DOWNER COW SYNDROME

Dr. S. Sivaraman, M.V.Sc.,
Assistant Professor
Dept. of Veterinary Clinical Medicine
Veterinary College and Research Institute, Namakkal.

ETIOLOGY

- Most commonly, the downer cow is a complication of milk fever.
- Ischemic necrosis of the large muscles of the pelvic limbs and injuries to the tissues around the hip joint and of the obturator muscles are common in cows which do not fully recover and stand but remain recumbent following treatment for milk fever.
- Injuries to the musculoskeletal system are also common as a result of cows ‘spreadeagling’ their hindlimbs if they are unsteady during parturition or forced to stand or walk on a slippery floor immediately before or following parturition.
- Dystocia due to an oversized calf may result in extensive edema of the pelvic tissues and vulva, and failure of the cow to stand following parturition. If these cows develop milk fever, it is unlikely they will be able stand following treatment with calcium.

EPIDEMIOLOGY

Occurrence

- The disease occurs most commonly within the first 2 or 3 days after calving in high-producing dairy cows immediately following milk fever.
- Cattle may also become persistently recumbent for many reasons other than complications of milk fever such as peracute coliform mastitis and carbohydrate engorgement.
- Downer cows can be divided generally into non-ambulatory cows with nonprogressive neurological findings and non-ambulatory with progressive neurological findings indicative of the presence of lesions in the nervous system as the cause of the recumbency.

Incidence

- The incidence as a complication of milk fever is high because many affected animals are high producers and of high economic value.
- Cases included in this classification are classified by others as maternal obstetric paralysis, obturator paralysis, or hypophosphatemia.
- However, the incidence seems to be increasing, particularly in intensive dairy farming areas, although this impression could arise from the increased necessity to effect a cure in valuable animals.
Risk factors

- Complication of milk fever.
- Prolonged recumbency after a long delay in the treatment of milk fever is a major risk factor. Prolonged recumbency before treatment for milk fever (more than 4-6 h) results in ischemic necrosis due to obstruction of the blood supply, especially in a heavy cow if she lies on one leg for a long period.
- Cows with retained placenta and dystocia.
- A marked increase in the CPK levels in cows with milk fever and failure to stand after repeated treatments is supporting evidence for ischemic necrosis associated with prolonged recumbency as a major cause of downer cow syndrome.
- Traumatic injuries to pelvis and pelvic limbs.
- The sciatic and obturator nerves are vulnerable to injury by pressure from the calf moving through the pelvic canal during parturition.
- Pressure injuries on the superficial nerves (radial and peroneal) of the extremities also occur in recumbent cows.
- Serum electrolyte imbalances.
- Hypocalcemia.
- Hypophosphatemia- the serum levels of inorganic phosphorus decline to below normal along with a hypocalcemia in cases of milk fever. This persistent hypophosphatemia has been regarded as a cause of downer cow syndrome associated with milk fever. Mature dairy cows may become recumbent in early lactation and subnormal levels of serum phosphorus may be present. Other cows in the herd may be lame due to demineralization of bones associated with a dietary deficiency of phosphorus.
- Hypomagnesemia- A long-term low-level hypomagnesemia has been associated with the downer cow, especially when it accompanies hypocalcemia. But it is usually manifested by a tetanic hyperesthetic state which is not part of downer cow syndrome.
- Hypokalemia is the most commonly quote cause, especially in the so-called ‘creeper’ cows, which are bright and alert and crawl about, but are unable to rise. Ischemia due to prolonged recumbency associated with milk fever, may increase the cell membrane permeability of muscle fibers and allow the loss of potassium from the cell; this in turn causes the myotonia, which appears to be the basis of downer cow syndrome.
- Hypokalemia occurs in dairy cows which have been treated with isoflupredone acetate for ketosis. Affected animals are weak, recumbent and severely hypokalemic with serum potassium levels ranging from 1.4 to 2.3 mEq/L.
- Environmental and management risk factors - A slippery ground surface is a major risk factor. Cattle which must walk across slippery floors, especially at the time of calving, may slip and fall and injure the large muscles of the pelvic limbs, resulting in an inability to stand.
CLINICAL FINDINGS

- The downer cow syndrome may occur independently, or follow apparent recovery after treatment for milk fever, except for the prolonged recumbency. Affected cows either make no effort or are unable to stand following treatment for parturient paresis.

- About 30% of cows treated for milk fever will not stand for up to 24 h following treatment. Those which are unable to stand after 24 h and after two treatments are classified as downers.

- They are usually bright and alert and, although the appetite is reduced, the cow eats and drinks moderately well.

- The temperature is normal and the heart rate may be normal or elevated to 80-100 bpm.

- Tachycardia and arrhythmia occur in some cows, especially immediately following the administration of calcium and sudden death has occurred.

- Respiration are usually unaffected.

- Defecation and urination are normal but proteinuria is common and if marked may indicate extensive muscle damage.

- Some affected cows may make no effort to stand. Others will make frequent attempts to stand but are unable to fully extend their pelvic limbs and lift their hindquarters more than 20-30 cm from the ground.

- These frequent attempts to stand result in ‘crawling’ or ‘creeping’ along the ground with both hindlegs in a partially flexed position and displaced posteriorly- the frogleg attitude.

- On a non-slippery surface (bare ground, sand pack, or deep bedding) some cows are able to stand with some assistance by lifting on the tail head or with the use of hip slings.

- Those cows which do not make an effort to stand usually cannot stand even with assistance and if supported with hip slings will usually make no effort to bear weight with either the hindlimbs or the forelimbs.

- Their limbs appear stiff, painful, or numb and they are unable or reluctant to bear weight. Damage to the peroneal nerve is usually present when there is hyperflexion of the fetlock joints, which is evident if and when the cow is able to stand and bear weight on the hindlimbs.

- In some cases, the hindlimbs are extended on each side of the cow and reach up to the elbows on each side. In this position, the cow is bearing considerable weight on the medial thigh musculature and causing ischemic necrosis.

- This abnormal position of the legs may also be due to dislocation of one or both hip joints or associated with traumatic injuries surrounding the hip joints with or without rupture of the ligamentum teres.

- Regardless of the cause, the cow prefers this leg position and invariably will shift the legs back to the abnormal position if they are placed in their normal position.
• In some cows, the signs may be more marked and bizarre, including a tendency to lie in lateral recumbency with the head drawn back.

• When placed and propped up in sternal recumbency, these cows appear almost normal but, when they are left alone, within a short period of time they revert to the position of lateral recumbency.

• Still more severe cases are hyperesthetic and the limbs may be slightly stiff but only when the cow is lying in lateral recumbency. These severe cases do not usually eat or drink, have been described as ‘non-alert downers’, and are thought to have brain damage which has not been documented.

• Complications in the downer cow syndrome are common and often result in death or the need for euthanasia.

• Coliform mastitis, decubitus ulceration, especially over the prominences of the hock and elbow joint, and traumatic injuries around the tuber coxae caused by the hip slings are common.

• When these complications occur in the early stages of the disease, they commonly interfere with any progress being made and become the focus of clinical attention.

• The course of the disease is variable and dependent on the nature and extent of the lesions and the quality of the care and comfort which is provided for the cow during the first few days.

• About 50% of downer cows will stand within 4 days or less if cared for properly.

• The prognosis is poor for those which are still recumbent after 7 days, although some affected cows have been down for 10-14 days and subsequently stood up and recovered.

• Death may occur in 48-72 h following the onset and is usually associated with myocarditis.

**CLINICAL EXAMINATION OF THE DOWNER COW**

• Clinical examination of the downer cow can be very difficult and challenging depending on the environmental circumstances and the physical size of the animal.

• Many different metabolic, nutritional, musculoskeletal, toxic, neurological, neoplastic, inflammatory, and infectious diseases can cause recumbency in cattle.

• Obtain an adequate history of the case on the first visit to the animal.

• History include age of the animal, duration of recumbency, any previous clinical abnormalities before the recumbent stage such neurological in the case of bovine spongiform encephalopathy, or spinal cord lymphomatosis, any previous treatments with particular attention to mineralocorticoids which may cause hypokalemia, the anatomical location of any parenteral injections, time since recent parturition, diet and accidental access to new feeds, sudden unaccustomed exercise, and an assessment of the management provided.

• The environment and the ground surface surrounding the recumbent animal may provide clues about the possibility that the animal slipped, fell, and was injured.

• A systematic physical examination of all accessible body systems is necessary.
• The animal should be examined visually from a distance for evidence of abnormalities of the carriage of the head and neck, the position of the limbs, observe any attempts of the animal to stand or creep along the ground surface.

• The standard close clinical examination is necessary to determine body temperature, heart rate and pulse, respiratory rate, and the state of the major body systems such as the respiratory tract, cardiovascular system, central nervous system for mental state, and gastrointestinal tract, mammary gland, reproductive tract, any of which may indicate the presence of abnormalities associated with shock which results in recumbency.

• In the recently calved cow, particular emphasis must be given to adequate examination of the udder for mastitis, the uterus for metritis, and the gastrointestinal tract for diseases associated with toxemia and dehydration and shock (acute diffuse peritonitis, carbohydrate engorgement), which results in recumbency.

• A urine sample must always be obtained and tested for ketones, and the presence of myoglobinuria.

• A vaginal examination of the uterus should always be done along with a rectal examination.

• Careful systematic examination of the musculoskeletal system includes palpating the muscles, bones, joints, and feet of each limb, including passive flexion and extension of each limb is necessary.

• The coxofemoral joints are examined for evidence of dislocation.

• The vertebral column is examined for evidence of painful sites or displacement of vertebrae.

• It is important to examine both sides of the animal which means rolling the cow over from side to side; often the animal may have to be rolled over more than once to repeat a particular examination.

• Neurological examination includes examination of the withdrawal reflexes and sensation of all four limbs, reflex arcs of the spinal cord, careful examination of lumbar and sacral areas including sensation and tone in the tail, and examination of the cranial nerves.

• The examination can be extended by lifting the downer cow with appropriate lifters and observing if the animal extends its limbs and attempts to bear weight.

• While the animal is being assisted to stand, additional examinations of other parts of the body can be made.

**CLINICAL PATHOLOGY**

• The calcium, phosphorus, magnesium and glucose levels of the blood are within the normal range and the results of hematological examinations are usually consistent with those found in normal cows which have recently calved.

• The CPK and AST levels are usually markedly elevated by 18-24 h after the onset of recumbency and continue to elevate within the next few days. Continued elevation of CPK levels indicates continued muscle damage.
A marked proteinuria is usually evident by 18-24 h after the onset of recumbency. The proteinuria may persist for several days or be absent within a few days.

In severe cases, the urine may be brown and turbid because of severe myoglobinuria.

Elevations of serum urea, muscle enzymes, and laboratory evidence of inflammation are considered the best prognostic indicators of an unfavourable recovery.

Cows with a serum urea level above 25 mmol/L and serum creatinine levels above 130 mmol/L had a poor prognosis.

The CPK levels need to be interpreted in relation to the days of recumbency when the sample was taken. Critical levels may be highest initially (up to 50 times the upper normal reference range) and reduce to 10 times normal range at 7 days of recumbency.

AST provided the best predictive indicator of whether a recumbent cow would not recover, the best results being obtained with serum samples taken on the first day of recumbency.

DIAGNOSIS

The diagnosis of downer cow syndrome is made after all other known causes of recumbency have been eliminated in a cow which had milk fever and failed to stand within 24 h following two successive courses of treatment.

It is difficult and time consuming to examine a downer cow thoroughly to eliminate all other causes of recumbency.

Only by repeated careful clinical examination will the clinician avoid the embarrassment of failing to detect the presence of coliform mastitis, a fractured leg or a dislocated hip.

TREATMENT

Treatment of a downer cow should only be undertaken if the cow has a reasonable chance of recovery and a competent stockperson is on hand, who is prepared to invest the time and energy required to provide adequate nursing care of the cow.

Begin treatment of the primary condition promptly to maximise the cow's chances of a quick recovery. A cow with a condition like calving paralysis, which may take several days or even weeks to recover, should be moved to a suitable nursing area.

A cow with uncomplicated milk fever, which would be expected to make a full recovery within half a day, may be best treated before making a decision to move her.

FLUID AND ELECTROLYTE THERAPY

Many treatments including the injections of magnesium salts, phosphates, corticosteroids, stimulant tonics, and vitamin E and selenium have been used without consistent success.

The use of parenteral solutions containing potassium, calcium, magnesium, and phosphorus has been recommended but there is no scientific evidence that these electrolytes, in addition to what was probably given to the cow already, are indicated or are of any beneficial value.
Large quantities of fluid and multiple electrolyte therapy by the oral or parenteral route is indicated for cows which may not be drinking normal quantities of water. Multiple electrolytes can be added to the drinking water if the cow is drinking normally.

BEDDING AND CLINICAL CARE

The most important aspect of treatment is to provide the most comfortable bedding possible and to roll the cow from side to side several times daily to minimize the extent of ischemic necrosis and para-analgesia which results from prolonged recumbency.

With conscientious care and the provision of good bedding, palatable feed and liberal quantities of water, most cows will attempt to stand with some difficulty and assistance within 24 h, and will stand unassisted and normally 1 or 2 days later.

A sand or dirt pack is the ideal ground surface which facilitates standing when downer cows attempt to stand. If affected cows are left on a slippery ground surface, they will not make an effort to stand and will become progressively worse.

Cows should be milked normally and the udder kept clean by washing with germicide soap before milking, and post-milking teat dips applied.

ASSISTED LIFTING TO AID STANDING

The clinician and farmer are commonly faced with the questions of whether or not to lift a recumbent cow which has not attempted to stand within a few hours after treatment for milk fever.

The guiding principle should be the behavior of the cow. If the cow makes an effort to stand on her own or by some coaxing such as a gentle nudge in the ribs, she should be assisted to stand by insuring a good non-slip ground surface, deep bedding, and lifting up on the tailhead when she attempts to stand.

The cow should be rolled from side to side every few hours and encouraged to stand a few times daily. With good clinical care, most cows with the uncomplicated form of downer cow syndrome secondary to milk fever will stand in 12-24 h.

LIFTING DEVICES

Several different kinds of cow-lifting devices have been used to assist downer cows to stand.

**Hip lifters** - Which fit and tighten over the tuber coxae, and body slings like harnesses are designed to fit around the abdomen and thorax of the animal.

These devices can assist a downer cow to stand if she makes some effort on her own and it appears that ‘if she were given some help she could stand’.

For those cows which make some effort to stand, the hip lifters or slings can be applied and the animal lifted to the standing position.

If the animal bears weight on all four legs, she should be allowed to stand with the aid of the devices for 20-30 min and then lowered down. This procedure should be repeated several times daily.
In most cases, such downer cows will stand on their own within a few days. While the cow is in the standing position, she can be milked and other clinical examinations can be carried out.

The hip lifters can result in **traumatic injuries** to the tissues surrounding the tuber coxae if not used judiciously.

Animals which make no effort to stand and bear weight on their own must not be left suspended in the lifter for more than a few minutes but lowered immediately.

If the hip lifters are not applied carefully, the animal may slip out of the device while she is being lifted, which commonly results in tissue injury around the tuber coxae; fractures of the coxae have even occurred. These injuries are often unnoticed clinically, contribute to persistent recumbency and the true extent of the lesions are evident at necropsy. Lifting devices must be used carefully by experienced personnel.

**Body slings**- Which fit around the abdomen and thorax of the animal appear to be the ideal ‘animal lifter’ because they distribute the weight over several sites in contrast to the hip lifters, which concentrate the weight over the tuber coxae.

However, the body slings are cumbersome to apply to a recumbent animal, and require more time and experienced personnel to insure proper application.

When the slings are applied properly, they do appear to allow the lifted animal to stand comfortably for 30 min or more and promote recovery. Lifting cows which make no effort to stand on their own is usually unsuccessful. When lifted, they usually do not bear anysignificant weight.

**Water flotation tank** - It has been designed for the management of downer cows.

A prototype consists of a metal tub with inside dimensions of 92 in long, 43 in wide, and 51 in deep. The system is affordable, portable, durable, effective, and simple to use.

The downer cow is pulled into the tub on a mat and the ends of the tub closed to make a water-tight container with an open top like a bath tub. With the cow’s head held up by a halter, the tubs filled with water at 100-102°F as quickly as possible.

Cows in lateral recumbency will roll into sternal recumbency when 12-24 in of water are in the container and will usually attempt to stand when the tub is one-half to two-thirds full.

Cows are allowed to stand in the water for 6-8 h. If the water temperature falls below 95°F, more hot water is added.

When the decision is made to remove the cow, the water is drained and the end of the tub opened, which allows the cow to walk out preferably onto a ground or grass surface. A success rate of 46% has been reported. However, the success rate could be higher if the selection of cases for flotation are more rigorous.

Cows with ruptured tendons, fractures, luxatedcoxofemoral joints, septic polyarthritis, and other physical injuries of the musculoskeletal system are not good candidates for flotation. The most suitable case for flotation would appear to be the downer cow as a **sequel to milk fever**.
WHEN TO CONSIDER EUTHANASIA

Cows with a low chance of recovery must not be left to suffer and must be destroyed humanely on site.

The trigger points for euthanasia of a downer cow are:

- Grave illness (non-alert) or incurable conditions e.g. fractures, tendon ruptures
- Lack of response to treatment within a reasonable time period
- An alert downer cow becoming non-alert, indicating further complications
- Pain and suffering
- Cow is lying on her side despite adequate treatment (unable or unwilling to maintain sternal recumbency)
- Not willing to eat or drink despite adequate treatment
- Obvious “bed sores” or swollen joints/limbs
- Insufficient labour or expertise required to provide adequate nursing care for the cow.

HANDLING, TRANSPORTATION AND DISPOSITION OF NON-AMBULATORY CATTLE

There has been considerable controversy and disparity among veterinarians and livestock producers about the handling, transportation, and disposition of nonambulatory cattle.

Economics has a major influence on decision making in these cases. There has been no common understanding of whether or not they are fit for transportation and which ones are fit for slaughter for salvage. When the owner and veterinarian are faced with a downer cow which is valuable, and the cause of the recumbency is uncertain, the tendency is to either attempt to provide treatment for several days and assess the progress, or consider slaughter for salvage.

In the case of valuable breeding animals which are recumbent as a complication of milk fever, or a disease such as acute carbohydrate engorgement, peracute mastitis, supportive, and specific therapy are commonly selected.

In the case of downer cattle of commercial value, slaughter for salvage has been a common option. Cattle producers would like to obtain as much financial return as possible by slaughter for salvage.

Cattle affected with complications of milk fever (ischemic necrosis of the pelvic limbs), traumatic injuries of the musculoskeletal system and other diseases not associated with toxemia or septicemia were commonly submitted to slaughter for salvage.

Transportation of these compromised animals has always been an animal welfare issue because of the difficulty of loading them humanely because of their size. The mere act of lifting, pulling, dragging and by other means of forcefully loading an animal weighing 500-800 kg onto a truck cannot be done without considerable pain and discomfort to the animal.

CONTROL

The early detection and treatment of milk fever will reduce the incidence and severity of downer cow syndrome.
Under ideal conditions, cows should be treated during the first stage of milk fever before they become recumbent. Once recumbent, cows should be treated as soon as possible and not delayed for more than 1 hour.

Cows with milk fever should be wellbedded with liberal quantities of straw, or moved to a soft-ground surface or sand pit area.

Recumbent Cows should be coaxed and assisted to stand if possible after treatment for milk fever. If they are unable to stand, they should be rolled from one side to the other every few hours if possible.

It is usually difficult to get owners to comply with this recommendation but frequent rolling from side to side is necessary to minimize the ischemic necrosis.

Dairy cows should be placed in a comfortable well-bedded box stall prior to calving and should be left in that box stall until at least 48 h after partition in the event that milk fever develops.

**PREVENTATIVE MEASURES**

When the treatment period is finished, and the downer cow has either recovered or has been euthanised, and it is important to consider any preventative measures that may be needed to protect other animals in the herd from the same risks.

**Hypokalemia in Cattle**

Hypokalemia is common in adult cattle with prolonged inappetence (>2 days), or in animals receiving more than one injection of corticosteroids that have mineralocorticoid activity, eg, isoflupredone acetate. Because mineralocorticoid activity enhances renal and GI losses of potassium.

Clinical signs
* generalized muscle weakness,
  * depression,
  * muscle fasciculations.
  * unable to stand or lift their head from the ground.

**Treatment**

* Potassium chloride 0.5meq/kg/hrBwt Intravenously in Normal saline solutions (if serum potassium <3 meq/L)

**NORMAL BIOCHEMICAL PARAMETERS**

* Calcium ------- 9 – 12 mg/dl
* Phosphorus------ 5.5-6.5 mg/dl
* Magnesium ------1.8-2.3 mg/dl
* Pottasium------- 4- 5.8 meq/qL
* creatine kinase- 35-280 units/L
* Glucose ----------45-75 mg/dl

Organised by Clinical Departments, Veterinary College and Research Institute, Namakkal