Abstract

This Paper covers the management of the downer cow after it has been examined and diagnosed. The prognosis must be determined to decide whether treatment and nursing is to be undertaken or whether euthanasia is more appropriate. Treatment aspects, including therapeutic drugs and physiotherapy are discussed along with the various aspects of nursing, such as bedding, rolling, barriers and lifting.

Introduction

It is important to differentiate between the down or recumbent cow, which can be from a wide variety of primary causes and the downer cow or ‘downer cow syndrome’, which describes the damage that arises to the recumbent cow after she has been down for a period of time (Huxley and Higgins et al. 2010). Treatment of the primary causes of recumbency won't be considered in this paper except for those affecting the musculo-skeletal system. The emphasis of the paper is on the nursing and treatment of the downer cow.

Downer cows need to be thought of in two parts and treated accordingly: The initial cause of the recumbency and the secondary effects of the recumbency. In cattle, these secondary effects often become the more significant part of the syndrome. If the primary syndrome isn’t resolved quickly with the animal being able to stand, secondary problems, especially myopathies and/or neuropathies occur. These will delay and often prevent the animal from recovering. They must be dealt with appropriately using both medical treatment and effective nursing strategies. Animal welfare issues must always be at the forefront of the decision-making process and if the downer cow can’t or won’t be nursed properly then prompt euthanasia needs to be instigated.

Management plan

An effective management plan needs to be developed for downer cows. After a careful examination is conducted a specific diagnosis can be made. The prognosis then needs to be estimated so that discussion with the farmer can be had to decide if the animal will be treated or whether euthanasia will be elected. If the animal is to be treated, the plan is further refined to incorporate all the aspects of her management. This includes treatment with therapeutic and physical agents and the various components of nursing, such as bedding, barriers, rolling and lifting. It is the veterinarian’s role to oversee this, not to “just simply give the cow an injection, a pat on the head and walk away”.

14 practicing and academic veterinarians with a special interest in dairy herd health met at the Nottingham Dairy Herd Health Group symposium in the United Kingdom to discuss the diagnosis, prognosis and treatment of recumbency in adult cattle (Huxley and Higgins et al. 2010). They considered that the overall on-farm nursing and management of cows suffering from ‘downer cow syndrome’ was more important than the veterinary treatment in regards to the likely outcome. Their three most important aspects of nursing were the provision of accessible feed and water, regular turning and lifting, and deep, soft bedding with good footing.

Euthanasia

The welfare of any downer cow must be considered and sometimes the best treatment is euthanasia. The welfare of the recumbent cow must be given the highest priority not just from the cow’s perspective but also from an
industry perspective. Farmers, advisers and veterinarians must be both pro-active and seen to be pro-active in matters relating to animal welfare. There are animal activist groups that look for ways to adversely influence the general public's view on animal industries and an expose of recumbent animals 'suffering' could have grave outcomes. There is no excuse for a downer to be nursed poorly and if the farmer is unable or unwilling to provide satisfactory nursing the animal must be promptly euthanased.

The prognosis is the most important decision that the veterinarian needs to make when attending downer cows (Andrews 1992). When assessing the prognosis for a downer cow, a variety of factors need to be considered, including the history, clinical symptoms, diagnosis, ability to treat the condition successfully and the stock person’s ability to nurse the patient. Those judged to have a poor or hopeless prognosis should be euthanase immediately. Those that are nursed should be revisited within four days to re-assess their condition and decide if treatment should continue (Huxley 2006). Statistics show that about half of the downer cows rise within 4 to 7 days (Andrews 1992) so the prognosis for cows down for more than 10 days is poor. Some cows, of course, still recover after extended periods of nursing.

An experienced cattle practitioner is better able to assess the prognosis than a younger one so a list of ‘trigger points’ to consider are often helpful. Various authors have discussed this (Andrews 1992, Harwood 2003, Huxley 2006, Huxley and Higgins et al. 2010) and on the basis of their articles and my experience, I suggest the following list as ‘trigger points’ for euthanasia:

- Conditions with poor or hopeless prognosis
- Non-responsive pain and suffering
- Non-Alert cow not responding within a suitable time period
- Not eating for an unreasonable time
- Persistent lateral recumbency
- Farmer unable or unwilling to nurse adequately
- Pressure sores
- Other complications, which can’t be dealt with adequately
- Deterioration despite adequate treatment

**Treatment**

Treatment includes the use of various therapeutic agents, such as calcium salts and non-steroidal anti-inflammatory drugs and physical agents, such as physiotherapy and hobble.

**Minerals**

Minerals, such as calcium, magnesium and phosphorous are used to treat the down cow when the primary condition involves their deficiency, such as milk fever and grass tetany. Their use in the treatment of a recumbent cow depends on whether it is a down cow or a downer cow. Certainly, if there is any doubt, they must be included in the treatment plan but often they are over-used and not necessary, particularly if the cow has been down for longer than the first day and is now a downer. When attending milk fever cases that have been down for more than 24 hours, and even as short a time period as 12 hours, many veterinarians still tend to only think of the primary milk fever condition and treat them with more calcium salts. Extra calcium usually makes no difference at this time because their levels are more than adequate and the reason they are still recumbent is the secondary damage. Different treatment and management strategies, thus, are needed.

**Non Steroidal Anti-inflammatory Drugs (NSAID)**

NSAID’s are commonly used for the treatment of recumbent cows and are indicated for many primary conditions, especially if involving nerve damage. They are also indicated to reduce the amount of secondary damage that occurs once the cow becomes recumbent. These secondary neuropathies and myopathies are an important part of the ‘downer cow syndrome’ and the treatment plan must include consideration of them.

There are several different drugs registered for cattle: Ketoprofen (1); Meloxicam (2); Tolfenamic acid (3); and Flunixin (4). Our practice dispenses Ketoprofen (1) to farmers to administer themselves. Metacam (2) and Tolfedine (3) aren't generally dispensed, as we like to keep them as the 'stronger, vet-only' drugs. Flunixin (4) has been superseded by these newer drugs in our clinic. Ketoprofen is used daily for three days with the dose rate for a 500kg cow being 20mls on day one, ideally intravenous, and 15mls intramuscularly on day two and three.
It has the advantage of a zero milk withhold period. Metacam, given intravenously at the rate of 15mls to a 600 kg cow will give seventy-two hours of effective blood levels but has a six day milk withhold period. Tolbedine, given intravenously at the rate of 25mls for the 600 kg cow will give forty eight to seventy-two hours of effective blood levels and has a twelve hour milk withhold period. We don’t normally extend NSAID treatment beyond three days as it seems that their benefit after this time is limited and side effects of intestinal ulceration can occur.

The ‘compartment syndrome’ is an important cause of the ‘downer cow syndrome’. In the bovine the hamstring muscle group (biceps femoris, semimembranosus and semitendinosus) and the adductor muscles are divided into compartments by thick fascia. Compression of these muscles from the initial recumbency of any cause will result in the release of blood and oedematous fluid into these compartments. The rigid nature of the fascia doesn’t allow the compartments to expand to accommodate this extra fluid so the pressure within the compartments increases causing further compression of the muscles. This vicious circle ultimately leads to ischaemic myonecrosis, as indicated by the rise in muscle enzymes, and the cow is then unable to stand even when the initial cause of the recumbency is corrected. This syndrome can occur in as little as four to six hours (Cox 1982) if the animal is on a hard surface, especially if it is a heavy animal. NSAID will reduce the swelling within the muscle compartments and help ameliorate the damage.

Secondary neuropathies also occur if the animal is lying on a hard surface: The sciatic nerve is especially vulnerable as it courses around the greater trochanter of the hip, over the lateral stifle and lateral hock (Cox 1982). The femoral nerve can be easily damaged as the cow struggles to rise on a slippery surface, such as wet or smooth concrete, by the legs slipping out behind into the ‘frog-leg’ position. The hyperextension of the lumbar back in this position can damage the nerve roots of the femoral nerve. Oedema within the axon sheath is part of these neuropathies, which NSAID will help control.

Researchers differ as to whether the subsequent nerve damage or muscle damage is the more important complication of recumbency in the bovine (Cox 1981, Cox and McGrath et al. 1982, Clark and Henderson et al. 1987, van Metre 2001) so it is probably fair to say that both are involved. Muscle enzyme analysis will give a guide to the level of myonecrosis and is often used as a prognostic indicator. However, if must be used in conjunction with consideration to the extent of the damage, either primary or secondary, of the nerves.

Physiotherapy

Most downer cows will have some degree of secondary myopathy and/or neuropathy. Physiotherapy can help stimulate blood flow to the affected areas and reduce the swelling within the muscle compartments and nerve sheaths. It can be applied in various forms, ranging from stimulating the cow to move by yelling or kneeing in the ribs, the judicious use of a cattle prodder or lifting the cow. The cattle prodder can also be used to make the cow kick her hind limbs vigourously when lying in a lateral position. Lifting can be as simple as helping support the tail when she tries to stand or can involve lifting with a mechanical device, such as a hip clamp. Electro-acupuncture also seems to be an effective method of physiotherapy.

The success of physiotherapy depends on the stage of the secondary damage: if it is only early in its course, the secondary myopathy/neuropathy is akin to ‘pins and needles’ in their legs and is resolved by physiotherapy so the cows will stand immediately afterwards. If the process is more advanced, whilst there won’t be an immediate effect, the increased vasodilation will help speed up the healing process.

A common example of this early situation is a milk fever case that hasn’t been treated effectively quickly enough and is still down 8 to 12 hours later but is bright and alert with normal heart function and has no other obvious abnormalities. The typical case was treated for milk fever when first found by the farmer early in the morning but is still recumbent in the afternoon when examined by the veterinarian. Many of these cows have an early stage of myonecrosis and effective physiotherapy will enable them to stand.

I find electro-physiotherapy to be very effective and will often work when other more conventional methods fail: I use an electro-stimulator connected to pairs of strategically placed needles to cause muscle fasciculation to the hamstring group. Most cows are able to stand immediately afterwards and the effects are obvious and dramatic. The details of this treatment are as follows:

An electro-stimulator is used, which can be purchased from acupuncture supply companies, such as AcuNeeds. (5) I use an Australian made model, the Meyer MME-501. They are no longer available but AcuNeeds supply a Chinese model, the AWQ104E, which costs about $230. Two leads are connected to the unit. Each lead has a pair of alligator clips, one with a positive polarity and the other a negative one, which are attached to 21G x 40mm hypodermic needles. With the cow in either sternal or lateral recumbency, two needles are placed along...
the lateral edge of the sacrum adjacent to the second and third dorsal spinous processes. This picks up the sciatic nerve as it courses out from under the sacrum and corresponds with acupuncture points Bladder (BL) 31 and 32. One lead is connected to these two needles. The second lead is connected to a needle placed in the proximal aspect of the hamstring muscle in a depression just below the tuber ischi (BL 36) and a needle immediately distal and anterior to the residual head of the fibula (Gall Bladder 34). This needle must be exactly on the peroneal nerve as it curves under the residual head of the fibula and small adjustment of the needle’s position can make a huge difference to the effect. The unit is set to 10 Hz in the ‘dense-disperse’ mode. The amplitude of the current of each lead is slowly increased, causing the muscles to fasciculate. It is turned up as high as possible, but below a level of discomfort to the cow. The thigh muscles and tendons of the lower limb will rhythmically contract in time with the varying current. This is continued for approximately 5 minutes. The cow is rolled onto the other side and the procedure repeated for a further 5 minutes. Most cows will now be able stand. Electro-stimulation of strategic acupuncture points is a very effective form of physiotherapy.

If the cow is still not be able to stand, a full downer cow examination should be undertaken and the cow treated accordingly, involving appropriate use of NSAID and nursing strategies. If they are still recumbent in a further 1 to 3 days the electro-stimulation can be repeated.

I also routinely treat my neuropathy cows with electro-stimulation. It has been shown to be very effective in treating Stage 1 and 2 Thoraco-lumbar Disc Disease in canines (Schoen 2001), where the myelin sheath hasn’t been severed. It decreases the oedema fluid within the nerve bundles from the trauma, so it makes sense that it would help both primary and secondary neuropathies in cattle. For sciatic and obturator nerve injuries, I use the same protocol as described above, but add a third lead: needles are placed into the sacro-coccygeal and lumbo-sacral spaces (Governor Vessel 2 and 3, respectively) and connected with this third lead. This stimulates the damaged nerve close to its place of injury. For femoral nerve cases, I use the three leads but move the sacral pair of needles anteriorly. The origin of the femoral nerve is L4-L6 so the needles are placed between lateral processes L4 and L5 (acupuncture point Bladder 25) and caudal to L6 (Bladder 27) approximately one hand’s width from the midline.

### Hobbles

Hobbles are an ‘old fashion’ treatment aid for cows with a displaced leg stance. They often aren’t used these days in many areas but should be as they have a legitimate place in the treatment of certain types of downers. Cows with obturator paresis/paralysis have a splayed-leg stance and have a high risk of dislocating their hip or tearing their adductor muscles. Cows with a proximal sciatic nerve paralysis with an anterior or medial leg stance also have a high risk of dislocating their hip or rupturing their hamstring/gastrocnemius muscles. Both these conditions will benefit from hobbles.

A variety of hobbles types are available at horse saddlery stores, usually made of leather or PVC. They are fitted to the hind limbs either above or below the hock, depending on the condition and the size of the udder. A rope of a suitable length is used to restrict the spread of the legs. They should be used until after the cow is able to stand up by herself.

### Nursing

The development of a nursing plan is the most important part of the veterinarian’s role when attending downer cows. Whilst the diagnosis and treatment of recumbent cattle is integral to the case, the on-going nature of the recumbency means that the nursing is vital to give them a chance to recover from the primary condition and to not succumb to the secondary conditions that can arise. The veterinarian must be pro-active in this process.

There a number of factors that need to be considered:

### Bedding

As recumbent cattle are particularly susceptible to secondary myopathies and neuropathies it is vital that they are quickly removed from a hard surface and suitable bedding is provided for them. Irreversible secondary damage to the peripheral sciatic nerve was shown to occur within as short a period of time as six hours when anaesthetised cows were place in sternal recumbency on rubber matting (Cox and McGrath et al. 1982) and can occur on harder surfaces, such as concrete in even shorter periods.

The animal should be provided with a clean, dry, warm and comfortable surface, which provides good footing for purchase when trying to stand (Huxley 2006).
In areas where the winters are wet and cold, most downer cows are put into a shed. Unfortunately, many sheds have gravel or even concrete floors, which are very poor surfaces to nurse recumbent cattle on. Many farmers will spread some hay under the cow to overcome this but often it is only a token amount and the cow usually digs through it or crawls off it.

The bedding of heaped straw or hay needs to be 300-400 mm (12-16 inches) deep to provide an adequate depth. The same depth of loose rice hulls or uncompacted sawdust is satisfactory. It must be replenished and kept clean.

A bedding of sand can be a suitable surface as it provides good footing, manure is easily removed from it and urine drains through it. A cow was nursed in excess of 80 days on a bedding of sand without complications, such as decubital ulcers and urine scalding arising (Cox and Marion 1992). They noted that straw and wood shavings mix with the urine and faeces and become soaked by them, so are a less suitable bedding.

A lot of cows are nursed in the paddock, which is more convenient for the farmer. However, the ground may be too soft or too hard to provide good bedding and it can quickly change from one degree to the other. Shelter can be more difficult to provide in the paddock.

**Rolling**

Frequent rolling is important, depending on the specific condition: Some cases are able to roll themselves from side to side whereas others can’t. This must be noted by the animal carer and if they aren’t able to, they must be manually rolled. This should be done as often as every three hours (Huxley 2006). A normal sitting cow swaps sides at least this often, which prevents pressure damage to the down leg. This recommendation is often impractical to implement by the stock person as it can be difficult to roll a heavy cow. If this isn’t done regularly the type of bedding becomes even more important.

Many downers have one leg affected more than the other. This is usually true for calving paralysis cases and the more affected leg is the one she was sitting on when calving. This asymmetry has the effect that every time the cow tries to stand the stronger, less affected leg will push her onto her weaker leg. Thus, the more affected leg takes the brunt of the pressure leading to myopathy of its hamstring muscles and/or peripheral nerves, which exacerbates the primary condition. During the first two or three days of the recumbency the cow usually tries to stand up frequently so the farmer needs to roll her onto her other side multiple times during the day. This is time consuming and frustrating for the farmers so it is important to explain the importance of it to them. Usually after a few days the cow is more inclined to stay on the leg she is left on and the frequency of rolling can be reduced.

Femoral neuropathies are usually bilateral, as they are an injury of the back rather than of the leg. Thus, both legs are equally affected and the cow can turn herself onto either side. Rolling is not necessary in these cases.

**Barriers**

Restricting the cow’s movements can be a very important part of her nursing, depending on the specific condition. One ‘school of thought’ argues that the cow should be encouraged to move around as it strengthens her muscles and speeds up recovery. The argument against this is that a lot of secondary damage can occur to a recumbent cow when crawling around and trying to stand. Secondary femoral nerve damage from the lumbar spine being in the hyper-extended position when crawling is very common. Secondary dislocated hips occur commonly when a cow tries too early to stand, especially if one leg is weaker than the other or is displaced laterally, as in some cases of calving paralysis. Barriers can also prevent self-harm occurring, as it is common for cows to crawl out of the warm, dry shed in the middle of the night and end up in the mud in front of it.

Barriers are often needed to restrict the animal on the bedding surface. Too often, the bedding is only over a small area. The cow will quickly crawl off this bedding and end up sitting on a hard surface. This is even worse in cases where the cow can’t change sides herself as they end up sitting on their weaker leg. This is most unsatisfactory. If the bedding area is limited, I recommend placing small square bales of hay around its perimeter to restrict the cow’s movement. These bales can easily be removed to access the cow when she needs to be rolled, as they always end up lying against the barrier. It is very hard to roll the cow if she is hard up against a solid wall.

Femoral nerve injuries require specific nursing. If they are left unrestricted, they will end up in the ‘frog-leg’ position as they crawl around and try to stand. In this position, they hyper-extend their back and further damage the femoral nerve roots. It is very important to prevent them from crawling by placing a moveable barrier, such as some small hay bales in front of them. The severity of the femoral nerve injury also affects the nursing recommendations (Poulton 2010): A Stage One femoral nerve injury (able to walk around normally when
Treatment and nursing of the downer cow

Lifting

There are two ‘schools of thought’ as to whether to lift downer cows: It can be the best thing to do but, equally, it can be the worst thing.

In my mind, lifting should only be done if it is EFFECTIVE and SUPERVISED. Effective lifting means that the cows are able to stand in a natural position and take some of their own weight. If the cow is hanging from a hip clamp or slouching in a sling, without taking any weight on their legs, more damage will be done to them than if they were left on the ground. Cow ‘lifters’ shouldn’t be confused with cow ‘hangers’! Supervision is important because downer cows tire easily and an effective lift will then become an ineffective one if she isn’t placed down at this time. Many farmers will lift a cow and then go away for several hours to do other jobs before returning. When they left, the cow was being lifted effectively but when they returned they find her hanging. If the cow is unable to be lifted effectively, they are best left on the ground for a few more days before trying again. Attention to the bedding and rolling is important for these cases. Unfortunately many cows are lifted ineffectively or unsupervised and they have a poorer chance of recovery than if the farmer hadn’t lifted them at all. Lifting is time consuming and as ineffective lifting is demoralising for the farmer they are more likely to become frustrated and euthanase the cow. However, if they don’t lift the cow for a few days they are more likely to give her extra time, which may be the difference between success and failure.

There are several methods used to lift cows: Hip Clamps are the easiest to use and the most common. They are ideal for a quick lift, but are not suitable for extended support. If the cow can stand when lifted, such as many milk fever and grade one femoral nerve cases, they are great. They are generally inadequate for medium to long-term recumbency due to associated trauma to the pelvis with extended and repeated use.

I have a poor opinion of slings, as I find they offer inadequate support. The straps tend to cut into the groin and axilla and compromise limb circulation and mobility. Cows tend to hang in them rather than stand in them. They are also difficult to apply.

The ‘Pelvic Lift’ (6) is a hip clamp with the a ‘bike’ seat that swings in under the pelvis when lifted. It has the convenience of ease of use of the hip clamp with the superior support of the seat, which bears about 40% of the cow’s weight. They are effective and easy to use.

The ‘Moo Mobile’ isn’t used much in our area so my experience of them is limited. They seem to be better than slings and clamps but if the animal is left on them continuously, as farmers tend to do, they slouch in it, which isn’t effective lifting. The animal should be raised and lowered during the day rather left in the raised position continuously.

Floatation tanks are used overseas and are available in Australia. Many downer cows will be able to stand in the tank with the assistance of the water providing buoyancy. They actually stand rather than float. Their response when first immersed can help in assessing the downer cow: If they are unable to stand in the water their chances of recovery are poor. Cattle that stood apparently normally on all limbs during the first flotation treatment were
2.9 times as likely to survive as those that had an asymmetric stance or were unable to stand (Burton 2009). They are left in the heated water for up to eight to 10 hours per day and may need several days of floatation before recovering. Nine out of 15 downers diagnosed with muscle damage recovered after being treated in a floatation tank (Chesterton 2011), which impressed the author and encouraged him to use it more.

It is important to ensure the surface they are nursed on between floats is suitable so that secondary damage doesn’t occur during the ‘non-float’ time. Surprisingly, mastitis isn’t a problem with float tanks, despite the warm water being soiled with faeces.

Shelter
The affect of excessive heat or cold is magnified in downer cows so shelter is usually an essential component of the nursing. It is surprising how often this basic need is underestimated or overlooked by farmers so the veterinarian must be pro-active in advising it. This is particularly important in a cold environment as the secondary effects to the limb, which is already poorly perfused, from sitting on a cold surface is amplified. Cows recumbent from Protein-Energy Deficiency suffer badly from the cold as it increases their maintenance requirements and further affects their negative nutritional state.

Feed and water
Adequate feed with sufficient energy and fibre is important, along with ample water. The feed and water must be within easy reach of the downer cow and away from other cattle (Andrews 1992).

Milking
Cows recumbent for more than 12 hours should be milked twice daily to reduce the risk of mastitis and for comfort (Huxley 2006). It could be argued that the risk of mastitis is higher if recumbent cows are milked as it opens their teat canals making infection more likely. Adequate teat disinfection and the provision of ‘hygienic’ bedding is particularly important whether the cow is milked or not.

Returning the downer to the herd
It is important to be judicious when deciding when to bring recovered downer cows back into the milking shed and herd to reduce the chances of them slipping over and re-damaging themselves. They should be kept isolated from the herd and brought into the shed separately for the first few milkings until they are confident on the concrete surface. Some cows will be ‘bullied’ when first mixed back into the herd as the social order is restored, which increases the chances of injury.

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1. Ketoprofen: 100mg/ml Ketoprofen, from Ilium
2. Metacam 20: 20mg/ml Meloxicam, from Boehringer Ingelheim
3. Tolufidine: 40mg/ml Tolfenamic acid, from Vetoquinol
4. Flunixil: 50mg/ml Flunixin, from Ilium
6. Cow Jack & Pelvic Lift: john.steinfurt@dcsi.net.au 0428 595 957