended, although occasionally they are of benefit. Antibiotic therapy may be of benefit for some bacterial organisms such as salmonella, but antibiotic-resistant strains of bacteria are very common or may develop quickly and these drugs may soon have little or no effect. Indiscriminate or improper use of antibiotics promotes the development of antibiotic-resistant strains of bacteria as does continuous low-level feeding of these drugs. Antibiotics have no effect against viruses and will not compensate for a lack of colostrum. Inappropriate use of antibiotics, particularly nonapproved ones, may lead to the development of illegal residues in the tissues of treated calves. Prolonged treatment or overdosage of calves with antibiotics may lead to fungal overgrowth in the gut resulting in chronic, non-responsive diarrhea and death in calves so treated. In herd outbreaks of NCD, and accurate diagnosis of the cause is essential for optimal treatment. Qualified professional veterinary assistance should be sought in the diagnosis and treatment of herd outbreaks of NCD.

When NCD occurs in a group of calves, every effort should be made to isolate the affected animals from normal ones. All new cases should be treated as soon as they are detected. Underlying any treatment program is the effective nursing care a calf must receive in addition to replacement of fluid losses and, if indicated, antibiotics. The sick calf should be kept in well ventilated,

clean and dry quarters, handled gently, and protected from temperature extremes.

SUMMARY

Reduction of the incidence of NCD by using a preventive approach should be the primary objective and is practical in progressive dairy or cow-calf confinement operations, especially if qualified veterinary assistance is utilized. On the other hand, operators buying calves from auctions and a variety of sources and mixing them together will have variable success in reducing the incidence of NCD. Results may range from good to poor when new calves that are susceptible or are carrying infections are continually introduced. These operators usually have no control over whether a calf receives colostrum. Routine diagnostic workups are necessary to establish the cause(s) of NCD. This may provide information leading to more specific preventive measures.

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Arizona Ranchers' Management Guide
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CASTRATING CALVES AND LAMBS

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Castration, stated simply, is the unsexing of a male animal. The practice of castrating males, in animal species used for food production purposes, is universally practiced and is probably one of the oldest surgical operations known to man.

The purpose of castration is not only to prevent reproduction, but to improve the fattening and meat production capability and to make the animal more docile and easy to handle.

In farm animals, other than horses, the job of castration usually involves simple surgery wherein the testicles (male reproductive glands that produce male reproductive cells and a hormone) are removed. Horse castration will not be discussed here, except to mention that with the horse, in addition to the testicles, special attention must be given to the removal of certain tissues adjacent to the testicles, to prevent the animal from exhibiting a level of false sexual activity sometimes referred to as being **proud cut.**

CALF CASTRATION

Equipment That May Be Used:

Jackknife — a cutting device with one or more cutting blades.

Emasculator — instrument designed to crush the tissue before it cuts them, and thus prevents serious hemorrhage.

Elastrator — instrument designed to spread and secure a small rubber ring around the spermatic cords, thus stopping blood supply.

Burdizzo — instrument that crushes the spermatic cords inside the scrotum, thus stopping the blood supply, causing eventual atrophy of testicles.

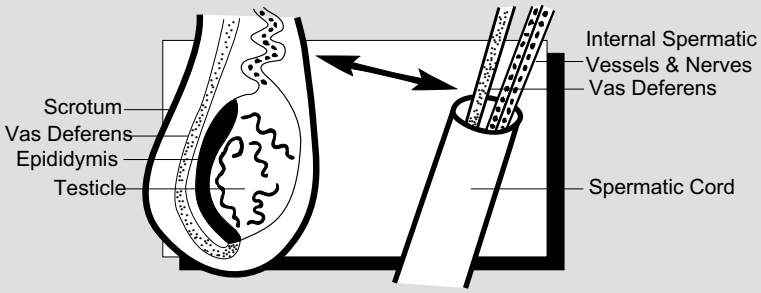
Wound Dressing — medicinal preparation used to prevent infection of wounds and cuts.

Age: It is recommended that bull calves not needed for breeding be castrated sometime between 4-10 weeks of age.

Season of Year: Spring and late fall are the best times of year to castrate calves. This time not only coincides with customary ranch herd roundups, but also is a time when the chance of wound infestation from flies is reduced.

Position of Animal: Young calves, 4-10 weeks old, should be thrown to the ground and held in a recumbent position. If it is necessary to castrate calves 8-9 months of age or older, these animals, when properly restrained, can be castrated in a standing position.

Figure A. Superficial Anatomy of Scrotum and Testicle



Methods of Castration:

1. Surgical — involves cutting into the scrotum, removing the testicles and severing the spermatic cords. This is commonly referred to as "cutting the calf."

2. Burdizzo (bloodless castration) — in this method, the scrotum is not cut, but by the use of a special pressure-leverage instrument, termed a burdizzo, the spermatic cords are crushed and severed inside the scrotum. In using this method, it is necessary to "work" a cord to the side of the scrotum and then clamp the instrument about 1-3/4 inches above the testicle. The instrument should be held in this position for 3-5 seconds. Repeat the same procedure with the other cord, making sure the instrument is clamped about one inch below the point where the first cord was clamped.

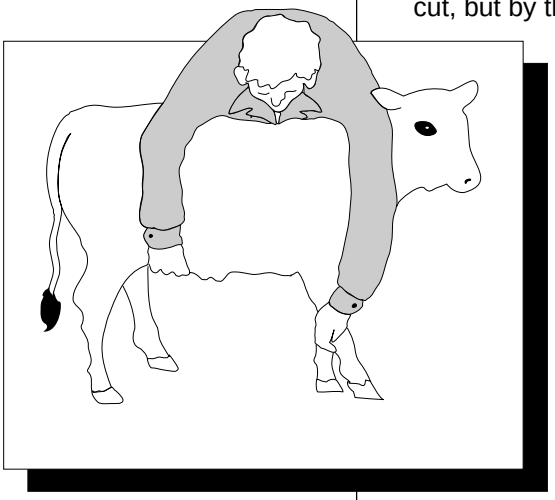


Figure B

3. Elastrator — by the use of a special hand leverage device, called an elastrator, a strong rubber ring, about 3/4-inch in diameter, is stretched open and slid over the scrotum and testicles and around the spermatic cords. When the device is removed, the contracted rubber ring remains and squeezes the spermatic cords to the point that no nutrients can again reach the testicles. This results in an atrophy, or wasting away, of the testicles.

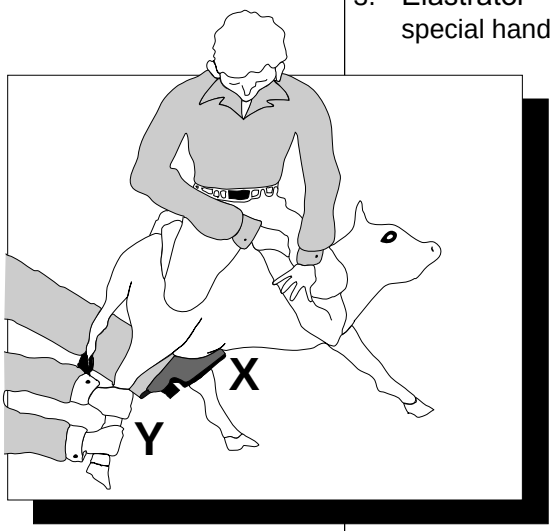


Figure C

Of the three methods of castration mentioned here, surgical castration is the one by far the most commonly used. A description of how surgical castration is used on calves is given in the following.

Procedures:

Step No. 1 — The bull calf is thrown to the ground and securely held in a recumbent position with the hind legs spread apart to permit access to the scrotal area.

To "throw" a calf, a team of "flankers" is used **(Figure B)**. In practice, one member of the team reaches across the animal's back and simultaneously grasps the calf's right leg below the knee with his left hand and the rear flank with his right hand. He then quickly "lifts" the animal with his hands and exerts force under the animal's abdomen with his right knee. This action will throw the calf off-balance and cause it to fall to the ground, resting on its left side **(Figure C)**. The team member now grasps the right (top) leg near the ankle with both hands and flexes it backward and, at the same time, exerts force into the calf's shoulder with his knee(s). As the animal is being tentatively secured in this manner, a second team member quickly grasps the calf's right (top) hind leg with both hands from the rear (Y) and, in a single motion, places his foot above the hock of the calf's lower hind leg (X) and assumes a sitting position behind the animal. By exerting forward leverage with his foot and rearward leverage with his hands, this team member is able to spread the calf's legs longitudinally, allowing access to the scrotal area.

Step No. 2 — Sanitation is important, so dirt or manure in the area of the scrotum should be removed.

Although in regular ranch operations the scrotum is not washed or cleansed, care should nevertheless be taken to keep the area as clean as possible.

Step No. 3 — Force the testicle upward in the scrotum and cut off the lower one-third length of the scrotum with a jackknife. This will expose the testicles from below. Grasp both testicles and pull them out clear of the scrotum. Next, open the jaws of the emasculator, place them around the spermatic cords and slide the instrument up the cords toward the scrotum. When approximately two inches of the cords are visible, close the jaws of the emasculator firmly, and hold the instrument in this position for 3-5 seconds. By the function of the emasculator, the spermatic cords

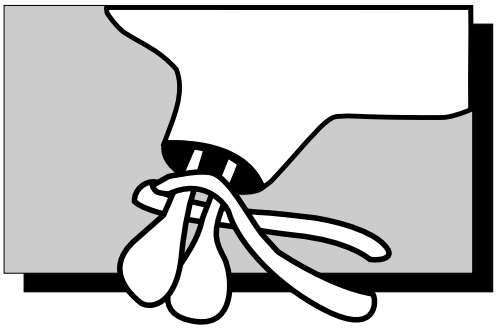


Figure D

will be severed by a crimping and cutting action. This crimping of the cords tends to reduce bleeding and enhances the healing process **(Figure D)**.

Step No. 4 — Apply a wound dressing and fly repellent to the scrotal area.

Customarily, several other management practices such as dehorning, branding, ear marking or vaccinations are carried out while the animal is in this recumbent position. If and when these practices are completed, the animal can be released.

Note: Though the surgical method described in the foregoing is the one most commonly used, some stockmen choose to use a slightly different surgical technique. This technique consists of squeezing the testicle tight against the scrotum and then cutting through the scrotum to expose the testicle. Next, a small slit is cut in the membrane (tunic) covering the body of the testicle; when this is done, the exposed testicle emerges instantly. The testicle is then pulled out and the spermatic cord is severed by the emasculator. The same procedure is followed to remove the second testicle.

LAMB CASTRATION

Equipment That May Be Used: Same with cattle.

Age: Male lambs not to be used for breeding should be castrated anywhere from one to two weeks of age.

Season of Year: Same as for calf.

Position of Animal: The animal is held in sitting position with the hind legs extended upward.

Methods of Castration: Same as with calf.

Procedures:

Surgical Castration Method — The steps in surgically castrating a lamb are the same as those followed in castrating a calf.

Elastrator Method — The elastrator castration method is probably used more with lambs than with any other farm animal. The method is quick, bloodless and very effective, if used properly. A review of the procedure follows:

Step No. 1 — Hold the lamb in a sitting position on a table, with animal's hind legs spread apart and pointing upward.

Step No. 2 — Place the specially designed rubber ring in the elastrator. Stretch the ring open and place it over the scrotum and testicles and around the spermatic cords. Care should be taken to insure that the ring is released well above the testicles and approximately one inch from the abdominal floor **(Figure E)**.

Step No. 3 — If other management practices are to be done at this time, such as vaccination and docking, these can be done and the animal then released.

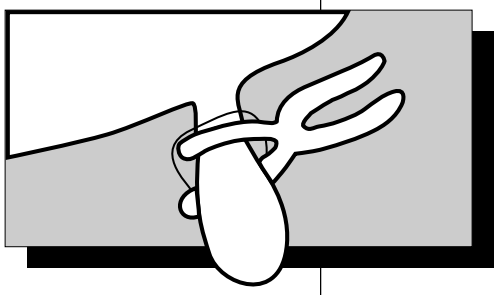


Figure E

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ABORTION DISEASES OF RANGE CATTLE

E. J. Bicknell,[1,2] C. Reggiardo,[2] T. H. Noon,[2] G. A. Bradley,[2] F. Lozano– Alarcon,[2]

Diagnostic success rates of only 25–30% attained by diagnostic laboratories around the world verifies the fact that determining the cause of abortion in cattle can be difficult. Abortion frequently results from an event that occurred weeks or even months earlier and the cause, if it ever was in the fetus, is probably undetectable at the time of abortion. Further, if the fetus remains in the uterus for any length of time after death, postmortem degeneration will hide lesions. Fetal membranes, which are most often first and most consistently affected are frequently unavailable for examination. Toxic and genetic factors causing fetal death and/or abortion are not discernible in the specimens available for examination and finally, many causes of bovine abortion are unknown or there are no useful diagnostic procedures for their identification.

Some of the disease entities causing bovine abortion will be briefly discussed with the idea of giving the reader an overview of abortion disease; what the veterinary practitioner would call a "differential diagnosis".

BACTERIAL DISEASES

Brucellosis

Abortions occur after the 5th month of pregnancy. Retained placenta and residual infection of the uterus are often indicators of the disease. The fetus has undergone a good deal of decomposition because it is usually retained in–utero for 1–3 days after death.

The diagnosis depends on the isolation of the Brucella bacterium from the fetal tissues and membranes, uterine exudate and blood testing of the dam.

Campylobacteriosis

Herds infected with Campylobacter fetus spp. veneralis, in which abortions occur, will have a history of infertility and repeat–breeding. If the infection has been present for several years, infertility will be more common in heifers, because many of the mature cows will have developed immunity. Abortions commonly occur between the 4th and 8th month of gestation, and expelled fetuses are usually fresh. Vaccines are available and their use has reduced the prevalence of this disease in cattle.

Corynebacterium Pyogenes

This bacterium is most frequently recovered from ruminants and is often involved in sporadic infections of the reproductive system of both sexes. It is one of the most common causes of sporadic abortion in cattle and causes abortion less commonly in sheep and swine. Abortions can occur at most any stage of gestation. Infection of the placenta is a consistent finding and is thought to result from spread of the organism by hematogenous (blood) route to the uterus. The organism can infect the fetus transplacentally and cause a septicemia.

Isolation of the organism from placental and fetal tissues as well as observing microscopic tissue lesions will provide a diagnosis.

Leptospirosis

In cattle, leptospirosis may cause fever, anemia, icterus and wine– colored urine.

However, in most cases, abortion occurs most commonly during the last trimester without any obvious symptoms in the cow. The fetus may be retained up to 3 days after death, however calves have been born alive, weak and die soon after. This is another disease where vaccination is routinely practiced and is effective.

Chlamydiosis

Chlamydial infections can produce abortion, stillbirths, or the birth of weak calves. For the most part, abortions occur very sporadically in cattle; this disease is more important as a cause of abortion in sheep. These infections can occasionally produce significant numbers of abortions in late pregnancy, particularly following inclement weather or other patterns of stress.

FUNGAL DISEASE

Mycotic Abortion

Abortions are typically sporadic, and occur from 4 months to term. The incidence, in cold climates, is highest in the winter months. Severe infection of the placenta, characterized by a leathery thickening of the areas in between the cotyledons, is a common finding. In about 25% of the cases the fungus invades the fetus and red or white ringworm–like lesions can be seen in the fetal skin.

Leathery, thickened placental tissue is observed in both Brucella and Campylobacter abortion, but in neither case is the thickening as severe as with mycotic infection.

VIRUS DISEASES

Infectious Bovine Rhinotracheitis

IBR virus can cause a number of disease manifestations in cattle including "Red Nose", Infectious Pustulo–vulvovaginitis, Conjunctivitis, Septicemia in Calves, and Abortion. Symptoms of any of these conditions may or may not be present in the herd when abortions due to the virus infection result. Abortions occur from 4 months gestation to term, and the fetuses have been dead 2 or more days prior to expulsion and can be even partially or completely mummified.

Bovine Virus Diarrhea

BVD virus infection usually results in a subclinical to mild disease, undetected in most affected herds. The mild disease is characterized by anorexia, respiratory distress, and diarrhea. The pregnant cow is seldom clinically ill with acute BVD infection but the embryo or fetus can be severely affected. In the first month of gestation, infection can result in death and resorption of the embryo. From the 2nd to 4th month, growth retardation, central nervous system malformations, alopecia, mummification and/or abortion can occur. Infections after the 6th month can result in abortion. In addition, 2–3 week premature calving, stillborn and weak calves can be a consequence of fetal BVD virus infection.

Epizootic Bovine Abortion

EBA, also called "Foothills Abortion" is a tick–borne infection of cattle that produces chronic fetal disease and abortion. The vector of this disease is the argasid tick Ornithodoros coriaceous which is known to inhabit the foothill chaparral, scrub oak, and manzanita brush areas of California, adjacent areas of Nevada, Oregon and Northern Mexico. Cattle exposed to the vector for the first time are primarily at risk. The infected cow presents no symptoms and if pregnant, passes the organism to the fetus who then becomes chronically infected; there is a 3–month or longer period between exposure of the cow to the tick and abortion of the fetus. Birth of weak calves as well as abortions happen during outbreaks of EBA. The causative agent is, at present, unknown.

PARASITIC INFECTIONS

Trichomoniasis

Trichomoniasis is a venereal disease of cattle characterized by infertility, pyometra and occasional abortion caused by a protozoan parasite, Tritrichomonas fetus. The parasite is carried asymptomatically on the epithelium of the penis and prepuce of the bull and transmitted to the cow at the time of breeding. Although abortions do occur most infected animals become, at least temporarily, infertile. The conceptus dies between 18 and 60 days of gestation. The affected cows' return to estrus is necessarily at irregular, delayed intervals greatly extending the breeding season. Thus, repeat breeding becomes an important clinical observation for Trichomoniasis as well as Campylobacteriosis.

Most infected cows are able to eliminate the infection, conceive and carry a calf to term. A small percentage of cows maintain the infection, and carry the calf to term, yet, a very small number will remain infected into the next breeding season.

Neospora-Like Abortion in Cattle

This relatively new abortion disease is caused by a coccidial parasite called Neospora caninum–like. It was named so because of its morphologic similarity to Neosporum caninum, a parasite causing disease in dogs. Sporadic abortions were described in the early reports, however more recently, papers from California and New Mexico describe abortion storms up to 10% of the herd occurring in 1–5 month periods. Abortions, as described in these reports, occurred between 5–7 and 5–6 months of gestation respectively. Affected cows show no signs of illness other than retained placentas for several days after the abortion.

A distinct pattern of lesions occurs in aborted bovine fetuses, which includes infection of the brain, heart, skeletal muscle, and evidence of inflammatory changes in other organs; a specific laboratory test has been developed for the detection of the parasite in animal tissues.

The organism has not been isolated from naturally infected cattle therefore the work necessary to fully characterize it cannot be done. The question remains as to whether the parasite demonstrated in the tissues of the aborted fetuses is Neosporum caninum or an antigenically similar protozoal parasite.

While there is no concrete information as to the source or method of transmission, the California group suspected a carnivore host, and the transmission of the parasite by fecal contamination of the feed.

ABORTION CAUSED BY PLANTS

Pine Needle Abortion

Abortions occur most often in the late fall, winter and early spring in the last trimester of pregnancy in cattle having access to pine needles (Pinus ponderosa). Predisposing factors include: sudden weather changes, starvation, changes in feed or sudden access of cows to pine needles. The abortion can begin as early as 48 hours and continue as long as 2 weeks after ingestion of the needles. The affected cow has weak uterine contractions, excessive uterine hemorrhages with incomplete dilation of the cervix. Retained placenta is a constant occurrence often followed by severe uterine infection and peritonitis.

Locoweed Abortion

Locoweeds are several species of plants of the genus Astragalus and Oxytropis. The active principle of these plants is an alkaloid called Swainsonine. This toxic substance induces a form of storage disease and continued ingestion of the

plant over a period of 4–6 weeks or more results in failure to thrive, ataxia, behavioral abnormalities (locoism) and abortion. We have also seen in Arizona, Hydrops amnii, a condition in pregnant cows who have ingested locoweed and develop a large accumulation of fluid in the amnion resulting in tremendous distension of the abdomen. In the pregnant ewe both abortion and birth defects can result from ingestion of locoweed. The birth anomalies include: brachygnathia (bulldog jaw), contractures or overextensions of joints, limb rotations, osteoporosis and bone fragility.

PLANTS THAT CAUSE ABORTION IN CATTLE

Gutierrezia microcephala (Broomweed)
Gutierrezia sarothrae (Broomweed)
Conium maculatum (Poison Hemlock)
Solidago ciliosa (Golden Rod)
Sorghum almum (Johnson Grass)
Trifolium subterraneum (Cocklebur)
Claviceps sp. (Ergot)

BOVINE ABORTION DIAGNOSIS

Submission of abortion specimens to most veterinary diagnostic laboratories may be done directly or through a veterinarian. In either case, a fee is usually charged for the service.

The following procedures are preferred by the laboratory:

1. Call ahead and notify the laboratory if at all possible.

2. The preferred specimens are: the fetus; placenta, if available; blood samples from the cow or cows that aborted.

3. The fetus and placenta should be placed in a double set of heavy duty plastic bags to prevent leakage, then packed in ice (but not frozen) along with any blood samples in a good quality, leakproof picnic cooler. Most laboratories will clean and return the cooler if requested.

4. Persons handling aborted fetal and placental material for shipment should always wear disposable gloves and wash thoroughly afterwards, as some infectious causes of bovine abortion can cause serious disease in man. Pregnant women should not handle aborted fetal tissues.

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FOOTHILL ABORTION: A WESTERN STATES PROBLEM?

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Epizootic bovine abortion (EBA) is commonly referred to as "foothill abortion" because it was originally recognized as an abortion disease of cattle that occurred after summer grazing in the foothill regions of coastal and central California. In the early 1950s, with the advent of calving two year old heifers, it became a recognizable disease with abortion rates up 50%. EBA is also is a phenomenon of summer grazing in the Sierra Nevada Mountains and the Great Basin regions of California, and has been diagnosed in southern Oregon and western Nevada.

IT IS A TICK TRANSMITTED ABORTION DISEASE

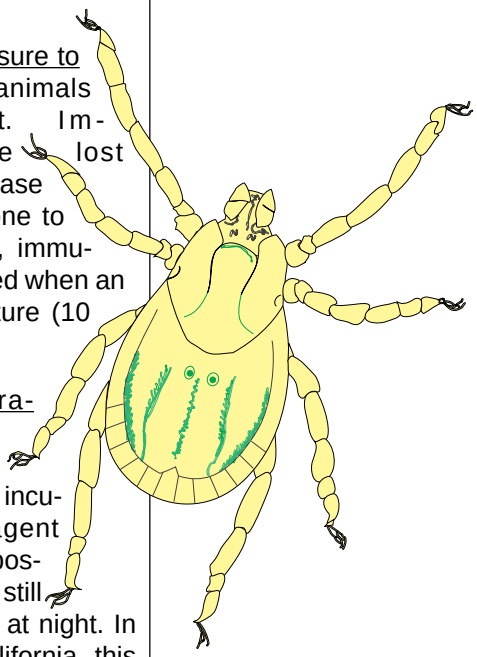
EBA is a disease that is apparently only transmitted by the bite of a particular soft-bodied tick commonly known as the pajahuello (or pajaroello) (pronounced pa-ha-way'-lo). The scientific name of the tick is *Ornithodoros coriaceus.* Despite several decades of study, the disease agent the tick is transmitting has eluded researchers. Suspected agents have been isolated from aborted fetuses and from the tick, but none has proved to fulfill Koch's postulates for recreating the disease when put back into pregnant cows. Recently, thymus from an aborted fetus has apparently transmitted EBA to a pregnant cow under experimental conditions.

FOUR THINGS ARE NEEDED FOR EBA TO OCCUR

First: Cattle must be six months or less in pregnancy. Experimentally, cattle that were as early as 35 days pregnant when exposed have aborted.

Second: Pajahuello ticks must be present and hungry in the range the cattle are utilizing. Ticks don't refeed for about two months after exposure to cattle.

Third: No previous exposure to the disease means animals have no immunity to it. Immunity can apparently be lost if exposure to the disease has not occurred for one to two years. Apparently, immunity can only be obtained when an animal is sexually mature (10 months or older).



Fourth: Ambient temperatures must be warm and dry enough to activate the tick's metabolism or incubate the unknown agent within the tick's body (possibly in the 70s F.), while still staying above freezing at night. In coastal and central California, this weather pattern usually occurs from May through October. In the mountains and high desert regions, the warm months typically are June through October. Unusually warm, dry winters can cause EBA to occur in normally "safe" periods.

ABORTION OCCURS 3-4 MONTHS AFTER EXPOSURE TO TICK

If all of the above four factors exist at the same time, EBA abortions can be ex-

pected to occur 3 to 4 months later. To determine where disease exposure (tick exposure) happened, the producer must be able to identify where his cattle were grazing 3 to 4 months prior to the onset of abortions.

THE TICK "LIVES" IN COW AND DEER BED GROUNDS

The existence of pajahuello ticks in a pasture can be verified by collecting them. The tick resides in the soil and organic matter found in deer and cattle bedding areas; this tick does not "quest" nor climb up on brush like most of its hard-bodied cousins. Few people have seen this tick in the field. Its bite on the human is very painful and subsequent bites cause skin necrosis and very swollen areas.

TICKS DON'T LIVE IN WET AREAS OR PLACES THAT FLOOD

Don't bother looking in irrigated pastures or areas that are subject to flooding. The pajahuello doesn't survive well when submerged or damp. Look above the high water mark when in gulches and arroyos. They have been found in desert dry wash creek beds.

TRAP THESE TICKS WITH DRY ICE (FROZEN CO_2)

The pajahuello tick detects and locates its host by being extremely sensitive to increased concentrations of gaseous CO_2 in its environment; CO_2 is exhaled in animals' breath. Tick collection is accomplished by placing pieces of dry ice (frozen CO_2) on the ground or in buried pans (traps) underneath trees or brush where there is evidence of deer or cattle bedding. If ticks are present and if they haven't taken a blood meal in the last month or two, they will crawl out of the ground, locate the source of CO_2, and be picked up as they are seen moving toward the dry ice, or fall in the trap on their way to the bait. If a pasture does not yield ticks to CO_2/dry ice trapping, then you may need to repeat it several times. A pasture with any number of ticks is positive, but a pasture without ticks being trapped needs several different trapping attempts before considering it negative.

THE TICKS ONLY STAY ON THE COW ABOUT 20 MINUTES AT A TIME

Unlike hard-bodied ticks that attach to their host for 7 to 10 days, the pajahuello only requires about 20 minutes of attachment in order to completely engorge itself with blood. Once full, the tick drops off the animal and quickly buries itself back in the soil. The exception to this behavior is the larval stage tick that hatches from the egg. These very tiny creatures stay attached for a week or more while they slowly engorge and grow to several times their original size. After the larva leaves the animal, it molts and becomes a nymph. Thereafter, each time a nymph feeds, it molts and becomes a larger nymph. This process continues through 5 to 7 nymph stages (instars) before the tick becomes an adult. Adult females are unmistakably larger than adult males. Females will lay about 300 eggs following each blood meal. The life span of the pajahuello is unknown, but experimentally, large females have lived in plastic dishes for four years without having a blood meal.

NO VACCINE AVAILABLE

Until the causative agent is identified, it will be difficult to develop a vaccine to protect animals from EBA abortion. A number of research projects are underway both at UCD and in collaboration with University of Nevada/Reno. Newer mo-

lecular biology and biotechnology tools are being applied to this problem.

YOU CAN LEARN TO MANAGE AROUND THE DISEASE

Many producers have been able to avoid the disease simply by incorporating knowledge of the previously listed four EBA prerequisites into their breeding and range management programs.

CRITICAL POINTS TO REMEMBER

Exposing sexually mature heifers to known pajahuello pastures during warm weather has often established immunity in many of these animals. Females may lose their protection if removed from tick exposure areas.

Shifting breeding seasons has avoided the overlapping of susceptible gestation period with warm weather tick exposure.

Changing pasture rotation schedules has utilized tick pastures before breeding or after cattle are six months pregnant.

Don't bring pregnant cattle into a known tick area without taking into account the EBA risk and how to avoid.

HAVE YOUR VETERINARIAN LOOK AT ABORTED FETUSES

If EBA is suspected of being the cause of abortion in a herd, a veterinarian should be consulted quickly. He will establish a herd history and ask that any fetuses that are found be brought to him refrigerated (not frozen) as soon as possible. Small pieces of fresh fetal tissues placed in formalin can be used by a veterinary pathology lab to look for microscopic lesions that are particular to this disease.

DIAGNOSIS OF EBA/FOOTHILL ABORTION

With a suspicious history, EBA can be grossly diagnosed in about 1/3 of the fetuses.

The fetus will usually be at least six months old (small cat sized), and may have any combination of the following external and including:

- enlarged lymph nodes, especially the prescapular nodes which are in front of the shoulder blade at the base of neck on the side,
- a fluid-filled abdomen,
- pinpoint hemorrhages around the eyes or under the tongue,
- enlarged liver with a rough discolored surface,
- and/or pinpoint hemorrhages on the thymus.

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University of California and the United States Department of Agriculture cooperating.

HAND FEEDING YOUNG CALVES

Stephen J. Campbell [1]

Many individuals purchase dairy calves during the year and raise them for sale or meat. Other calves may be orphaned due to the death of the mother. In many cases, these calve do not survive the first week or two of their new environment.

Anytime a newborn calf is taken from the mother and raised separately several problems may arise. It is critical that the calf receive colostrum (the milk given during the first 5 days after calving) from a mother cow if it is to have any chance for long term survival. Colostrum contains antibodies to common diseases. When purchasing calves at auction it is important that the buyer receive an affirmation of this prior to the sale. If the calf does not receive colostrum within the first 12 to 24 hours following birth, it does no good to provide it later. The intestinal wall changes shortly after birth following the first ingestion of milk or water, and is incapable of absorbing the antibodies from the colostrum into its body after 24-hours.

The following recommendations will help ensure survival of hand raised calves:

- Place the calves in a warm, dry enclosure where they are protected from the wind.
- The calf may require assistance the first day or so until it is used to the feeding process. A nipple bottle or pail is valuable for starting calves, however they can learn to drink from a pail in a few days.
- Avoid placing a very young calf in a pen with an older animal. The older animal may harass the calf and compete for dry food.
- As a matter of course, it is a good idea to inject the new calf with vitamins A, D & E and Combiotic. Approved antibiotics in the milk replacer will help guard against respiratory problems, scours and other digestive upsets.
- Milk replacers made from dried milk are more expensive than soy based products. However, they may be better initially. Some calves may have, or develop, allergies to some of the proteins in either soy based or dried milk products. Be prepared to shift products if scours or other symptoms of product incompatibility occur.
- Ensure that there is adequate fat and protein in the milk replacer. Generally, fat content should be at least 20-25% at the onset while protein should be 18 - 20%.
- Feed the calf every three to four hours for the first two or three weeks. This a critical element in the survival of very young calves. A little bit several times a day will be one of the best scours prevention measures one can employ.

The calf can go for eight hours between feedings, two to three weeks after birth. Good alfalfa hay along with a commercial calf starter ration, available from local feed stores, should be placed in the pen. Generally, it is more economical to feed at the rate the calf will eat, rather than putting large amounts of feed out for it to waste or become stale. Once the calf is eating five to six pounds a day (about 2.5% of body weight) it can be gradually weaned from the milk replacer. Calves should be observed for diarrhea

and/or other infections and treated accordingly.

Some calves have been successfully weaned as early as thirty days after birth. However, for the average person it is better to wean them gradually at 60 to 75 days of age. The key is to be sure of adequate consumption of the calf starter and high quality alfalfa hay before weaning.

The new calf is very delicate and needs the same type of round the clock care the human baby needs. Before going out and purchasing a calf, be prepared for the time, effort and expense required to raise it.

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TRICHOMONIASIS

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This disease is caused by a microscopic one-celled parasite Tritrichomonas fetus, which infects the cow's uterus resulting in abortion and infertility. Trichomoniasis has been recognized in all major cattle-producing countries during the past 100 years. It was first characterized in Europe at the turn of the century as a bovine infertility problem.

With the widespread use of artificial insemination there was an apparent disappearance of the disease in parts of the world where cattle are intensively managed. However, it persisted where cattle graze regions considered unsuitable for intensive agriculture.

Few economic analyses have been made to assess the disease's cost to the rancher. But, one study done in the late 1950's suggested the overall loss associated with this infection could be as high as $800 per bull per year. In another more recent estimation a loss of anticipated revenue loss of $43,000 developed in a 360 cow herd the year trichomonas infection occurred. The pregnancy rate had dropped from 95 to 64.5% and almost 10% were cycling late.

The bull is the important link in the transmission of the disease in the herd. The parasite is present on the mucosa of the penis and in the crypts of the prepuce of the bull. These crypts are downfoldings of the epithelium which forms the lining of the prepuce and they offer an environment that is conducive to the proliferation of the trichomonas organisms. An important fact in the prevention and control of the disease is the poor development of prepucial crypts in bulls less than four years of age.

Trichomoniasis causes a very mild inflammation of the affected tissues in the bull with virtually no clinical signs of disease. Transmission then occurs from sexual contact between animals. Bulls can passively transmit the organism when a non-infected bull serves an infected cow and, soon after, serves a non-infected cow, however infection rates by this means of transmission are low. A more common scenario occurs with the introduction of a mature bull in the herd, who is infected by a cow who actively transmits the organism which establishes itself in the prepucial crypts where it evidently stimulates little immune response on the part of the bull. This animal can then infect many cows in the herd and subsequently other herd bulls.

The organism can be found in the cervix, vagina and uterus of cows after both experimental and natural infection. The part of the tract where long-lasting infections occur has not yet been identified. As with the bulls, clinical signs of the disease are not usually apparent; although infrequently a cow may show a slight vulvar discharge.

An infected cow will abort between 18 days and five months of gestation; losses most commonly occur at 40-60 days. The infection results in the development of an intrauterine environment not conducive to the maintenance of pregnancy. For the most part, the infection is rather short lived in the cow; researchers report a duration of 90-100

days. Following the initial infection, a period of temporary immunity exists during which a cow can conceive and carry a calf to term.

There have been reports that the carrier condition occurs with this disease. In this case, the infected cow conceives and carries the organism through gestation, calves and maintains the infection for at least six to nine weeks following calving. It is believed that this does not occur often, and thus, we can be encouraged that the majority of cows that have calved normally are uninfected.

In herds with short breeding periods, the disease can result in a high number of non-pregnant cows. With a longer breeding season, there may be more pregnant cows since there is adequate time for immunity to develop. In the latter case, cows become infected, abort, develop immunity and go on to conceive again and carry the calf to term. It is entirely possible that a given cow can go through this cycle more than once before carrying a calf to term; in this instance the rancher will observe a significant measure of repeat breeding in his herd. In either case, there are also an increased number of late calves.

The definitive diagnosis of Trichomoniasis depends on the cultivation and identification of the organism from cervical mucus or prepucial smegma. In most cases the sampling of the bull battery for the organism is recommended and it is important that the sample be properly and adequately collected. For best results, an insemination pipette to which a 10cc syringe is attached, is inserted into and as far back in the prepuce as possible. The prepucial lining is scraped by a backward-forward movement of the pipette, the tip against the lining, done in a vigorous manner for 30 seconds to 1 minute. The pipette is withdrawn from the back of the prepuce while pulling back the plunger of the syringe. There should be 4-8 inches of pink to red mucus in the pipette. If this mucus recovery is not achieved the lining of the prepuce was inadequately scraped and the process should be repeated. This is important as it increases the chance of recovering the organisms that lie in the deep parts of the prepucial crypts. If the sample is not satisfactorily taken, and there are false negative results, the disease will continue to cause production loss unabated.

A plastic 2-chambered pouch ("In Pouch") containing an improved trichomonas culture media is available, that can be used for the collection and transporting of cervical and smegma samples. The material in the insemination pipette is transferred directly into the upper chamber of the pouch. The mixture is then squeezed into the lower chamber by rolling down and sealing the top chamber. The pouches can be sent to the diagnostic laboratory where they are incubated and subsequently examined under the microscope. These pouches make sample inoculation, shipping and the laboratory examination much easier with better results than the previous methods employed. The pouch held at room temperature has a shelf life of six months and is reasonable in price.

Treatment for infected animals is not, for the most part, effective or practical. Prevention is the only satisfactory approach to this disease. A vaccine is commercially available but there is a good deal of controversy as to its efficacy. A number of management recommendations can be offered which will help to prevent introduction of the disease in the herd. Replacements should be only virgin bulls and heifers and use, as much as possible, home raised heifers. Ideally bulls should be replaced after 4 years of service. A mature bull introduced in the herd should be tested for trichomonas at least 3 times on successive weeks with a negative test, before exposure to

cows. Surveillance of breeding behavior of the animals, in particular the observation of excessive repeat breeding, may give a warning of possible infection.

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PINE NEEDLE ABORTION

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INTRODUCTION

Pine Needle Abortion (PNA) is a problem for cattle ranchers who raise cattle in areas where ponderosa pine trees grow. Abortions caused by pine needles are most common on grazing lands throughout the western United States (James et al., 1977). Pine needles have been known to cause abortions in cattle since 1920 (James et al., 1989). PNA can cause severe financial losses to the cattle industry. Abortion rates can range from 0% to 100% (James et al., 1989).

Abortions are caused when cows eat green pine needles off trees, from windfalls, and dead needles off the ground around pine trees (James et al., 1977). Cows in feedlots have been seen eating pine needles due to boredom (James et al., 1977). Weather influences consumption of pine needles by cows, due to the availability of feed, snow cover, and grazing time (Pfister et al., 1993).

Calves aborted due to PNA are born weak but viable, meaning pine needles cause a premature parturition (Ford et al., 1992). Abortions may occur as early as twenty-four hours to as long as three weeks following ingestion of pine needles (Pfister et al., 1993). Cows usually retain the placenta after abortions caused by PNA (Stuart et al., 1989). There are also other problems associated with PNA such as metritis, peritonitis, and death to the cow (Stuart et al., 1989).

PNA interrupts the stage of development when cell division and growth are occurring rapidly (Chow et al., 1972). The stage affected is the last trimester of pregnancy during late fall, winter, or early spring. Various studies indicate that blood flow to the calf is reduced during late pregnancy by up to 60% (Ford et al., 1992; Panter et al., 1992). The reduced blood flow stresses the calf, causing a premature parturition (Short et al., 1997). The chemical in pine needles responsible for the reduced blood flow to the calf and the cause of PNA is called Isocupressic acid (Smith 1996).

DIFFERENTIAL DIAGNOSIS

PNA should not be confused with abortions caused by Foothill Abortion. PNA generally occurs later in gestation than does Foothill Abortion. PNA calves have a short hair coat, lack teeth, and are very susceptible to respiratory infections. Pine needle aborted calves may be viable if they are spotted early enough because they are born prematurely but not dead. Foothill aborted calves are typically born dead, with no chance of survival. They generally have lesions around their lips and no hair on the body with the exception of a little hair above the eyes.

SUSCEPTIBILITY

Cows are susceptible to PNA even when there are very few pine trees in the area they are grazing. The only way to prevent PNA is to keep cows away from pine trees and pine needles (Short et al., 1994). One rancher has observed that one pine tree per three acres is enough to cause PNA. Cows having access to pine needles are at risk, no matter how few pine trees they have access to.

Cows will eat pine needles off the ground or while they are still on the tree. The pine needles that are eaten off the ground are eaten because the cows are trying to eat the grass coming up underneath the pine needle cover.

Often in snowy country, the area under pine trees does not have much snow cover. Grass can easily grow in this area under the fallen pine needles.

Cows try to move the pine needles away so they can get to the grass. However, by trying to clear the pine needles away they still may ingest enough pine needles to cause PNA. This usually occurs under trees that are all by themselves with no other trees nearby. The area under these trees is not trampled on by cows trying to stay out of harsh weather conditions and provides a good environment for grass to grow.

Pine needles eaten off trees are due to snow or wind pushing branches down to a level where cows can easily reach them. Once the snow or wind has pushed the branches down, cows are able to reach up and grab a mouthful of pine needles. The reason cows eat pine needles off branches is unknown, but may be due to boredom or a diet high in protein. Upon inspection of pine trees it is easy to see that cows do eat pine needles from the branches.

MANAGEMENT STRATEGIES

Cattle ranchers have a variety of methods from which to choose to combat PNA. These may include pruning trees higher so snow and wind cannot push branches down to a level that cows can reach. All fallen pine needles around trees must be raked up as well. Other strategies include logging the trees, fencing cattle away from trees, or simply avoiding grazing areas that contain pine trees during cows' third trimester of pregnancy. The pine needle cover can be abundant under trees.

Each of these strategies carries considerable additional costs to ranchers. Also, not all of these strategies have the same effectiveness. In selecting a preventative strategy ranchers must determine what they can afford to do. They should account for the cost of the strategy they choose and also the amount of time required to implement the preventative strategy.

Calves born after day 250 of gestation have a greater chance of survival than calves born prior to day 250 (Panter et al., 1992). These calves need to be warmed up quickly since they have been born prematurely and lack the ability to keep themselves warm. Also, some calves will need to be bottle fed since some cows have not been stimulated to produce milk (Stuart et al., 1989).

The amount of money cattle ranchers lose due to PNA depends on what costs the rancher has in the cows. Total costs including feed, pasture, veterinarian, supplements, etc., may be as high as $421. This is just an example; actual figures will vary depending on size, and location of operation. Ranchers may also need to include other expenses to determine the actual amount lost per calf due to PNA.

At $421 per calf, the amount a rancher can lose due to PNA can be very large. Cattle ranchers need to be aware of PNA and of the substantial costs that come with it. There are ways to deal with PNA that may cost cattle ranchers a lot of money in the short run but will save them money in the long run.

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