Module 10
Livestock Welfare Assessment (Part 1)

Lecture Notes

Slide 1:

This lecture was first developed for World Animal Protection by Dr David Main (University of Bristol) in 2003. It was revised by World Animal Protection scientific advisors in 2012 using updates provided by Dr Caroline Hewson.

Slide 2:

This module will introduce you to the main ways that welfare inputs can affect livestock welfare – that is, the farming system, the animal's genetics and the stock person.

Then we will look at the main welfare problems in dairy cattle, dairy calves and beef cattle.

Slide 3:

Other modules in this course look at how animal welfare is affected by the resources that are available to the animal. These resources are termed 'welfare inputs' and they fall into three main categories, shown at the top of the slide, from left to right:

- the management/stockperson
- the environment, i.e. the husbandry system
- the animals themselves, especially their genetic makeup.

Today, we are going to look closely at how welfare inputs can affect animal welfare. First we will consider general principles, then we look at how welfare inputs may cause concern in different types of livestock.

Slide 4:

In Module 1, we saw that animal welfare is a complex concept with three overlapping areas of concern:

- physical functioning
- mental state/feelings
- some aspects of naturalness, which may be understood as the performance of behaviours that are important to the animal.

When we think of how welfare inputs may affect each of these areas of welfare, different sectors of society may value one area of welfare more than the others and may therefore favour a particular type of welfare input. For example:

- Some consumers do not like animals to be kept under intensive conditions because this does not satisfy the 'naturalness' aspect of animal welfare. Those consumers generally prefer animals to live outside. They assume that if animals can live that way, they will feel well. Therefore those consumers focus on the welfare input of environment – i.e. the husbandry – and they like that to be extensive i.e. free-range and outdoors.
- In contrast, some farmers and vets believe that physical functioning is the most important aspect of welfare, and if animals are healthy and producing well, they must feel well. So, farmers and vets may prefer animals to live under more intensive conditions if that is better for animal health. They may also focus on animals' genetic makeup, and on stockmanship, as well as husbandry.

In both these examples, the assumption is that the husbandry – intensive or extensive – is what creates good welfare. However, any type of husbandry has the potential to jeopardise or enhance welfare, depending on the system, the animal's genetics and the stockmanship.

We can see that, overall, every farming system has the potential for good or bad welfare.

Slide 5:

The welfare potential of a farming system relates to the features of that system, as listed on this slide.

First, there is husbandry, which includes:

- housing – we've seen that some consumers prefer animals to be outside
- feeding – again, some consumers prefer animals to be foraging. However, many farmers and vets may prefer the animals to have supplementary, manufactured food in order to maximise health and production. They may want to keep the animals inside to ensure that each one gets enough extra food.

Another aspect of husbandry concerns whether animals have to undergo routine procedures that may cause pain. For example, some laying hens in intensive systems or large groups peck at each other, causing pain and injury. To prevent this, the chicks have their beak trimmed and shortened, which is painful at the time and can be very painful throughout the bird's life.

The other factors affecting the welfare potential of any farming system are:

- the genetics of the animals
- the stockmanship.

Slide 6:

There are many different types of farming system around the world.

The larger-scale, more intensive farming of animals is typical of the wealthiest countries. As other countries become more prosperous, they also aim to produce more animal products at an affordable price, and they also farm more intensively.

Most of the research on the welfare of farmed species and most of our lecture today concerns these intensive systems. However, note that, globally, there are many farming systems which are on a smaller scale and much less intensive. Some of the main types are listed on this slide:

- mixed crop–livestock farming, e.g. rice and livestock in Latin America and South Asia
- pastoralist and agro-pastoralist: here animals may range freely, under the care of the owner or stock person, but they may also be partly reared in fields. These systems are common in Africa
- urban livestock: the keeping of animals in towns and cities is an important source of income for many people in Africa and South Asia, and parts of Latin America. The animals are usually kept in people's back yards or gardens, but may also be in more formal farms at the edge of the cities
- in rural areas, livestock may also be kept in back yards or they may roam freely in the village.

Typically, these less intensive systems may offer greater welfare potential in the areas of naturalness and associated feelings. However, they require good management if physical functioning and associated feelings are also to be good. Therefore problems with malnutrition and parasitism may occur.

Such problems are not confined to smallholders in low-income countries. In wealthier countries, some people who have lived in cities may decide to move to the country and to keep poultry or other livestock. However, they may not know how to care for their animals, and problems with parasites and malnutrition can occur.

Slide 7:

Continuing this general look at welfare inputs and husbandry systems, you can see that there is a range of systems and that some welfare problems are inherent to the system – as with beak trimming for hens kept in cages or large groups.

Typically, the choice of farming system is economic. In the case of intensive systems, the market for cheap food for humans is a huge economic pressure, because it may mean that the farmer has very small profit margins. This can in turn result in farming practices that create animal welfare problems. Some common examples are listed on the slide:

- intensive systems typically centre on a high growth rate or production per animal, creating metabolic pressure on animals' bodily systems
- to maximise profit margins, the farmer may need to keep as many animals as possible in a small space
- these high stocking rates and high production demands can in turn give rise to undesirable behaviours. This may then necessitate painful procedures
- a further problem may be that farmers try to minimise their daily overheads by reducing the number of stockmen employed. This may mean that animals are not monitored sufficiently, and it also makes it hard for the stock person to know the animals individually and maintain his/her empathy for the animals. For example, pig farms may have 1,000 sows looked after by one person
- there may also be inadequate veterinary care because the farmer cannot afford to call the vet. This is usually a false economy, as illness typically reduces productivity and, so, profit. It is also a welfare concern.

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Farmers may be under other economic pressures besides that for cheap food.

The first can arise with subsidies.

- For example, until 2006, sheep farmers in the European Union (EU) received a subsidy for each ewe they owned. The larger the flock, the larger the subsidy: farmers stocked as many sheep as possible on their land. To improve profitability further, some farmers reduced vaccination, feed, worming and the number of stock people. This resulted in severe welfare problems.
- That scheme has changed so that the subsidy is independent of sheep numbers. However, now the lack of automatic financial support in the context of low market prices may lead farmers to seek greater cost-saving, e.g. by increasing stocking density, or not seeking veterinary assistance with health planning.
- Meanwhile, the presence of subsidies makes it difficult for overseas farmers to compete. They may try to raise their animals under less favourable welfare conditions, in order to produce them cheaply enough to compete.

- So, you can see that subsidies can cause some farmers to create welfare problems in their livestock, in order to make a living.

Another economic pressure is the farmer's own resources.

- The weather or the occurrence of a natural disaster such as flooding can affect the availability and price of feed.
- An outbreak of disease can affect the productivity of the animals.
- Both the above cases could greatly increase the farmer's costs and may mean that he/she does not have enough money to hire qualified stock people, call the vet, or modify housing so that it provides more comfort to the animals. Therefore, animals may suffer directly and indirectly.
- In areas of the world where there is armed conflict, the national infrastructure and veterinary disease control can all break down, which further reduces the farmer's ability to care for his/her animals. The effect of war on animals is examined in Module 28.
- In poorer countries, economic aspects can put especially great pressure on individual livestock keepers. In 2011, the Food and Agriculture Organization of the United Nations (FAO) estimated that there are 766 million rural livestock-keepers who live on less than US $2 per day. The numbers are increasing in some regions such as sub-Saharan Africa, and Eastern Europe. Clearly, any disease outbreak, conflict or natural disaster can be devastating for those owners and make it impossible for them to care for their livestock.

Slide 9:

We've now seen that there are several different types of husbandry systems, all with the potential to affect the three areas of welfare for better or for worse.

We have also seen that direct or indirect economic pressure is one of the main reasons why animal welfare can deteriorate on any type of farm. Module 31 examines the role of economics on animal welfare more closely.

For now we can say that, as a vet, you cannot help these various economic factors. However, it is important to understand the factors that may apply in the region where you find yourself working.

We shall now look at the other two welfare inputs – the animal's genetics, and the stock person – to see how these can also affect livestock welfare.

Slide 10:

Genetics affect the inherent ability of livestock to adapt to their environment, whether to the climate or the husbandry system. For example:

- some strains of laying hens are not suited to free-range systems because they are naturally quite active in large groups. Therefore they are likely to peck each other in some free-range systems. However, the Colombian Blacktail breed typically has low pecking levels; as a result, it may not be necessary to trim their beaks if they are in cage systems, and they are well adapted to the large social groups found in free-range systems
- generally, in intensive farming systems, health traits have been under-emphasised in breeding, and production traits have been over-emphasised. This has created numerous welfare problems with health and behaviours, as we will see later on.

Slide 11:

In more extensive systems found in low-income countries, other genetic problems are a risk.

- First, in countries that are starting to become more prosperous, there is a risk that the drive to increase production may involve the uncritical adoption of 'exotic' breeds that are used in more intensive systems, but are not adapted to the local conditions. For example, an epidemiological study of 78 randomly selected dairy farms in Kenya found that Jersey cows were five times more likely to have foot-related lameness compared to local breeds and cross–breeds.
- There is also the risk of losing genetically well-adapted local breeds of pigs, small ruminants, etc., as there may be no short-term economic incentive to retain them.
- Meanwhile, among subsistence farmers who keep animals in small groups and allow them to mix freely (e.g. pigs in a village), there is a risk of in-breeding.

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The third welfare input that can affect animals in any husbandry system is the stock person. We have already seen how the quality of care may depend on economic pressures, especially if there are not enough stock people to care adequately for large numbers of animals in intensive systems.

Economic pressures may also affect human care, if a farmer does not have enough money to provide good-quality feed or appropriate mineral supplements, depending on the local soil.

Lack of income may also affect their use of medication. For example, farmers may under-dose with anthelmintics in order to save money. This can allow animals to become or remain parasitised, reducing their welfare.

Clearly, the stock person's knowledge can limit or enhance the possibility of good welfare. Particular issues include:

- their knowledge of genetic factors
- animal handling. If stock people are rough with livestock, the animals may be fearful, which is a negative emotional state. The animals' productivity may also be reduced. We will talk more about this in Modules 16 and 25, on animal slaughter and transport respectively. We will also look at it in Module 30, which is about human animal interactions
- his/her knowledge of biosecurity and disease control.

One welfare problem that can arise if the farmer is not knowledgeable is vaccination:

- the farmer may buy vaccines from you or the pharmacist or farmer's cooperative. However, the farmer may not transport them or keep them at the correct temperature, so they are inactivated. The farmers' animals will become sick despite being vaccinated.

Slide 13:

You now have an overview of the main welfare inputs that can create welfare problems in livestock in any farming system.

Because of the increasing use of intensive farming systems around the world, we shall now focus on the welfare problems that these can create. We shall first look at cattle, starting with dairy cows.

The following lecture, Module 11, will look at pigs and poultry, and then examine some possible solutions to these problems.

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The principal husbandry systems for dairy cows are either pasture-based or indoors. Indoor systems typically involve cubicle systems, or open yards of concrete or bedded with straw.

The cows are usually milked twice or, sometimes, three times each day, by machines that are placed on the udder by the stock person.

However, robotic milking systems are becoming more common. These operate automatically with no human supervision.

One of the most common dairy breeds in the intensive system is the black and white Holstein, or Holstein–Friesian cross, illustrated on the previous slide.

Slide 15:

The framework we shall use for considering the welfare of dairy cows is the one we outlined in Module 9. It is based on the Five Freedoms and was developed through collaboration among scientists from Latin America and the EU, in the Welfare Quality® project.

You may remember that the framework has four main welfare areas, with a total of 12 welfare criteria. This slide summarises all of them. Please take a minute to review them.

When we apply this framework to intensive dairy farming, we find a number of problems in each of the four main areas, as we will see on the next slide. Some of the problems overlap, and they are affected very much by genetics.

Slide 16:

The main welfare problems in dairy cows are:

- hunger, which is a result of the metabolic demand of lactation. That metabolic demand is inherent to the animal because it is a genetic trait
- housing discomfort. The criteria of resting area and ease of movement are often not met because of poor cubicle design. This can mean inadequate lying areas and not enough space when getting up within a cubicle
- health problems. All three welfare criteria in this area are often not met for dairy cows
- cows can suffer injuries to their lower limbs because of slipping and falling on concrete floors
- cows often have diseases during lactation. This may include painful diseases, notably mastitis and foot disorders, and metabolic diseases resulting from the metabolic demands of high lactation
- our third criterion in the good health area is painful procedures. These are not routine in cows but, in some countries, many farmers mistakenly dock heifers' tails to try to prevent mastitis. Docking is painful.

In the fourth area, appropriate behaviour, there are several potential welfare problems. Foremost is the number of negative emotional states e.g.

- separation from the calf soon after birth
- feelings of exhaustion from the metabolic demand of producing milk and having to ingest so much food, but often without enough comfort to lie down and rest
- feelings of frustration due to not being able to graze
- possible fear because of crowding and bullying by other cows, when accessing feed or cubicles, or waiting to enter the milking parlour
- possible fear from rough human handling.

You will learn more about many of these welfare problems in other parts of your veterinary training. Today, we will only highlight some important points.

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First, the problem of hunger.

- In the last 40 years, genetic selection for high production has increased the yield per lactation from approximately 3,000 litres in the Friesian, to up to 18,000 litres today in Holstein and Holstein–Friesian cows. That can mean an average of up to 50 litres per day, for around 320 days of the year.
- On grass, a cow can only eat enough to produce 25 litres of milk each day. However, her inherent metabolic drive is to produce 50 litres a day. This makes her hungry if she only eats grass, and it causes her to lose weight.
- To avoid this, the cow needs extra concentrated feed. However, her natural tendency is to graze instead so, to ensure she can obtain the concentrated feed needed for her high milk production, it becomes more cost-effective to keep her inside all the time.
- Even then, her inherently high milk production means that she is likely to be hungry some of the time while also having a very full gut, so her capacity to keep eating is limited. Also, she needs time to lie down and digest the food as well as simply to lie down and rest. These needs may conflict, i.e. wanting to eat in order to diminish hunger, while having a full gut, and while needing to stop eating and lie down.

We can see that in some systems the highest-producing dairy cows may experience a combination of hunger and exhaustion for much of the time.

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Another factor which can add to feelings of hunger and exhaustion is the use of artificial hormones to boost milk production and milk letdown.

The first hormone is synthetic bovine growth hormone (BGH), also known as recombinant bovine somatotropin (rBST).

- In some countries, it is available to farmers to inject every 14 days because it increases milk production by approximately 10–15 per cent at recommended doses, depending on the parity of the cow. Studies have tended to focus on this aspect of the treatment, but not so much on the longer-term effect of the treatment on the cow.
- Perhaps the most detailed and robust examination of the data was a meta-analysis that was performed by veterinary epidemiologists on behalf of the Canadian Veterinary Medical Association in 1999 (Dohoo et al., 2003a, b).

- Those vets looked at the randomised clinical trials submitted by the manufacturer in their licence application to the Canadian government. The researchers found that the treatment was associated with increased intake of dry matter, and loss of body condition. These factors suggest that increasing the cow's milk production with injections of rBST is likely to make her hungry, and it is impossible for her to eat enough to maintain her body condition and produce the larger amounts of milk.
- The study also found that the treatment reduced conception rates and significantly increased the risk of cows developing signs of lameness and sub-clinical mastitis.
- The researchers noted that there was sparse data on longevity and culling. However, many cows who are injected with rBST are culled within two years because they are diseased or metabolically 'used up'.
- For these welfare reasons and others, such as the high occurrence of reactions at the injection site, the use of rBST is illegal in some countries, including EU countries and Canada. However, its use is permitted in other countries where there may be a different balance of market forces, income level and consumer awareness of animal welfare.
- Another hormone which may be injected in dairy cows is oxytocin.
- Oxytocin is produced by the pituitary gland and increases milk letdown.
- Oxytocin production is inhibited if cows are stressed, and in countries where local breeds do not produce large amounts of milk, oxytocin injections may be used to maximise their milk letdown. This tends to increase milk production and contribute to loss of body condition, and to hunger if feeding is not sufficient.

Slide 19:

The second area of welfare concern in dairy cows is good housing.

In some climates, housing cows for some of the year is necessary in order to protect them from extremes of weather. Also, for the highest-producing cows, housing is necessary to ensure that they eat enough concentrate, as we have mentioned.

Cubicle systems are often used. These are relatively expensive and problems include:

- insufficient cubicles for the number of cows, causing cows to stand for long periods, especially subordinate cows and young heifers. This is difficult for cows who are lame, as we will see later on
- poor design. Other courses in your programme should examine housing in more detail. Two examples of poor design are:
  - cubicles are often too short or too narrow
  - there may be insufficient lunging space at the front – cows need space there to allow free movement of their head and forequarters when standing up.

All these problems may also arise if the cubicles are old and the farmer now has larger cows, or more cows.

Other problems with cubicles or open yards may be that there is little or no bedding, which can cause discomfort when cows are lying, especially thin cows who are producing milk in excess of the amount of energy that they can ingest.

Dirty bedding or concrete are serious problems too, because they predispose cows to mastitis. On the other hand, standing on wet concrete that has been washed down can predispose to foot disorders.

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This brings us to the third of the four main areas of welfare concern – good health. Again, there is an overlap with genetics and with feeding and housing.

- Silage is commonly fed to indoor cows. This results in wet, acid slurry. Also, feeding a lot of concentrates, which are high in protein, causes high concentrations of urea in urine. All these factors can result in soiled bedding and concrete. As a result: the cow may slip on the faeces, bruising or sometimes cutting herself, which is painful
- if cows stand in their urine, the urea and ammonium salts are keratolytic and cause softening and erosion of the claw and sole of the foot, which can predispose to infections and lameness.

However, using bedding to keep cows' feet dry can increase their risk of environmental mastitis, as the soiled bedding allows the bacteria concerned to multiply. Mastitis can be fatal and always reduces milk output.

Mastitis and lameness are very common welfare problems in dairy cows around the world, so we will now look at them further.

Slide 21:

Some farms have very low levels of mastitis, but others have very high levels of the disease, which is caused by bacteria in conjunction with multiple predisposing factors. You will learn more about these factors in other courses, but examples are:

- the cow's genetics
- the rise in cortisol at the time of parturition, which reduces the cow's immunity – as we reviewed in Module 6, when we looked at the stress response
- husbandry and hygiene, and the use of rBST.

This slide highlights two important welfare points about mastitis. The first is tail-docking.

- Docking the tails of dairy cows has become popular in some countries because it is assumed to help reduce mastitis by keep cows' udders clean.
- Research indicates that the procedure is painful, and may result in chronic pain. Moreover, research indicates that docking cows' tails does not improve udder cleanliness or health. Meanwhile, tail-docking prevents cows from removing flies elsewhere on their bodies.
- Therefore we can say that tail-docking is both unscientific and inhumane.
- Another point about mastitis concerns the growing number of automated milking systems – there are at least 8,000 in use around the world. Typically they are part of a very large-scale approach to dairy farming, sometimes with thousands of cows kept on lots.
- Research continues on the risks and benefits of automated milking for cow welfare. However, a review of the research available in 2011 concluded that udder health generally deteriorates during the first year or more after the introduction of automatic milking to a herd because the robotic system does not detect mastitis well or provide adequate milking hygiene.

Slide 22:

Lameness caused by foot disorders is also very prevalent in dairy farms around the world. As with mastitis, some farms have relatively low levels of foot disorders in the cows, but others have very high levels.

These disorders are caused by various bacteria and include ulcers on the sole of the foot, and digital dermatitis.

There are many predisposing factors such as genetics, metabolism, foot anatomy, husbandry and hygiene, and rBST.

Lameness indicates pain and is always a welfare concern. Moreover, lameness reduces milk yield and fertility, so it has both non-financial and financial costs. However, farmers may not recognise this.

Farmers' lack of awareness of lameness contrasts with their awareness of mastitis. Feedback from the dairy informs farmers if their cows are at risk of developing mastitis. Often, there are financial penalties if the milk indicates that the cows are likely to have the disease sub-clinically. Farmers are, therefore, usually very aware of mastitis in their cows.

However, British research has indicated that farmers are not good at detecting lameness in their cows. In a study of 222 farms, 90 per cent of farmers did not perceive lameness to be a major problem on their farm, although the researchers found that the average prevalence of lameness was 36 per cent.

This illustrates how 'bad' can become normal unintentionally. Part of the reason for this in the British study is that farmers did not have time to observe their cows walking, and did not know the signs of lameness. Given the efficiency pressures on dairy farmers generally, it seems likely that this is a problem for farmers in other countries too.

Slide 23:

We now move on to the fourth area of welfare concern: appropriate behaviour. We have already outlined the negative feelings such as pain, hunger and exhaustion that many dairy cows may feel. They may also experience fear caused by rough handling. Module 30 on human–animal interactions looks more closely at the effect of fear. Very briefly, when dairy cows are handled roughly and are afraid of their handler, the stress response associated with their fear reduces their residual milk letdown. This reduction in their milk yield is an economic loss to the farmer.

In addition, dairy cows experience distress due to being separated from their calves, which typically happens within 48 hours of birth.

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Before we leave dairy cows, you can see that there are many welfare concerns.

As a vet visiting a dairy client, your work will include watching out for all these problems using your observations of welfare outputs and welfare inputs.

You can use your observations to work out why the bad welfare outputs may occur. As we have seen, often the causes may be a complex interaction of overriding economic pressure, unsuitable genetics and housing, none of which can be changed easily or rapidly. However, there will also be related aspects of stockmanship, which will be easier to change.

You will then need to inform the farmer of your findings and suggestions, and support him/her in making changes.

Slide 25:

Next, we shall look at some of the main welfare concerns in dairy calves. Again, we will use the four main areas of welfare.

Slide 26:

We shall start with good feeding.

Area 1: good feeding

- Hunger can arise in traditional rearing systems where calves are fed 10 per cent of their body-weight in milk from a bucket. When calves can suckle from their mother or have free access to a nipple-feeding system, they ingest much more milk and they vocalise less. Both these changes indicate that calves almost certainly feel hunger under the traditional system.
- Some veal production systems cause malnutrition. Male calves cannot produce milk; however, they can generate income if they are raised for veal (or for beef). In some veal systems, calves are fed only milk because the resulting iron deficiency reduces the myoglobin in their muscle, causing the muscles to appear pale. This pale meat typically has a high market value. However, it also reflects malnutrition, which is a welfare concern.

Area 2: good housing

Some veal production systems involve raising calves in individual crates which do not have enough space for them to turn around or move about. This causes muscle weakness, as well as social isolation.

The picture illustrates older calves housed in single stalls and fed from buckets. Such housing makes it easier to monitor each calf's growth and health, but does not address the welfare concerns we have just noted.

Slide 27:

Now we move on to discuss the third area, which is good health, in relation to dairy calves.

- Enteric and respiratory diseases are common in dairy calves. You will learn more about this in other courses in your programme.
- To give you a brief overview now: calves are typically separated from their mothers after 24–48 hours, mixed with other newborn calves, and then transported to market aged between one and three weeks. At the market, they are mixed with other calves, and transported to a new farm for rearing. These stresses of separation, mixing, interruption of food intake, and transport all cause fear, which leads to cortisol release, which tends to lower the calves' immunity, predisposing the animals to infectious diseases.
- A second welfare problem in the broad area of health is pain caused by routine procedures. These include disbudding, castration and branding. Some heifer calves may also undergo tail-docking, as we discussed earlier.

We have reviewed the pain pathway in other modules and it is outlined on this slide. Briefly:

- procedures such as castration, disbudding and branding cause tissue damage by pressure, cutting, and burning
- these noxious stimuli are detected by specialised receptors – the nociceptors – and the local nerves transmit this to the spinal cord
- from the spinal cord, the information is transmitted to the forebrain, where it is perceived as painful.

To manage pain fully, you need to use drugs that work at each stage of the pain pathway. Using several drugs may be too expensive for farmers. However, local anaesthetics can be very inexpensive.

Although local anaesthesia may only last one or two hours, it prevents the initial pain caused by routine procedures such as castration and disbudding.

Ideally, an injection of a non-steroidal anti-inflammatory drug (NSAID) should also be given at least once, to counteract the ongoing pain that results from inflammation of the tissues following castration, disbudding or branding.

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You will learn more about conducting these routine procedures in other courses. However, the current state of research suggests that the procedures are best carried out on calves in the first four to six weeks. This slide suggests the best methods in each case.

- Castration: use of a rubber ring, in conjunction with local anaesthesia.
- Disbudding: thermal or chemical cautery of the horn bud, with the use of local anaesthesia. Note that sometimes calves are allowed to mature with their horns, and you may be asked to amputate their horns. This is a very severe procedure for these older animals, and can cause a lot of pain if you do not use a combination of anaesthetic drugs. That is then costly for the farmer because of the animal's size. Therefore there are strong economic arguments for removing horns while the animal is very young, and before the horn bud has started to grow.
- Tail-docking: as we saw earlier, this has no scientific basis and offers no benefit to the farmer or the animal. However, rubber-ring docking in the calf is preferable to surgical amputation or rubber rings in the older heifer.
- Branding: this may be done by hot irons, or freezing the tissues using irons dipped in liquid nitrogen. Both methods are painful, and there has not been enough research to recommend a feasible way of reducing the pain. However, freeze branding is thought to be less painful than hot branding.

Other painful procedures which are carried out on calves are:

- inserting ear tags or notching the ear, or cutting the skin under the neck (wattling). These procedures are likely to be painful, especially if the instruments used are blunt. However, identifying cattle is important for ownership, disease control, etc. and, of all methods, ear notching and ear-tagging are the least traumatic for the animals
- rings or ropes may be inserted through the nasal septum of cattle and buffalo in some countries. This is painful, and continuous pulling on the nose remains painful so this should be avoided if possible. If practised, local anaesthesia should ideally be used.

Some heifer calves may also undergo tail-docking, as we discussed earlier.

As vets, you will have both the knowledge of and the access to pain-relieving drugs. You can educate your farm clients about how to prevent or minimise the pain of routine procedures. The pain pathway is reviewed in other modules and it is outlined on slide 27. Procedures such as castration, disbudding and branding cause tissue damage by pressure, cutting and burning. These noxious stimuli are detected by specialised receptors – the nociceptors – and the local nerves transmit the pain to the spinal cord, from where it is transmitted to the forebrain. Although local anaesthesia is not long-lasting, it is normally inexpensive and it prevents the initial pain caused by castration and disbudding.

Slide 29:

The fourth area of welfare concern is appropriate behaviour. The main concerns are:

- calves and their mothers vocalise when separated, indicating distress on both sides. However, if calves stay with their mothers, this reduces the amount of milk available for sale. Research indicates that the distress is less if calves are separated in the first 48 hours, once they have had colostrum and then some initial feeding. Moreover, calf distress is reduced if calves can suckle frequently from an artificial system
- dairy calves may also not have the opportunity to perform species-typical behaviours that are important to them. Typically these are:
  - lack of opportunity to suckle: this can cause calves to suck on each other, if they are in groups, or to suck the bars of their stall
  - lack of opportunity to graze – or to eat roughage if they are in milk-only veal production systems. The inability to perform grazing behaviour may give rise to stereotypical behaviour involving tongue movements (‘tongue-playing’). Note that cattle use their tongues to help them bite off grass and ingest it. However, the tongue-playing may also buffer the acid in the abomasum, by production of saliva.

A further area of behavioural welfare concern is fear, caused by rough human handling.

Slide 30:

If you are visiting a farm which is rearing dairy calves for veal or beef, or as replacement heifers, your welfare assessments can help your client.

As you now know, this means observing the calves, e.g. for signs of disease, cross-suckling, pain from routine procedures, etc. Then, you will need to observe welfare inputs and use the information to work out why problems may be occurring for the calves, and whether they can be changed.

Then you will need to discuss your findings with the farmer in a two-way dialogue, and to support him/her in making changes. Often there are good economic reasons for improving the welfare of calves, e.g. to save on the costs of treating disease and the indirect cost of reduced growth rates. Module 31 considers the economics of animal welfare in more detail.

Slide 31:

We shall finish by looking at the welfare problems that may occur in beef cattle.

Slide 32:

The principal husbandry systems for beef cattle are either pasture-based, or feedlots outdoors or indoors. Pasture systems can be very extensive, with calves suckling their mothers and weaning naturally. However, extensive beef systems are becoming less common. This is partly because the international demand for grain, soya, ethanol and other commodities – sold for human and animal feeds, fuel, etc. – mean that the land is not available for grazing. In other countries, there is limited agricultural land because of human development, and the climate may make it difficult to rear animals extensively.

When intensive systems are used, they involve calves who were born either from dairy cows, or from beef breeds. Typically the calves are bought from markets. After the first weeks of life on milk, the calves are weaned on to a combination of highly concentrated feeds and fodder, to maximise their growth rate. Growth promoters may also be used.

They are then kept in pens or yards which may have slatted floors so that urine and faeces drop through to pits underneath. There may or may not be areas with bedding.

Slide 33:

Again, we use the familiar framework of the four main areas of welfare to highlight the main areas of concern over the next few slides.

Area 1: good feeding

Hunger may result from competition at the feeding areas. However, ordinarily, good stockmanship and housing should make this a relatively low risk compared to the inherent problems of hunger that arise with dairy cows and bucket-fed dairy calves.

Area 2: good housing

- Discomfort may occur because of crowding, inadequate lying areas, or lack of protection from the weather, including shade.
- Some regions of the world where beef cattle are finished have a very hot climate which may also be humid. This can cause animals to suffer heat stress, and to have to pant in order to keep cool enough. It is important to provide shade.

Area 3: good health

- Respiratory disease is a serious problem in beef cattle in some intensive systems. You will learn more about this in your other courses: *Mycoplasma bovis* is one of the main causes of respiratory disease in beef animals kept in feedlots, and it may cause chronic disease.
- Lameness can occur in beef animals, in association with the use of β-adrenergic agonists as growth promoters.
- Examples of these drugs are zilpaterol and ractopamine. Typically, the drugs may be fed to animals during their last few weeks on the feedlot, to increase growth rates and the amount of lean meat in the carcass. However, excessive use of them tends to cause lameness, heat stress and muscle weakness, predisposing cattle to fall in the feedlot or during transport to the slaughter house.

Slide 34:

Painful procedures such as castration are a welfare concern in beef calves too.

- The presence of horns on beef animals can cause bruising of the meat, which is another reason that farmers may wish to remove them. In some countries, farmers may cut the ends off the horns in mature animals before taking them for slaughter. This is very painful and should be avoided by ensuring that calves are disbudded, or by using polled breeds.
- In some countries, beef heifers may be spayed transvaginally, to prevent them from becoming pregnant if they are mixed with uncastrated beef males. It is not clear how common the practice is, e.g. it has been used in Australia and parts of the USA. In some jurisdictions, it can be done by technicians without analgesia. The behaviour of heifers during and following the surgery indicates that it is painful.
- Dystocia can be a problem in cows who give birth to some of the larger, more heavily muscled beef breeds.
- The Belgian Blue breed has a double muscling gene. The cows of this breed, and cows of other breeds who are crossed with those bulls, may undergo severe trauma to the birth canal and subsequent infections, and obturator nerve paralysis, if they give birth naturally. Often Caesarean sections are planned for those cows, which can pose risks of retained placenta and increased risk of infection, but increase the likelihood that the calf will survive, while preventing harm to the mother in the short term. In the long term, though, subjecting cows to repeated Caesarean sections is very bad for their welfare.

The Belgian Blue is an extreme example, although the breed has been popular and the problems real. More generally, crossing dairy cows with some beef breeds may lead to oversized calves and puts calf and dam at risk during parturition. This is especially likely if a large beef breed is used to breed with dairy heifers, who are themselves still not fully grown. Clearly, careful stockmanship can avoid these problems. However, note that the farmer may still choose to risk the problem, because of economic pressures and the greater monetary value of the calf if all goes well.

Slide 35:

Area 4: appropriate behaviour

- In the fourth area, appropriate behaviour, there is a risk of negative emotional states in beef animals in feedlots. This can be caused by bullying if animals are overcrowded. There may also be fighting and distress when new animals arrive and are mixed at the start of the feedlot period.
- Lack of ability to graze and perform the full range of species-specific behaviours may cause frustration, and there may be fear due to rough handling. When beef animals are shipped for slaughter, they can suffer from a range of negative emotional states because of how they are handled. Modules 16 and 25 examine this more closely.

Slide 36:

Although more most beef production systems are intensive, it would be wrong to say the extensive systems do not raise welfare concerns.

By ‘extensive’, we mean several hundred or sometimes tens of thousands of cattle ranging freely in an area that might range from ~6,500 hectares to 1.6 million hectares. The farmer may need a helicopter in order to monitor his/her land adequately.

The main issues of welfare concern are shown in italics on this slide, as follows:

Area 1

- Prolonged hunger and prolonged thirst can occur under extensive systems, if the climate is very dry (e.g. northern Australia). When the cattle are very widely dispersed over hundreds of acres, farmers may feel unable to provide adequate food or water, or they may take it for granted that some of their cattle will die from thirst or starvation.
- Hunger may be made worse by overstocking.

Area 2

As extensively farmed animals live outside, housing is not an issue. However, it is important that they have areas to shelter from the wind, rain and sun.

Area 3

- Cattle living outside may be at risk of injury and death from predation by wild canids and other predators. Because extensively farmed cattle are dispersed over large areas, it may be many hours or days before the farmer finds a wounded animal.
- Tick-borne and other local diseases can be a hazard in extensively farmed beef cattle, and vaccinations and anti-parasitic treatments are needed to prevent them.
- Pain can be caused by castration, spaying and dehorning, as described earlier. Farmers often castrate and dehorn extensively farmed beef animals when they are relatively old, e.g. aged eight months. This is more painful than performing the procedure at a younger age. However, it may be difficult – and more stressful to the herd – to round up calves at a younger age.

Area 4

The area of human–animal relationships is the biggest concern in extensively farmed beef cattle. In particular:

- Without careful handling and stockmanship, animals can suffer severe fear and distress that can occur when they are mustered, and then handled for routine procedures. Exhaustion and heat stress are also a concern here.
- Similarly, fear of humans may make it difficult to treat sick animals, or to bring them in for hospitalisation and treatment.

Slide 37:

You now have an overview of how welfare inputs can affect livestock welfare. You have seen that bad welfare outputs are related to inherent problems with the farming system concerned, or with genetics, as well as stockmanship.

You also have an overview of the common welfare problems seen in intensively farmed cattle. Examples have included:

- exhaustion and painful diseases in dairy cows
- the inability of dairy calves to suckle
- painful procedures in dairy and beef calves.

You also know how to use the four-point welfare framework to assess if those problems are present on a farm.

A final point is that the World Organisation for Animal Health (OIE) has a Code for Terrestrial Animal Health. This Code includes animal welfare specifically, and it provides minimum standards for the care of livestock. You can find the Code online.

In Module 11, we will look at the main welfare problems seen in pigs and poultry, and at some general solutions to the welfare problems seen in intensive livestock production.