4

Cattle behaviour

This chapter discusses the details of cattle behaviour (in other words, what cattle do) such as the relative importance of the five body senses, the various ways stock communicate with each other and their keepers and behavioural problems arising from clashes with their environment.

The main points of this chapter

- Of the five senses cattle possess, sight is the most dominant. Hearing and smell also play important roles in how cows assess their environment.
- As a prey species, cattle have an inherent fear of unfamiliar objects, situations, smells, sudden movements and noises. As well they can experience fearfulness in situations where they are solitary or isolated. Understanding this is critical to managing them in a low stress manner.
- Cattle are less expressive of pain and injury than humans. Therefore, behavioural indicators of pain that cattle do express are subtle. An animal experiencing pain has compromised welfare, and consequences to their health and productivity are also likely.
- The presence of stereotypic behaviours indicate that a cow is in a compromised welfare state, and is feeling frustrated at the inability to behave naturally. In cattle, oral stereotypies, which relate to nutritional and foraging deficits, and ambulatory stereotypies, the result of restricted movement, are common.

- The intensification of cattle housing, feeding and management contributes to behavioural problems not seen in grazing animals. Frustrations lead to some cows engaging in often repetitive and pointless (stereotyped) behaviour that can be interpreted as a reflection of reduced activity, hence restricted normal behaviour, in intensively managed housing systems.
- Tongue rolling and bar chewing are two classic stereotype behaviour problems. Nymphomania, silent heats and extreme aggression towards humans are other behavioural problems in intensively managed cattle.
- Feeding vices can be attributed to boredom following a too rapid satisfying of their nutritional needs. These include dropping feed, feed throwing and water lapping.
- The behaviours of cows will change in response to the situations they are in and the handling they experience, resulting in an increased or decreased frequency of common behaviours.
- The behaviour of the cow handler has an enormous impact on cow behaviour, welfare and performance. Negative behaviours produce more fearful cows. Positive behaviour will lead to a relaxed herd of cows that are easier to handle.
- A good handler with a considerate, calm and positive attitude towards cows can lead to 20% higher milk yields over a handler with a poor attitude.

The behaviour of domestic cattle has evolved over a long time, initially in response to their domestication as discussed in the previous chapter, but more recently in response to more subtle changes in their handling, feeding and herd management as they have become more exposed to the intensive practices of modern day dairy and beef cattle farming.

4.1 The development of cow behaviour

The behaviour of cattle is determined by instinct, sensory perception and experience. Instinctual behaviours refer to those that the cow is naturally motivated to perform. Sensory behaviours are those that are the result of something heard/seen/smelt/felt in the environment.

Examples of these different types of behaviour include:

- Instinct or innate, fully developed and complete at first appearance; suckling and standing at birth, those rhythmical behaviours fundamental to the life process (such as breathing and defecation) and freezing or baulking in response to an unfamiliar noise or object. Baulking is when the animal flinches and ceases movement, that is, it is resisting what it is being led to do.

- Conditioned learning or learning by experience, which can be positive, negative or neutral; drinking milk from a bucket, mounting behaviour during copulation, eating concentrates from an out of parlour feeder, responding to a feedout wagon, milk letdown during milking as well as responding to a handler. Much of this occurs as the result of sensory perception and investigatory behaviour when cattle are first exposed to an unfamiliar environment.
- Many behaviours are a combination of these influences. Mounting behaviour during copulation is a good example of this, with the novice bull being instinctually driven to attempt mounting, but the technique of mounting improving with experience.

Breeding programs to select for product-specific livestock can alter stock's physical and possibly behavioural attributes. For example breeding beef cattle for high lean meat content, such as producing 'double muscled' stock, can adversely impact on the natural delivery of calves during parturition, while selecting for rapid growth can lead to genetic leg disorders. With regard to dairy stock, selection for high milk production has reduced the meat producing attributes of their offspring, while the high nutrient demands for milk production often leads to lactation anoestrus (or delays in oestral cycling in newly calved cows). Furthermore, the oestrus cycle can be manipulated artificially through exogenous hormone implants.

Genetic selection for tameness has continued long after animals have been domesticated due to increased culling rates of stock that are difficult to handle. But the increased mechanisation of animal farming has shifted the target for artificial selection towards efficiency of production rather than handling ease. Selection of dairy stock for more intensive production may have produced more nervous and aggressive animals making them more difficult to handle.

Such intensive breeding programs can reduce the genetic variability within a species with unexpected consequences. For example, Phillips (2002) argues that the recent outbreak of 'mad cow disease' in the UK could be partly attributed to the increased susceptibility to the disease due to the lack of genetic diversity in the country's population of Friesian dairy cows, as a result of intense selection for high cow performance. Such are the unpredictable impacts on cattle survivability. This was then impaired animal welfare brought about by too much emphasis on economic performance.

Vices develop, such as tongue rolling as a result of the thwarting of natural behaviours and such abnormal behaviour appears to be under genetic control (see the following section). It may in fact be possible to breed stock that do not perform these abnormal behaviours and this could result in improving their welfare status because they do not find the environment as frustrating. However, some of the abnormal behaviours noted may provide relief from frustration and thereby

improve the animal's welfare. The fact that these behaviours exist in the first place, however, are indicative of a welfare issue that needs to be addressed. The behaviour of domesticated stock seems to be more flexible than their wild ancestors and could include the capacity to develop such stereotypies as part of their coping mechanisms in our modern day, and often less animal friendly, production systems.

Cattle are social animals. Forming a herd reduces the risk of predation by leaving large areas of grazing land open and reducing the chance of a predator seeing an individual animal or picking up its trail. In addition, predation is reduced by the rapid flight of large numbers of animals in random directions thereby confusing the predator. Also the opportunity of members of a herd learning survival tactics is increased through social facilitation.

Cattle are animals that fear novelty but become accepting of a routine. They have good memories and stock with previous experience of gentle handling will be easier to deal with than stock with a history of rough handling. A better understanding of natural behaviour will facilitate handling. Being prey animals, fear motivates them to be constantly vigilant in order to escape from predators. When cattle become agitated during handling, they are motivated by fear. Calm animals are then easier to handle. Fearful animals stick together making handling more difficult. If cattle become frightened, it can take 20 min for them to calm down.

Although cattle are creatures of habit, gentle dairy cows can easily be prompted into movement that is dangerous to both the animal and handler by the use of unnecessary severe methods of handling (such as shouting and electric prods) and restraint. Attempts to force an animal to do something it does not want to do often end in failure and can cause the animal to become confused, disorientated, frightened or upset. Handling cattle requires them to be 'outsmarted' rather than be 'outfought' and they should be 'outwaited' rather than hurried. Most tests of will between the handler and the cows are won by the cow.

Recent management practices that have improved comfort and wellbeing in dairy cows include:

- raising calves in comfortable pens or shelters, including contact with other calves
- providing exercise before calving
- grooving or roughening polished, smooth concrete flooring to prevent slipping
- making use of pasture or earthen exercise lots and removing slatted floors
- eliminating stray voltage.

When cows ruminate, they appear relaxed with their head down and their eyelids lowered. Resting cows prefer to lie on their chest, facing slightly uphill. Also, through cud chewing as well as mutual and self-grooming, aggression is reduced and there is little or no boredom.

Females of dairy breeds on heat are reputed to mount more than those of beef breeds. It has been argued that this is the result of greater selection for this trait in

systems where males are largely or completely absent (Chenoweth and Landaeta-Hernandez 1998). The widespread use of artificial insemination in dairy herds may have led to unplanned selection for cows showing overt oestrus behaviour because those showing weak signs of oestrus would be less easily identified and therefore inseminated.

In feral cattle, herd social organisation usually takes the form of groups of mothers and offspring, and bachelor groups of bulls grazing separately. These groupings are related to the dominance of the stock within each one and so are often called social dominance groups. Dominant bulls join the cow herd when there are oestrous cows, which is their signal for mounting behaviour. In domesticated cattle these social dominance groups are replaced by groups of cows and growing cattle, usually divided into similar age and single sex groups after about 6 months of age. Bulls kept for reproduction may be solitary confined for much of their life, or they may run with the herd of cows or even be rotated between herds. These changes in social structure from the natural groupings and the intensive husbandry methods used, increase social tension. With growing male cattle or bulls, the stresses of close confinement may make them difficult to manage safely without danger to the stockperson, with castration used to improve their temperament by reducing aggression.

As cattle handlers, it is important to understand both innate behaviours of cattle and how our actions can modify their responses. This chapter aims to outline both of these fundamental principles that have such an important impact on how cattle behave.

4.2 The five senses

4.2.1 Vision

Vision is the dominant sense in cattle and is responsible for about half of the sensory information they receive from their surroundings. Cattle have a 330° vision, of this visual area, they have binocular vision for a limited area in front of them. This is where they will have the clearest vision and ability to judge depth or distance. In order to get the best possible vision, cattle will lower their head and face the stimulus of interest front on.

The rest of their visual field is monocular. This large monocular area is very good for detecting predators, but they cannot judge distance here well. Because of this poorer depth perception here, it is best to approach a cow from the side, but moving at a slow pace. This will not spook the cow and allow you to approach more closely than front on.

The remaining area around the cow is referred to as the blind spot. This is the area directly behind the cow's tail. If you approach the cow from her blind spot she

will not know you are there. Suddenly moving into or out of this position can upset the animal and lead to flighty and unpredictable behaviour.

Cattle are less able to discriminate objects that differ in light intensity and cannot see red colours as well as humans. This increases their colour contrast, making shadows look more extreme compared to how we perceive them. Paired with limited depth perception, a block of shadow can look like a hole in the ground to cattle. Shadows, very bright light and sparkling reflections will distract or slow down cattle investigating their surroundings, often upsetting the smooth flow of cows in a laneway. Cattle are also motivated to move from areas of low light to well lit areas. Conversely, they will avoid moving from well lit to dark areas.

Taking cattle's visual sense into consideration is very important when trying to move them. In both free moving and tethered cattle, moving them can be much easier if lighting is even, the area free of distracting and unfamiliar objects, and you don't make sudden, significant movements.

4.2.2 Hearing

Cattle are very sensitive to high frequency sounds and have a wider range of hearing than humans (a human's auditory range is from 64 to 23 000 Hz, cattle's from 23 to 35 000 Hz). Despite having a greater range of auditory detection than people, cattle have greater difficulty in locating the origin of sounds and will use their sight to assist them determine the source. High pitched noises such as whistling are also unpleasant to cows. Intermittent sounds such as clanging of metal (e.g. gates), shouting and whistling can be particularly stressful, especially if they are sudden and at a loud volume.

4.2.3 Smell

Due to their evolution as prey animals, cattle have a very acute sense of smell. Cattle select their feed on the basis of smell and can detect odours many kilometres away. They will avoid places containing urine from stressed animals, and for this reason may be reluctant to enter places where cattle have been previously handled such as raceways and cattle crushes. They dislike the smells of dung and saliva, so when housed, their feeding area needs to be kept clean and smell fresh, not contaminated with dung, saliva or exudate from other cows' noses. Herd hierarchy is strongly linked to smell, as shown by studies where the social order among cows was unaltered by blindfolding them.

As well as a sensitive nose, they have an additional olfactory sensitive organ, called the vomeronasal organ, on the roof of their mouth. The reception of odours by this organ is used for the reinforcement and maintenance of sexual interest. When seeking and finding a suitable cow on heat, this is characterised by the 'flehman expression' in mating bulls, in which the head is directed upwards with the mouth ajar, the tongue flat and the upper lips curled back. This is thought to

aid odour sampling by allowing air to contact the roof of the mouth during inhalation. Bulls appear to increase their olfactory behaviour about four days before cows show signs of oestrus.

The production and detection of pheromones is another way cattle seek out suitable stock for mating. For this reason, cows on heat spend much time sniffing and licking the anal and vaginal areas of other cows. Other pheromones convey fear. Cattle respond to pheromones produced in fearful situations by increasing their own physiological stress response and fear behaviours. Cattle are also sensitive to the odours of potential predators, like dogs, spending more time sniffing the air and in cautious movement. In comparison to humans, cattle are able to detect much smaller differences in odour concentration.

4.2.4 Taste

There are four primary tastes identifiable in cattle. These are:

- sweetness (associated with energy supply)
- saltiness (associated with electrolyte balance)
- bitterness (assists to avoid toxins and tannins that reduce the nutritive value of plants)
- acidity (linked to pH balance).

The taste receptors are located in specific areas of the tongue, with differences between cattle and humans in their taste discrimination, sensitivity and location on the tongue. Cattle have two to three times as many taste buds as humans, and so are more sensitive to tastes. Cattle can be apprehensive when it comes to eating novel food – feed with unfamiliar tastes and smells. For example, they need artificial sweeteners to mask bitter tastes such as zinc in water.

4.2.5 Touch

Skin receptors are used to detect pressure, movement, temperature and some damaging pathological conditions such as inflammation. Humans have increased sensitivity in their fingertips whereas cattle often use their extended mouth as a sampling tool in exploratory situations.

Cattle perceive extreme ambient temperatures, relative humidities and/or wind speed through thermoreceptors, skin dryness (particularly in the throat and nasal passages) and mechanoreceptors. They learn their comfort or thermoneutral zones, above and below which they must use physiological processes to sustain their core body temperatures. They then modify their behaviour accordingly, such as seeking cooler locations during hot weather to find more favourable microclimates. As the lower critical temperature of adult cows is –23°C, they are rarely affected by cold stress. Heat stress is a common problem, at 21°C cattle increase their respiration rate, and at 25°C, above which they reduce feed intake to reduce metabolic heat

production from rumen fermentation. Breed differences also influence the susceptibility of cattle to heat loads. Factors like higher metabolic rate, greater amounts of body fat and thicker coats all increase the likelihood of cattle suffering from heat stress. These breed differences are important considerations in the tropics.

Cattle can readily detect low-level electric current, which often exists in milking parlours where wet conditions and connection of machinery to their udders make cattle prone to stray voltage. As the resistance provided by humans is two to 10 times greater (depending on footwear), the level of current that will disturb cows is much lower than it is for humans.

4.3 Behavioural indicators of poor welfare

The intensification of cattle housing and dairy cattle management contributes to behavioural problems not seen in grazing animals. Restriction of normal behaviours due to the production systems imposed on them are most frequently at the root of behavioural problems in cattle. Cattle, as with other domesticated species, have fewer behavioural problems when left in their natural environment. Therefore, there is a concern that intensive management has resulted in the decline of the animal's wellbeing. In some cases, the way that stock behave is the only clue that discomfort and distress are present. This can be even more subtle with tethered animals.

4.3.1 Pain and its detection

While pain detection is related to touch, we have included it here in a separate category because it is of major importance to cattle welfare.

Cattle have similar mechanisms for sensing pain as humans do, with responses increasing with the magnitude and duration of the stimuli. Situations cattle are in can influence their responsiveness to pain. Pain is reduced in cattle kept with herd mates (known as conspecifics) and greater when cows are isolated. Being aware of this factor when conducting any painful husbandry practices is important.

Cattle are less expressive of pain and injury than humans. This is an evolved mechanism, with it being disadvantageous for prey animals to express pain or weakness, as weakness makes them an easier target for predators (Phillips 2002). Therefore, the behavioural indicators of pain that cattle do express are subtle. An animal experiencing pain has compromised welfare, and consequences to their health and productivity are also likely.

Common behavioural indicators are as follows:

- Abnormal stance and gait. Stances indicating pain may include a tucked abdomen and tail, hunched back or standing still for extended periods of time. Abnormal gait can include unusual walking patterns (e.g. walking backwards), or uneven weight bearing, as seen when a cow is suffering from lameness.
- Unusual resting behaviours. Lying with legs in an unusual position and a hesitation to rise when lying may indicate pain. Dog sitting may occur when

the animal is trying to keep the painful area off the ground while trying to rest (see Figure 4.4).
- Vocalisations. These can act as a warning to other cattle to avoid a painful situation, or an involuntary response to painful stimuli. Anecdotal evidence suggests that Asian cattle vocalise less than Western breeds.
- Kicking and tail swishing. Both may be performed in response to acute pain and may be directed towards the painful stimulus.
- Very subtle indicators. These can include teeth grinding, reduced food intake and an absence of rumination.

Some of the above examples are indicative of specific painful experiences, while others are more general. In many situations of compromise, the provision of pain relief will improve the animal's welfare and recovery.

4.3.2 Fear and its implications

Fear is the response to a real or perceived threat and serves to protect the animal from danger. As they have evolved as prey animals, cows are naturally reactive or fearful in several different situations, including a fear of novelty. As a result cattle can find unfamiliar objects, situations and smells and sudden movements and noises frightening. This is exacerbated when they are solitary or isolated. It is for this reason that gentle handling, repeated exposure to situations or environments and a consistent routine can help to create calm animals. Improved cow movement and milk yield are measurable benefits arising from 'cow friendly' facility design and stock handling practices.

In the same way that cows can learn to become relaxed if they are treated well and exposed to stimuli in a consistent, calm way, they can also learn to fear an environment, situation or handler. Below are examples of situations that commonly elicit fear in cattle. Repeated exposure to these sorts of events will result in cattle displaying fear in anticipation of a situation. As a result, they will be more flighty and difficult to handle. With gentle handling and routine, cows will be easier to move, easier to milk, and will let down more milk.

Examples of fear-eliciting situations are as listed by Klindworth *et al.* (2003):

- Sudden movements or noises are very threatening to cows. Moving and handling animals in a calm, quiet way can significantly reduce fear. Associated fear behaviours (such as startling, baulking, fleeing) can result when cattle interpret some relatively common situations as threats, such as heights, sudden movement, sudden noises, threatening or aggressive actions, prolonged eye contact and large or towering objects. These evolutionary threats can be minimised through good dairy and shed design and thoughtful stock handling.
- Cows can find novelty fearful, and are generally afraid of sudden changes to facilities and routines. Keeping environmental features such as lighting, floor

surfaces or levels, and fences or wall types as consistent as possible will help to reduce fear. If cows become fearful in a new situation, try and allow them some time to familiarise themselves with the new environment before introducing further changes or other stressful procedures. Rushing cows when they are slow because of novelty (and so are fearful) will exacerbate the issue.
- Cows will fear humans if handled poorly and they associate this poor handling with the place where it occurred. Using the cows' natural behaviour to guide handling and other interactions will minimise fear responses.
- Fear can make handling and milking harder, more time consuming and more dangerous. It can also delay milk letdown (for up to 20 min) and reduce milk yields (by up to 20%).
- Fear responses during movement make cows more prone to slipping, falling and injuries (e.g. pelvic and hip injuries due to falling, hoof injuries during slipping leading to lameness, for example) and compromise their welfare.

Improved cow movement and milk yield are measurable benefits arising from 'cow friendly' facility design and stock handling practices.

4.3.3 Descriptors of cow behaviour

A wide variety of terms can be used to describe cow behaviour, such as the 20 used by Welfare Quality (2009) in their welfare assessment protocols. These are listed below in decreasing order of positive emotional state:

Happy, content, positively occupied, friendly, relaxed, calm, active, sociable, playful, lively, inquisitive, uneasy, bored, indifferent, fearful, apathetic, frustrated, agitated, distressed, irritable.

When describing antagonistic behaviours, Welfare Quality (2009) use the following descriptors:

- *head butting*; which occurs with physical contact where one animal is butting, hitting, thrusting, striking or pushing the other animal with forehead, horns or horn base with a forceful movement; the receiver does not give up its present position
- *displacement*; which is physical contact where one animal is forcing the other animal to give up its position
- *chasing*; where one animal makes another animal move
- *fighting*; where two animals push their heads against each other while planting their feet on the ground with both exerting force against each other
- *chasing-up*; where one animal uses physical contact against a lying animal to make it rise.

4.3.4 Stereotypic behaviours

Stereotypic behaviour is a term applied to repeated sequences of a behaviour that has no apparent purpose or benefit and is caused by the frustration of natural

behaviour patterns or repeated attempts to deal with some problem (Mason and Rushen 2006). These are behaviours that have replaced natural ones that have been repressed by the artificial conditions of management. Compared to non-ruminant species such as poultry, cattle generally display fewer stereotypic behaviours when kept intensively. The more restrictive the management, the higher the frequency of their occurrence. Different species perform different stereotypies, and the type of stereotypic behaviour usually relates to the root cause. In cattle, these are usually oral stereotypies, which relate to nutritional and foraging deficits. Ambulatory stereotypies, the result of restricted movement, are also common. Tongue playing or rolling, bar biting, prepuce or scrotum biting and urine drinking are behaviours commonly referred to as stereotypies in cattle.

Oral stereotypies are common in cattle when kept intensively because they no longer perform the long amounts of grazing and ruminating that they would when on pasture, which accounts for more than 9 h of their time budget naturally (Mason and Rushen 2006). With tongue rolling or tongue playing, the animal curls and uncurls the tongue inside or outside their mouth. After that, partial swallowing of the tongue and gulping of air may take place. In addition to this, object licking and bar biting are common. Bar biting consists of clamping the jaws around a bar and moving the head back and forth while chewing on the bar.

Along with restricted grazing, ambulatory stereotypic behaviours develop as a result of tethering. Tethered cattle show pacing and swaying behaviours, suggesting frustrations with an inability to move. Swaying is particularly prevalent and has been reported in up to 20% of the tethered herd (Blaszak 2011).

Research has shown that a combination of oral and ambulatory stereotypies have been found to occur in previously grazed cows that were then continuously tethered over many months (Albright and Arave 1997). These behaviours were linked to frustration resulting from a greatly reduced opportunity for activity (walking) along with reduced psychological and physiological contacts and the manipulation and processing of their feed. Environmental stimulation in the form of 1 h of exercise (e.g. loose in a pen area) each day can reduce incidences of bar biting in tethered cows, while tongue rolling ceases altogether following the transfer from tethering to loose housing or grazing. The provision of straw or hay, which increases chewing and ruminating time, is recommended to combat this.

Such oral manipulation, tongue playing and non-nutritive sucking is also very apparent in veal calves that are individually stalled and only fed milk and concentrates. Feeding long hay reduces such abnormal behaviour in stall fed calves while they are absent altogether in calves suckled by their dams and grazed for 6 h per day (Albright and Arave 1997). Housing calves in pairs or small groups will also reduce the incidences of stereotypical behaviour, and address their other behavioural needs (see Chapter 3).

Grandin and Deesing (1998) considered tongue rolling to be a relatively new abnormal behaviour and mainly apparent in intensively managed (generally lofted)

Friesian beef steers and dairy heifers and cows. They also considered it may need to be performed to satisfy their instinct of prehension of forage plants during grazing as it is seen most frequently immediately before and after feeding. As well as rolling their tongues with their mouths open, these cattle excessively lick every surface in the feedlot pen, such as fences and gates. Grandin and Deesing (1998) attributed this phenomenon to overselection for high levels of milk production in Friesians. In order for Friesian steers to maintain such high growth rates, or for Friesian cows to produce large volumes of milk, they must consume large quantities of feed, for which they have been genetically selected for large appetites. This pointless licking of fences and gates might be a precursor to more serious problems if genetic selection for the highest production is continued. These authors also pointed out that Friesian steers on high grain rations tended to have more bloat than beef steers on similar rations. In addition to bloat, they reported grain-fed Friesian steers to have higher levels of sudden death than beef cattle. Grandin and Deesing (1998) then interpreted these observations as a caution in that intensive genetic selection programs for high performance may need to be more seriously considered in the light of these ongoing concerns about animal welfare.

In addition to tongue rolling, prepuce sucking and urine drinking are frequently observed in intensively managed fattening bulls. In one study, incidence of these behaviours were very high for urine drinking (53%), sucking and licking and biting of ears (44%), sucking and licking of the prepuce or scrotum and tongue rolling (38%) and licking and biting of tails (1%). Such high incidences of abnormal behaviour were associated with too little space per animal, rations with no dry forage and difficult access to water. Despite being offered sufficient feed of high quality and adequate drinking water, tongue rolling is still apparent, even in well-managed dairy farms in SE Asia.

The presence of these stereotypic behaviours indicate that a cow is in a compromised welfare state, and is feeling frustrated at the inability to perform natural behaviours. As indicated in the examples above, simple modifications to the animal's environment will reduce these behaviours and improve the animal's welfare.

4.4 Animal movement

4.4.1 Flight zone and point of balance

The flight zone is the area around an animal that if penetrated will cause the animal to move or flee. It specifically relates to stimuli that the animal considers to be threatening, and it extends around the whole animal. Entering the flight zone will cause the animal to move, as it aims to re-establish a safe distance between itself and the perceived threat. Because the animal's senses are concentrated towards the reception of signals from the front, the flight distance is greater in

front of than behind the animal. The flight zones of cows differ between individuals, and are influenced by things like environment, temperament, age and previous experience. The flight zone of a cow will also change depending on the situation they are in. Novel and stressful situations will increase the flight zone of the animal, as will unfamiliar people. As they become habituated or relaxed in a situation, the flight zone will reduce. The pace at which you enter the flight zone will also influence the cow's behaviour. Rapidly moving into the flight zone will stimulate the flight response of cattle, whereas gentle movement will still cause the animal to move away, but it will do so more slowly. Figures 4.1, 4.2 and 4.3 provide a graphical depiction of the flight zone and point of balance.

Generally, the flight zone of loose housed cattle in large-scale commercial dairy herds is 3 to 5 m, although it could be smaller on smallholder farms where the stock are handled more frequently. Permanently tethering milking cows is also likely to reduce their flight zone because of their more frequent contact with people, and the animal knowing that it cannot move away. In intensive systems, the flight distance is by necessity reduced, compared with, for example, an open range. Dairy cattle have a smaller flight distance than beef cattle. This would have resulted from more frequent handling and interaction with people, on dairy farms compared to beef farms, and genetic selection for closer flight zones during the

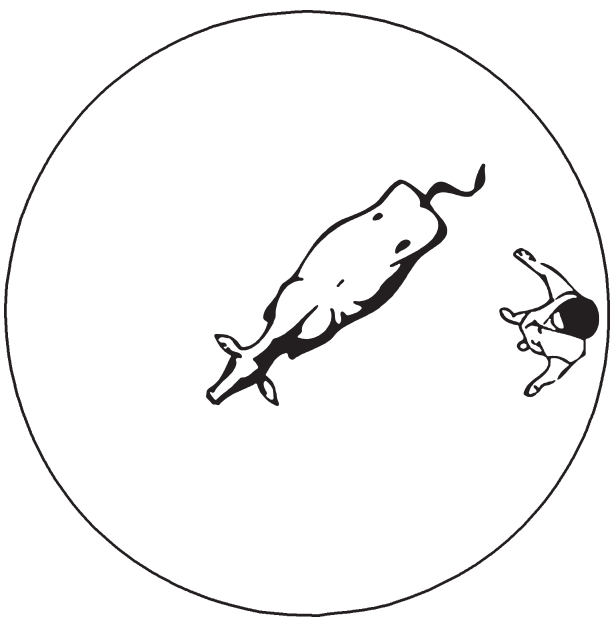

Figure 4.1: Flight zone: the flight zone of a cow is an invisible boundary around the animal and is the minimum distance that the animal feels safe from you. Moving into the flight zone will cause the animal to move as it tries to re-establish this safe distance.

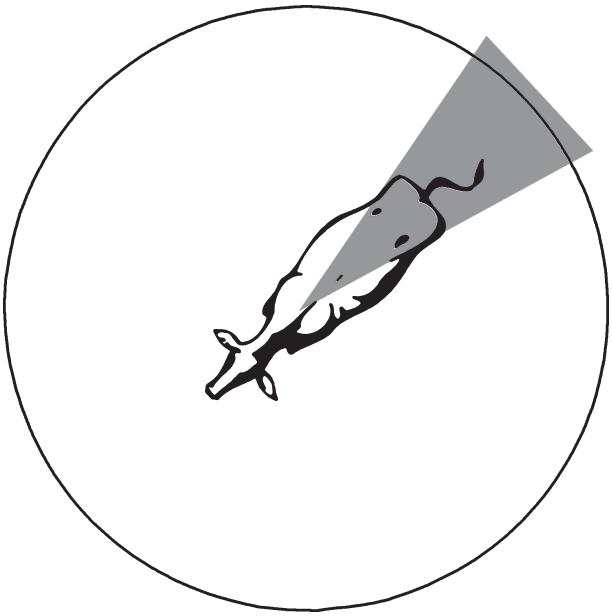

Figure 4.2: Blind spot: the cow cannot see you if you are in her blind spot. Sudden movement in this area will cause her to startle.

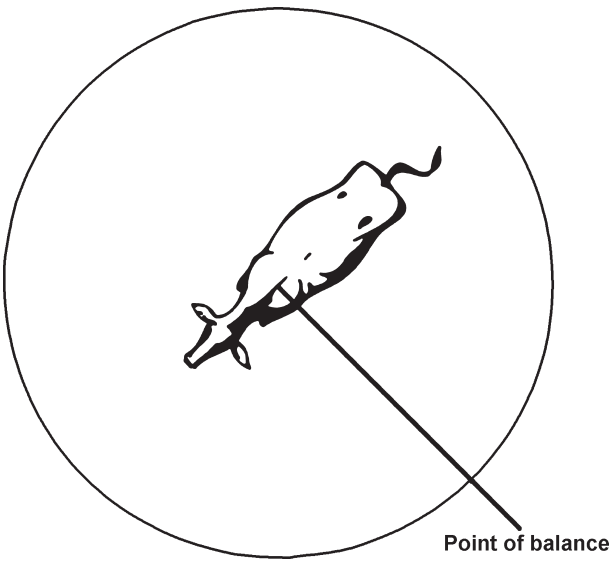

Figure 4.3: Point of balance: moving into an animal's flight zone in front of this point of balance (in front of the shoulder), will cause the cow to move backwards. Moving into an animal's flight zone from behind this point of balance will cause the cow to move forwards.

domestic evolution of dairy cattle. In the same way that fearfulness can either increase or decrease with experience, the flight zone will depend on the animal's history. Cows that have positive handling experiences will have a smaller flight zone than those with negative experiences.

4.4.2 Individual animal movement

In cattle, this flight zone can be used successfully to aid animal movement. Entering the flight zone will encourage the cow to move, to re-establish it. The direction and posture by which you move into the flight zone will influence how the animal moves. The handler's position and direction of approach in relation to the cow's 'point of balance' determines the direction the cow will move in. The point of balance is an imaginary line through the animal's shoulder.

If you enter the flight zone from in front of the cow (in front of the point of balance) it will cause her to move backwards. Entering from behind the shoulder (behind the point of balance) will cause her to move forwards.

Animals tethered by the nose or halter are conditioned to move in response to leading. They are prompted to move by the forward movement of the handler, effectively the opposite to the point of balance and flight zone described above. When moving a tethered animal it is important to keep in mind stimuli that will cause an animal to baulk. Loud noises, unfamiliar sounds and sights, will all cause an animal to stop moving. Pulling too hard on the tether can be both painful to the animal and futile for you. Avoiding these fear-inducing situations or slowly and calmly leading cows through this area is a better option. A cow that is comfortable with its environment and handler should move easily when required.

4.4.3 Herd movement

When untethered, the forced movement of cattle initially creates an order unrelated to dominance, because the dominant animals are interspersed throughout the herd. However, subordinate cattle gradually move to the front on the herd and the most dominant animals stay in the middle, leading the herd by 'pushing' rather than 'pulling'. There is also a reluctance to be at the back of the mob, as these animals are the most exposed and closest to the human (or predator) driving them.

When moving the herd, keep in mind that cattle will naturally group and move together; movement of other cows triggers the next cows to move. The pace at which you push the herd will influence the pace of their movement. A slow, consistent pace is best as this ensures safe movement, reducing the risks of injury and lameness, or of causing panic in the herd.

Calm people have calm cows and calm cows give more milk and have fewer problems such as hoof conditions. It is important to let cows move at their own pace because hurrying them up achieves little else other than making the last few cows in a group nervous. Cows generally walk in some order of rank and do not overtake

each other. When they are calm, they keep their heads down so they can see where they are placing their feet. They only lift their heads when they become nervous. Since cows are creatures of habit, they like to learn exactly what is happening, what they have to do and when. So it is important to have patience to allow routines to develop, then rigidly stick to these routines. A group of cows moves like a flowing stream, so to prevent this stream from being interrupted, it is important to avoid obstacles, passageways with dead ends and things that make cows feel afraid.

4.5 Social behaviours

Cattle are social animals and have evolved to live in herds in a strategy to reduce the risk of predation. Grazing in open areas increases the risk of predation, and group living increases the likelihood of predator detection to compensate. Another protective element of herds – the rapid flight or stampede of large numbers of animals – confuses predators during attack. The opportunity of members of a herd learning survival tactics is also increased through social facilitation.

Importantly, this evolution of social behaviour means that isolation is particularly stressful to cattle. Isolation can cause animals to be distressed and panic, increasing the likelihood of injury to both the individual and handler. The effect of isolation is additive or compounding, with animals being more stressed during husbandry procedures when isolated. Therefore, it is always best to keep several animals together during activities like veterinary treatment, artificial insemination or movement from one place to another.

4.5.1 Visual communication

Visual signs are one of the main methods used by cattle to communicate, particularly to indicate aggressive and reproductive states (discussed below). For tethered animals, the ability to express these methods of communication are limited, as a result, they will be more subtle than those in free moving cows.

The signals of aggression displayed by bulls take the form of lowering of the head, drawing the chin towards the body and inclining the horns to the opponent, signalling their intention to charge by pawing the ground. In cows, the threat is less forceful and generally involves head swinging for aggressive displays and turning away as a submissive signal. The ability of tethered cattle to display submissive signals to dominant animals will be limited, and as a result, aggressive interactions should be monitored carefully, and cows moved if aggressive behaviours continue.

The tail is an important signalling device in cattle. The tail will usually be held horizontal during defecation and urination. If, together with the head, it is elevated, this often indicates an exploratory situation to investigate the source of some stimulus. Tails are also elevated during oestrus display, fighting, threats,

greetings, suckling and homosexual activities in both males and females. Conversely when the tail is held between the legs, this indicates the animal is cold or frightened or fearful. Lateral movements of the tail are often used for fly removal, but can be a response to more general cutaneous irritations such as rubbing or stimulation such as of vulva or penis during sexual behaviour. Tail wagging is also common when cattle are being irritated. Cows will wag their tail as a threat if they are about to kick. Tail wagging can also be performed in response to painful stimuli.

Facial expressions are of less importance because the facial musculature is less well developed than in other species, and the distance between animals would often preclude the use of facial gestures as signals. Some obvious signals are present, however. The flehman response has already been discussed in relation to oestrus. Situations causing arousal (surprise, alarm, distress) will cause an increase in the size of the white of the eye surrounding the pupil. Conversely, cattle often perform routine behaviours, such as eating, ruminating or lying with their eyes half closed, which may be an indication of relaxation. Ear movement may also be involved in expressive behaviour, as they are in sheep, but this is yet to be researched. Ear postures will change in response to auditory signals, allowing the cow to locate the direction of a sound.

Grooming is primarily a body care activity but it has additional benefits. Cattle groom each other (allogrooming), usually the head and neck region of animals that are of similar or slightly subordinate positions in the dominance order. They may groom each other to maintain dominance position, to reinforce family bonds and those between adult cattle. Abilities to allogroom and reinforce bonds is also limited in tethered animals. Providing the opportunity for animals to interact and perform these behaviours is important.

4.5.2 Vocal communication

Vocal communication is used in recognition, eliciting contact as well as greetings, threats and fear display. Certain types of calls are associated with specific behaviours or emotional states. With calves, the calls during isolation are of lower frequency and carry further than during branding, perhaps suggesting greater stress. As an animal becomes more excited or distressed, the duration, volume and pitch of the calls increase. Vocalisations have been categorised and calls fall into five ‘main syllables’ based on the mouth, tongue and nasal placement and the speed of air leaving the throat (Phillips 2002). Other classifications use amplitude, pitch, tonality and length to interpret the message of different calls. Calls change as the animal ages, and bulls tend to vocalise more than cows and steers.

The frequency of vocalisations can be used as an indicator of cattle welfare in abattoirs and during handling. Vocalisations can also indicate pain. However, as yet, no specific meaning has been attributed to different calls.

4.5.3 Reproductive behaviour

Cows indicate reproductive receptivity by homosexual mounting, where the cow exhibiting the standing reflex is receptive, not necessarily the mounting cow. Mounting cows, although not necessarily receptive, are usually approaching receptivity so their activity indicates they may benefit from the presence of a bull. In herds where the bull is removed from the herd, such homosexual mounting is of great benefit to the stockperson to indicate the right time to bring in a bull or to use artificial insemination. Females of dairy breeds on heat are reputed to mount more than those of beef breeds. It has been argued that this is the result of greater selection for this trait in systems where males are largely or completely absent (Chenoweth and Landaeta-Hernandez 1998). The widespread use of artificial insemination in dairy herds may have led to unplanned selection for cows showing overt oestrus behaviour because those showing weak signs of oestrus would be less easily identified and so inseminated.

In confinement, there are about 14 different behavioural sexual activities, and cow-to-cow mounting is the most accurate sign that the time is right for insemination or taking the cow to the bull. Reasons for failed visual detection of oestrus include inappropriate flooring, with bulls and cows being unwilling to mount when on slippery, unsteady surfaces and oestrus behaviours being performed overnight and therefore go unobserved. Despite the fact that the senior author has been told by numerous farmers in different Asian countries that they can detect cows on heat as well as a bull can, visual oestrus detection is only about 50% successful in most herds.

Mounting behaviour is also not possible to be observed in tie stall housing. For good oestrus detection, cows should be allowed access to a dirt exercise yard once or twice daily for a minimum of 1 h each time.

4.5.4 Cow–calf bonding

Cow–calf bonding is both a learnt and innate behaviour. The bond is created at a time when the calf is naturally drawn to the dam by wanting to suckle and the chances of other bonds developing during this period of primary socialisation are small. Grooming during and after suckling preserves the imprinting bond, but sight, smell and vocal communications are important for reunion of the calf and dam. This bond, and in particular suckling, maintains the post partum anoestrus in cows for about 8 weeks to prevent early rebreeding.

Intensely selected dairy breeds show weak cow–calf bonding, probably because of the routine practice of early separation of cow and calf. Artificial rearing has little effect on the calf's temperament and cross fostering is also easy.

4.5.5 Communicating with the calf

Calves have many, often quite subtle, ways to communicate their feelings to humans. Staff should learn to closely observe and interpret changes in both calf

appearance and their normal behaviour, which may be symptomatic of stress or illness. This topic has been covered in detail in a previous book written by the senior author and the reader is referred to Chapter 12 on Moran (2012b) for further details.

4.5.6 Social dynamics in free moving herds

Much of this section is specific to untethered, free moving dairy systems. As farms expand in herd size, these types of systems are likely to become more common. Creating awareness of these issues beforehand will allow expanding production systems to address them before they arise.

In wild cattle, herd social organisation usually takes the form of groups of mothers and offspring, and bachelor groups of bulls grazing separately. These groupings are related to the dominance of the stock within each one, and so are often called social dominance groups. Dominant bulls can join the cow herd when there are cows displaying oestrus (or mounting behaviour). Depending on farm management systems, these social dominance groups are replaced by groups of cows and growing cattle, usually divided into similar age and single sex groups after about 6 months of age. In these extensive herds, bulls kept for reproduction may be solitarily confined for much of their life. These changes in social structure from the natural groupings and the intensive husbandry methods used can increase social tension. With growing male cattle or bulls, the stresses of close confinement may make them difficult to manage safely without danger to the stockperson. This is one of the main reasons castration is performed, to improve their temperament by reducing aggression.

Within the herd, there is a dominance hierarchy. The hierarchy usually depends on the temperament of the animal, her age and her size. Aggressive (or agonistic) behaviours are one of the ways these hierarchies are established, and introducing new animals into the herd will likely lead to hierarchies needing to be re-established. It is important to give cattle enough space so subordinate individuals can avoid confrontation.

Herd size

Herd size will influence the social dynamics. Herd sizes and space allowances are also not often a point of consideration on typical SHD farms in the tropics, often limited by land availability and affordability as well as knowledge. However, as smallholders become more experienced and competent, they may have greater opportunities to increase their farm and herd size. For example, there is also increasing interest in SHD farmers to combine their smaller herds in the one shed or use shared facilities, hence handling large numbers of stock may be of relevance; these cow colonies are further discussed in Section 9.2.3 in Chapter 9.

In untethered systems, as herd size increases, the frequency of agonistic interactions increases as the result of increased competition for resources. Albright

and Arave (1997) noted that the provision of 3.5 m of walking space per cow and at least one feeding space and one cubicle per cow could significantly reduce social stress, highlighting the importance of resource allocation in a changing herd. In addition to this, as the size of the herd increases, individual members have difficulty in remembering the social status of other members, leading to prolonged dominance-related aggression. In young calves where no dominance order has been formed, group size has little effect on the frequency of agonistic encounters (Albright and Arave 1997).

Mixing

When cattle groups are mixed, a new dominance structure is created, usually within 24 to 72 h, depending on the degree of change in the group. Minor changes result in a doubling of aggression activity for about 24 h. Changes in the group structure may sometimes cause sufficient disruption to actually reduce feed intake and hence milk production. However, this can be quite variable, varying from 19% to zero reduced milk yields in eight different studies (Phillips 2002).

4.6 Cattle–human interactions

4.6.1 Temperament

A cow's temperament is one of the key aspects of their personality in relation to their reaction to humans. It relates to fearfulness or reaction to fearful stimuli rather than aggression, which reflects the position in the dominance order. An animal's temperament relates strongly to previous handling experiences (positive or negative) and handling frequency. There are also genetic differences, with variety between breeds and between sires within breeds. For example, Friesian cattle are more sensitive to sound and touch in auctions than beef breeds.

Subjective scoring systems describing temperament as placid, docile, nervous or lively, correlate well with more objective measures of heart rate and breathing rate. Docile cows tend to produce more milk, this may be related to being more calm during milking and therefore having greater milk letdown. Some cattle react strongly to human presence, and can remember aversive handlers in the milking parlour thus leading to reduced milk production and poorer reproductive performance.

Cattle usually improve their temperament and become less fearful with age, as this is associated with habituation, with the animal becoming more familiar with handling procedures and the environment.

It is likely that handling experiences as a calf influence temperament, as bad handling during this critical period will render an animal nervous and hypersensitive to stress. Therefore, it is beneficial to positively condition calves to

handling from an early age. Exposing calves to novel, but positive experiences in early life will lead to a cow better habituated to novelty and more docile towards people.

4.6.2 Behaviour of the cow handler

The cow handler has an enormous impact, and can be considered the most important factor influencing cow behaviour, welfare and performance. Negative behaviours, such as hitting, slapping, tail twisting, quick and sudden actions and shouting, produce more fearful cows. Once humans enter the flight zones of entrapped, fearful stock, their behaviours can become even more unpredictable. Even less obvious negative behaviours, such as mild slaps and pushes, can lead to heightened levels of fear of people. Poor treatment of cattle will also initiate a continual cycle of increasing fear and poor behaviour in the herd. Negative human behaviours will make cattle more fearful and harder to handle, which then increases the incidences of hitting, pushing, yelling and other negative behaviours in the handler. Positive interactions and handler behaviours include slow and gentle movements, rubbing or resting a hand on the cow's back or flank, and gentle vocal communication at an even volume, will lead to a relaxed herd of cows, generating easier handling and better herd health and performance.

To improve stockpersonship we need to pay attention to the level of job satisfaction of the people who care and handle the stock. To reduce rough handling, we need to understand the situation in which people become rough with animals. Educating stockpeople on the best ways to handle cattle will help improve cow movement and encourage positive human behaviour. Poorly designed facilities can make cattle more difficult to move, leading to frustrations in the staff. Correcting for this where possible and providing low-stress handling techniques to staff can help to reduce staff frustration. Other routine tasks such as hoof trimming are essential for the good welfare of stock but are often rated as unpleasant by the staff. Designing better equipment and facilities for such tasks may result in them being carried out more often and more effectively.

Adopting strategies to behave positively towards cows is the key to reducing fear of humans in cows and this can be best achieved by developing good handling practices and routines, such as:

- Keep herd handling routines (milking, veterinary treatments) consistent and calm
- Allow time for cows to learn any change in routine
- Use positive interactions such as a stroke or a rub or resting the hand on the cow's back
- Scratch the cow or give her feed as a reward after a bad experience
- Use slow and deliberate movement and talking

- Reduce excessive noise, such as banging gates and shouting
- Avoid staring at a cow directly for long periods
- Move stock by working at the edge of their flight zone
- Avoid painful procedures in the milking parlour
- Move cattle as a group rather than individually
- Use rewards to mask or minimise unpleasant experiences such as restraint or vaccination.

Studies found that high production cow handlers were able to minimise cow stress and achieve good cow performance by constant attention to the behavioural patterns or performance of each individual cow in the herd. Other studies have been undertaken on the 'ideal' type of person to manage cows in the close confines of the dairy shed (Albright and Fulwider 2007). Interestingly, cows responded best to confident introverts (in other words people with the following set of traits: self-reliant, considerate, patient, but difficult to get on with, forceful, suspicious of change, not easygoing and not talkative). People with these traits were more stable and had an air of confidence, which enabled them to develop positive relationships with their cows that benefited their performance.

The behavioural response of cows to their handlers is best assessed by the flight distance, or how close one can approach an individual animal without it moving away; this can vary from almost zero to 6 m. As expected, the flight distance was larger on dairies where there were more negative interactions such as yelling or hitting. Milk production was also lower on these dairies. As already mentioned, fear of humans can account for 20% of the variation in herd milk yield. Therefore, a change in handler has the potential to substantially alter milk yields. Handler interaction also affects aggressive behaviours of the cows; with less fearful cows being less likely to kick the milker, have lower blood cortisol levels and have higher milk yields.

Cows are able to effectively discriminate between familiar and unfamiliar, as well as positive and negative handlers. A detailed study was made of responses by (untethered) dairy cows to either pleasant or aversive handling with results as follows:

Action of cow	Pleasant handling	Aversive handling
Mean entry time to milking shed (s/cow)	9.9	16.1
Flight distance (m)	0.5	2.5
Dunging in milking shed (frequency/h)	3.0	18.2
Free approach to humans (frequency/min)	10.2	3.0

While the above examples are related to free stall and extensive housing systems, studies have also shown that positive handling and good stockperson

attitudes led to an increase in milk yields on dairy farms (Hemsworth *et al*. 2002). These results are applicable to all production systems, including tie stall housing, and further support the importance of stockperson behaviour.

4.6.3 Cowpersonship

With the cows generally located in close proximity to the home, dairying offers more opportunities for women to become closely involved in the day-to-day management than with other farming pursuits. This is important in the village life of South and East Asia, where women have traditionally been the homemakers and family rearers. The cultural and religious bonds limiting their contribution to managing the family budget are being loosened in many SHD communities. Redirecting their mothering instincts from children to livestock is seen by many to provide the basic fundamentals of empathising with, hence providing a better level of care to, the dairy herd. There are also gender differences in cows' responses to handling in that women milkers can increase milk yields and quality. Milkmaids were very common in the days of hand milking and now seem to be making a comeback with machine milking. The politically correct term is then cowpersonship rather than cowmanship.

The term 'cowpersonship' could be defined as developing the skills to get to know the individual behaviour of every animal in one's charge and having the ability to recognise small changes in the behaviour of any animal or all the animals collectively. People with good cowpersonship:

- Are perceptive to the conditions from the animal's point of view, in other words they 'think like a cow'. They can use these skills to detect any changes in the health, comfort and welfare of stock and relate them to ongoing cow performance.
- If they see something wrong, it is immediately put right.
- They organise animal flow through the buildings to balance that with any physical limitations of the building as practically as possible.

The key to cowpersonship is observation and willingness to correct the conditions causing any deviation from a normal behaviour pattern. Some animals cope with stressful situations by changing their behaviour, while others simply change physiological reactions, such as heart and breathing rates. Good cow handlers become aware of such differences between individuals, groups and breeds when handling stock. They can then interact with individual animals that require specific attention.

Insufficient walking space, lack of feeding places and cubicles or resting places are all stressors on a farm, and they induce more social competition and more injuries. Lack of experience of the handler can increase the adverse effect of these factors. Albright and Arave (1997) noted that as well as factors like provision of

walking and feeding space reducing social stress in cows, it can also be reduced by improving the handler's husbandry skills. Similarly, it is important to improve these same issues for tethered cattle. As highlighted earlier in this chapter and in Chapter 2, suitable resting places, providing the right resources and space, being aware of social behaviour between neighbouring cows, appropriate exercise and hygienic environments all help to improve the welfare of tethered cows, and all of these factors are in the control of the handler.

As indicated in the sections above, good cowpersonship can lead to 20% higher milk yields over a handler with poor skills. The same holds true with young calves and their positive response to rearers with friendly, as against unfriendly, treatment of their young stock. There are also gender differences in cows' responses to handling, in that women milkers increase milk yields and quality.

Cows are normally quiet and thrive on gentle treatment by handlers. Good handlers allow their cows to develop their own individual personalities as long as no special care or treatment is required and they can 'fit into the system' rather than developing the system to conform to the habits of the cows.

4.7 Practical ways to improve cow flow

This section is specifically written for free moving dairy herds.

4.7.1 Poor movement can be solved with simple observation

The smooth and rapid flow in and out of the milking parlour is highly desirable, but determining the cause of cows' reluctance to enter the parlour may require careful or some astute observation and walking through the system at the cow level. Things that distract cows or can cause them to baulk will slow movement; examples include steep declines, a grate over a drain, a water puddle, change in floor texture, a flapping piece of cloth, clanging metal or a change of lighting along the laneway. A walkthrough of the facility considering issues that can cause baulking can help to solve this. Additionally, milking personnel can influence cow movement as well as the ease of milk harvesting.

4.7.2 Improving cow flow

Well-designed cowsheds and handling facilities can make a difference together with cow management by complementing the natural 'following' behaviour of cattle. Clear entrances and exits allow stock to see and follow others. Good design can also partially compensate for poor stock handling practices by removing the need for handlers to interact with the stock frequently or on an individual basis. We need to use our knowledge on how cows perceive their surroundings to

improve cow flow. Based on the sensory abilities and behaviours we've discussed so far, the following considerations will help to improve cow flow:

- Provide wide, clear, well-lit pathways for cow movement.
- Cattle are attracted to the sight of others moving ahead so visual contact needs to be maintained and not obstructed.
- Curved races, with an inner radius of 3 to 4 m, are most useful in situations in which stock are required to wait in queue rather than run feely through the race.
- Races with clear, unobstructed views towards the exit or where animals are meant to move will encourage them to move.
- The sight of stationary cattle adjacent to a race will slow down movement, so it is best to screen race walls adjacent to other animals.
- Keep surfaces as consistent as possible because changes in race construction material or floor type (e.g. slats to concrete) will inhibit cow flow.
- Avoid contrasting colours in yards, raceways and the dairy.
- Ramps with covered sides will not allow stock to judge the elevation and so improve cow flow.
- Provide an incentive for cows to move through the milking parlour, food at the end works particularly well.
- Avoid sudden changes in lighting, floor surfaces and textures, floor level and fence or wall types.
- Avoid changes in critical points along the route, such as at gates, pen exits, corners and entrances to the race or laneways.
- Avoid moving and flapping objects, and noisy and dusty environments. These will all cause animals to baulk.
- Remove any solid projections or obstructions from the cows' path.
- Avoid places where painful procedures have previously occurred.

4.8 Recent behavioural problems arising in cattle

The intensification of cattle housing and management contributes to behavioural problems not seen in grazing animals. Restrictions to normal behaviour via unnatural environmental conditions imposed on cattle by their human caretakers are most frequently at the root of behavioural problems. Cattle, as with other domesticated species, have fewer behavioural problems when left in their natural environment. Therefore, there is a concern that intensive management has resulted in the decline of cows' wellbeing. In some cases, the way that stock behave is the only clue that discomfort and distress are present. This can be all the more subtle with tethered animals.

Restricting natural behaviours to the point of frustration can then lead some cows to engage in apparently pointless behaviour. This can be interpreted as a reflection of reduced activity in intensively managed housing systems. Feeding vices can be attributed to restricting natural foraging behaviour or boredom following a very rapid satisfaction of their nutritional needs. With an understanding of these natural behaviours or instincts that have been thwarted, management can improve conditions for both humans and animals alike. The following is a not exclusive list of common behavioural problems that can be encountered in modern day cattle production systems.

4.8.1 Calves will not suckle

Calves that have gone through the trauma of a difficult birth (dystocia) are more likely than those from a normal birth to refuse to suckle. This delay in suckling is also more pronounced if the mother is a heifer. Since the ability of the calf to absorb antibodies (immunoglobulins) from the colostrum decreases the later it is consumed, and heifers have lower levels of antibodies, any delays in the first suckling are more likely to reduce the quantities of circulating antibodies in the bloodstream of calves. This will reduce the calf's immunity against diseases. This has been discussed in more detail by Moran (2012b). In addition, mis-mothering is more likely to happen when large numbers of cows calve down in intensive dairy systems, which will further add to the problems of delayed suckling and poor immunity status.

4.8.2 Cows refusing to use their stalls

In free stall sheds, cows can refuse to use the stalls if they are not comfortable, are unfamiliar, or are less comfortable than alternative areas. It has been observed that cows rarely use poorly designed and constructed free stalls, often preferring to lie in the dirty walkways. The appropriate dimensions of free stalls are then very important for the size of stock being housed and Albright and Arave (1997) provide a good checklist. In addition, the type of bedding and its thickness can greatly influence stall usage. Some cattle practise 'dog sitting' behaviour in confinement where cows have difficulty in rising or they do this on a regular basis outdoors. This topic is discussed in more detail in Chapter 7 of this manual.

4.8.3 Nymphomania

Nymphomania is linked to a follicular cystic disease of the ovary in cattle. It has a higher incidence in dairy than in beef cattle, probably due to their more intensive housing and management. It appears to have a genetic basis and can be in 5 to 25% of the cows in problem herds. Most cases occur within the first 3 to 8 weeks after calving with the development of the first new follicle. Ovulation fails and in the absence of adequate luteinising hormone, several follicles may grow to form

multiple cysts. Cattle so affected may show frequent, intermittent oestrus, stand for mounting and aggressively pursue monosexual 'bulling' behaviour, such as pawing the ground, bellowing and attempting to mount herd mates. Masculinisation of the head and neck, and a prominent tail head are characteristic of the chronically nymphomaniac cow. Manual rupture of the cyst is one of the oldest treatments, although it has risks of haemorrhage and scar tissue formation. Human chorionic gonadotropin and gonadotropin-releasing hormone therapy is used to treat the condition.

4.8.4 Silent heat

This is the failure to indicate signs of oestrus even though the reproductive tract is at the height of influence by the reproductive hormones. Silent heat can be attributed to several factors, including but not limited to: cows being in oestrus but outside the observation period of persons assigned the task of heat detection; movement of cows from pastures to holding yards; slippery concrete and other places of unsure footing; heavy rainfalls; cows with sore feet and lameness; and group dynamics – submissive cows may avoid mounting dominant cows in oestrus. Detection of heat can also be more challenging with tethered animals.

Improving heat detection methods in problem herds is likely to identify cows previously evaluated as being in silent heat. These techniques include combinations of visual observation by trained people, activity meters, teaser bulls fitted with a marker harness, progesterone levels in milk, painting or chalking the tail head, heat mark detectors glued onto the tail head as well as various pressure sensitive transducers attached to radio receivers. Heat can be detected in tethered animals by giving them access to an exercise yard and providing a space where mounting behaviours can be noticed. Pressure testing can also be used for heat detection in tethered animals, where animals that will stand receptively to pressure applied to their back are likely to be on heat.

4.8.5 Aggressive behaviours

As humans are no match for cattle in terms of brute strength, proper respect or caution has to be exercised. Cows are more prone to act aggressively in the first few hours post partum while protecting their newborn from outside intrusion. Cows and heifers on heat or young bulls past puberty may lose their inhibitions towards humans and attempt to mount them.

Dairy bulls have more of a reputation for attacking humans than do beef bulls, this is possibly due to differences in rearing management. Young bulls may initially engage in play behaviour that can escalate into aggressive bunting if the play is not sufficiently discouraged. When entering a bull pen, note possible escape routes that can be taken such as specifically built walk-though gaps in fences. Any bull that has attacked a human should be removed from the herd.

4.8.6 Feed related vices

Feed tossing behaviour is practised by up to 10% of the dairy herd and is exaggerated by the presence of many flies in summer. Cows prefer to eat at ground level where feed tossing is rarely observed rather than from elevated feed bunks. A ritual of rooting, sorting and finally tossing feed along the sides and over the back can lead to 5% feed wastage.

Dropping feed from an elevated feed bunk to the ground may be an animal's solution to fulfilling the natural grazing instinct – that is, putting the feed where it can be more comfortably eaten. The slanted design of headlock stanchions theoretically reduces feed wastage as the animals have to angle their head before leaving, causing the feed to be released back into the feed bunk. Ideally, for new designs, consider lower feeding stations/troughs to accommodate and replicate natural feeding behaviour as best possible.

Water lapping occurs when some cows lick the water with their tongue instead of putting their mouth in contact with the water and syphoning it into their mouth. Excessive water lapping can lead to wet bedding in tie stalls, or formation of muddy bogs around water troughs. The presence of stray voltage may cause this hesitation to drink properly. It might also be a stereotypy with cows in tie stalls, indicating boredom from suppressed grazing behaviour and lack of exercise.

It is important to note that teeth grinding is one sign of pain in cattle and should not be confused with a feeding vice.

4.8.7 Kicking

Cattle can kick backward, forward and to the side with some degree of accuracy and strength. Proper precaution should be exercised, especially with cattle that are infrequently handled. Kicking can be the result of negative temperaments, cattle experiencing fear, or can be an indicator of pain. Identifying which one of these problems is causing the kicking behaviour is important, as cows of poor temperament are not wanted for breeding, whereas the welfare of a cow experiencing fear or pain is compromised.

4.8.8 Changes in normal behaviour

The following would not be described as abnormal behaviour but rather changes in normal behaviour in response to unfavourable stimuli. Cows in unsafe situations exhibit fear, such as those caused by expectations of danger, pain or disaster.

- Increased defecation and urination
- Standing with front feet in stalls and rear feet in walkways
- Increased standing and less lying
- Increased lying time and less frequent standing and repositioning themselves in stalls

- Refusal to use stalls and lying in walkways or partially in stalls
- The 'hesitation waltz' or apprehensive behaviour before actually lying down in stalls. This can take several minutes, in contrast to a few seconds taken by cows at pasture. This intention time is then another measure of stall comfort.
- Unusual actions when rising or trying to rest in stalls
- Lapping at water rather than sucking it up
- Reaching over the walls to drink water rather than stand in the walkway where troughs are located
- Unusual and unexpected approaches to eating or drinking
- Unusual walking actions
- Reluctance to cross gutters or enter some areas of the shed.

This apprehension could be learned from previous experience, originating from a variety of sources of pain, such as:

- Needles or injections given in the milking parlour or at lockups at the feeding face
- Neck rails that are too low, too high or too close to the back of a stall
- Poorly positioned or designed stall partitions

Figure 4.4: A dairy bull 'dog sitting' that could indicate discomfort or pain.

- Hard stall surfaces
- Wide slots in slatted floors
- Flooring surface, either too rough or too smooth
- Obstacles such as walkway manure scrapers, return pulleys on floor scrapers in high traffic areas
- Automatic gates
- Electric crowd gates in pre-milking yards
- Body contact with parts of the milking parlour, especially when stray voltage is present
- Feed bunk barriers
- Electric cow 'trainers', electric wires positioned above stalls to teach cows to step backwards when their back is arched before defecation and urination.

Cows will also show apprehension from cows with dominant behaviour or ones that intrude into their comfort zone. For example, if there are no obvious escape routes or the shed is too dark to make them obvious. Deep gutters and dark alleys and entrances can also 'spook' cows as can frightening objects such as people wearing the same apron or clothes used in milking or while administering painful treatments. Cows adopt avoidance behaviour rather than risk injury.

Figure 4.5: This animal is being subjected to very poor stock welfare.

Apprehension may also arise from the design of equipment and facilities that is beyond the ability of the cow to cope with comfortably. Examples are:

- Watering devices that are too difficult to operate, too high or with poor floor access
- Noise from air operating gates and other noisy machinery
- Lack of lighting
- Slippery floor surfaces
- Stall features that contribute to entrapment.

In some free stall sheds, cows lie partially in the stall or completely in the walkway, or they may rise like horses, back into stalls or even paw bedding out of their stalls. In tie stalls, frustrated cows lap at water, chew on water bowls because the stabling and bowl position prevent them from getting their head in to drink comfortably. These cows all show their displeasure with unwanted behaviour. Sometimes, in sheds with slippery floors, they protest silently by not mounting when in oestrus.

In summary, the behaviours of cows will change in response to the situations they are in and the handling they experience, resulting in an increased or decreased frequency of common behaviours (Figures 4.4 and 4.5). Chapters 5 and 6 provide examples of these changes and clarify the situations the cattle are reacting to.

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