Section 2
Concepts and assessment of pain and distress

- Stress, distress and suffering
- Pain assessment

STRESS, DISTRESS AND SUFFERING

Within a prosecution it is evidentially sufficient to demonstrate or show that pain or distress existed and that it was unreasonable or unnecessary. The evidence of suffering pain and distress must be provable "beyond reasonable doubt" from facts and objectively sustainable inferences taken from those facts.

Moberg (2000) defines "stress" and "distress" in biological terms:

Stress is the biological response elicited when an animal perceives a threat to its homeostasis. The nature of this response varies between individuals and is influenced by previous experience, genetics, age, physiological status, environment and season. The result is an alteration of the animal's normal biological functioning as it attempts to adapt or to cope with the stressor. This will include one or more of the following:

1. A behavioural response, e.g. the animal may move away from the perceived threat if possible.
2. An autonomic nervous system response, e.g. changes in heart rate, blood pressure, gastrointestinal activity.
3. A neuroendocrine response which may result in, for example, failed reproduction, altered metabolism.
4. An immune response which may result in increased incidence of disease. In most cases this altered biological functioning has minimal effect on the animals well being – the stress is brief or eliminated.

Distress: occurs when the magnitude and/or duration of the stress response is such that significant changes in biological functioning must occur for the animal to survive. At this stage, the animal's resources are taken up with dealing with its response, resulting in impairment of other biological functions such as immune competence, growth and reproduction.

Other definitions include:

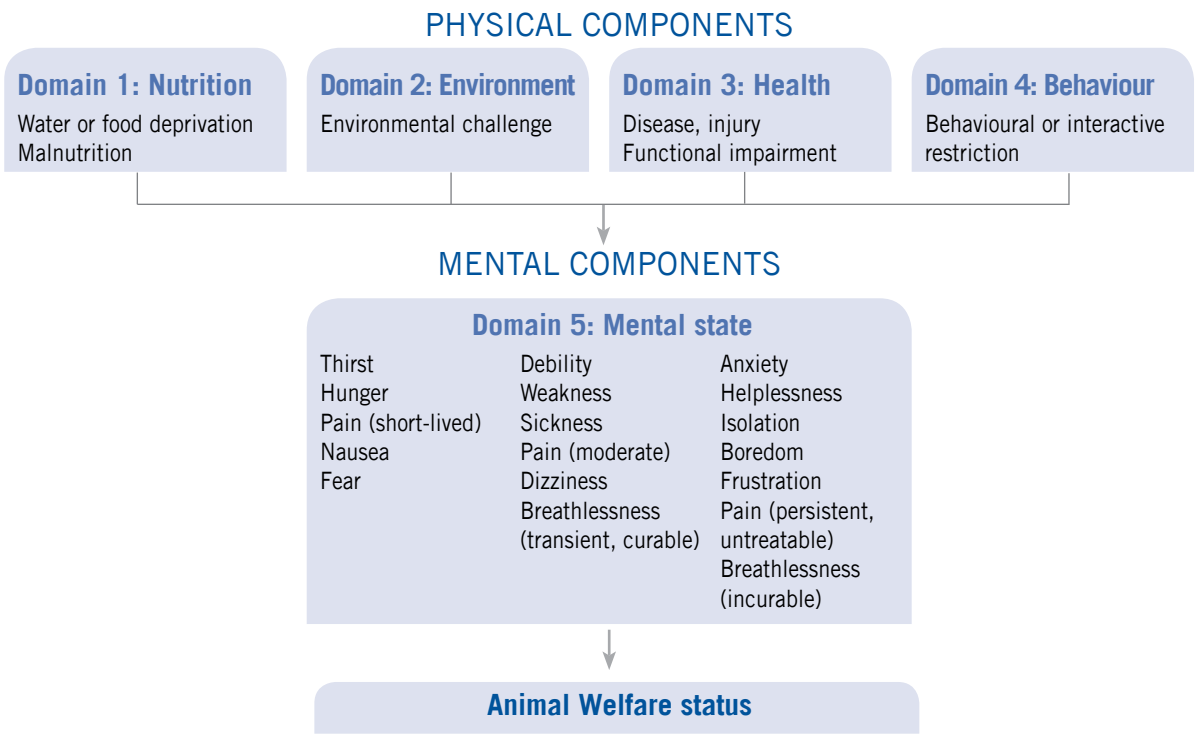
Pain: "As applied to any animal, pain means any procedure that would reasonably be expected to cause more than slight or momentary pain or distress in a human being to which that procedure was applied, that is, pain in excess of that caused by injections or other minor procedures" *(Definition of Painful Procedures, Animal Welfare Act)*

Pain: "is an unpleasant sensory and emotional experience associated with actual or potential damage or described in terms of such damage." *(Webster's dictionary)*

Distress: "Acute or chronic response of an animal caused by stimuli that produce biological stress which produces observable, abnormal physiological or behavioural responses." *(Australian code of practice for the care and use of animals)*

Distress: "A state associated with invasive procedures conducted on an animal, or with restrictive or other conditions which significantly compromise the welfare or an animal; it may or may not be associated with pain, and is present when the animal must devote substantial effort or resources to the adaptive response to challenges emanating from the environmental situation." *(Canadian Council in Animal Care).*

However, there is now increasingly secure scientific understanding of the neurological foundations of affective states and the motivational drives that energise and direct associated behaviours (Mellor, 2012). What Moberg's approach lacks, particularly when we are looking to enable veterinarians to recognise and articulate the concept of distress, is that it ignores the mental or emotional content of the associated experiences. So another approach is to consider the different "domains" of potential animal welfare compromise (Mellor, 2012a and 2012b). This approach, originally derived from the concept



of the "five freedoms", sees "distress" as a catch-all phrase for a range of negative affective states or feelings that an animal may experience as a result of welfare compromise. These negative effects are seen as occurring in one or more of five "domains" in which welfare compromise may occur:

- Nutrition.
- Environment.
- Health.
- Behaviour.
- Mental state.

The first four domains are physical/functional and give rise to sensory inputs that may lead to subjective experiences in the mental domain. The latter represents the overall welfare status of the animal as in the above diagram from Mellor (2012).

What the animal experiences as a result of welfare compromise is found in Domain 5. As an example, if an animal has a respiratory complaint with symptoms of dyspnoea and cyanosis, what it would be experiencing – and what represents its welfare status in this case – is the distress of breathlessness. This gives both a context and a more definitive explanation of that particular animal's distress.

Suffering means an unpleasant, undesired state of being which is the outcome of the impact on an animal of a variety of noxious stimuli and/or the absence of important positive stimuli. It is the opposite of good welfare and may be associated with elevated levels of thirst, hunger, breathlessness, nausea, pain, fear, anxiety, boredom and other negative experiences. It can manifest as physical, mental and/or emotional pain, including unpleasant feelings, sensations or perceptions, cognitively processed and interpreted by the animal according to its species-specific and individual nature, and past experience. (Mellor, 2011)

References

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PAIN ASSESSMENT

The International Association for the Study of Pain[1] defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."

Acute pain results from a traumatic, surgical or infectious event that is abrupt in onset and relatively short in duration. It is generally alleviated by analgesics.

Chronic pain results from a long-standing physical disorder or emotional distress that is usually slow in onset and has a long duration. It is seldom alleviated by analgesics but frequently responds to tranquillisers combined with environmental manipulation and behavioural conditioning.

As prey animals, our livestock species are likely to mask pain so that assessment is not always easy and signs may be subtle. Behaviour may also be affected by the environment. There are three general approaches:

- Body functioning, e.g. food/water intake, weight gain/loss.
- Physiological measures, e.g. heart rate, plasma cortisol.
- Behaviour, e.g. lameness, guarding the painful area, vocalisations.

In the context we are discussing here, the latter is the most useful.

An animal in pain, regardless of species, displays one or more of the following signs:

- An absence of normal behaviour.
- Attraction to the area of pain.
- Increased skeletal muscle tone.
- Altered electroencephalogram (EEG) response.
- Increased blood pressure and heart rate.
- Pupillary dilation.
- Change in the respiratory system.

Signs of ACUTE pain	Signs of CHRONIC pain
protection of the painful part e.g. back arching	limping (if painful part is an appendage)
vocalisation (especially on movement or palpation of painful area)	licking of the affected area
licking	licking of other areas if the painful part cannot be reached
biting	reluctance to move
scratching or shaking of affected area	loss of appetite
restlessness	change in personality
sweating	change in eye brightness
increased rate of respiration	
unusual mobility or reduction in mobility	
isolation from conspecifics	

1 http://www.iasp-pain.org//AM/Template.cfm?Section=Home

SPECIES SPECIFIC SIGNS

Horses

- periods of restlessness;
- interrupted feeding with food held in the mouth uneaten;
- anxious appearance with dilated pupils and glassy eyes;
- increased respiration and pulse rate with flared nostrils;
- profuse sweating;
- rigid stance;
- reluctance to be handled;
- in prolonged pain, behaviour may change from restlessness to depression with head lowered;
- in pain associated with skeletal damage, limbs may be held in unusual positions and there is a reluctance to move with head and neck "fixed";
- in abdominal pain, a horse may look at, bite or kick its abdomen; it may get up and lie down frequently; walk in circles; roll and injure itself as a result of these activities. This state may progress and can last for several hours.

Cattle

- often appear dull and depressed with little interest in their surroundings;
- rapid shallow respiration in severe pain;
- may react violently on handling or adopt a rigid posture designed to immobilise the painful region;
- rumination and rumen activity may be absent;
- grunting and grinding of teeth may be heard;
- generally signs of abdominal pain are similar to those seen in the horse but are less marked;
- rigid posture may lead to a lack of grooming because of an unwillingness to turn the neck;
- loss of appetite, weight loss and, in milking cows, a sudden drop in milk yield.

Sheep and Goats

- in general, signs of pain in sheep and goats are similar to those in cattle, although particularly with sheep, there may be no overt signs;
- changes in posture and movement are apparent;
- lack of rumen activity and rumination;
- a change in facial expression may be indicative of pain;
- grinding of teeth, grunting and head pressing;
- goats in particular are more likely than cattle to vocalise in response to pain;
- goats may appear agitated and show foot stamping behaviour.

Pigs

- changes in gait and posture;
- normal squealing and escape attempts when handled may be accentuated;
- unwillingness to move;
- may hide in bedding if possible.

While the behavioural signs of pain in other species have not been well researched, it is clear from their neurological anatomy and physiology that they have the capacity to feel pain. How that is manifested will vary between species and individuals, with the overriding factor that, as prey animals, overt signs will be minimised.

SUFFERING AND DISTRESS

Bryan McKay, Director of Dairy Production Systems

Many judgments made of suffering and distress would be anthropomorphic that is, translating expected human feelings, experiences and responses to the animals. There are no reports which clearly characterise the changes in temperament of ruminants during chronic under/malnutrition. However, there are inferred similarities, during the early and final stages, to "Kwashiorkor" in humans.

Early symptoms of any type of malnutrition are very general and include fatigue, irritability, and lethargy. As protein deprivation continues, one sees growth failure, loss of muscle mass, generalised swelling (edema), and decreased immunity (lowered white cell count). A large, protuberant belly is common in some species. Skin conditions such as dermatitis, changes in pigmentation (pale), thinning of hair, are seen frequently. Shock and coma precede death. In Kwashiorkor, there are four psychological changes as the disorder progresses. Initially there is frustration, which is followed by irritability. Then there is a stage of anger and aggression, and finally apathy. During apathy, the individual wants to be left alone to die, and resents being disturbed. These moods are quickly reversed during recovery, and loss of apathy is a good indicator of recovery.

In cattle it is easy to recognise the frustration stage (stage I) from the bellowing of hungry stock. The recumbent cattle, where the animals did not get up, are presumably in stage IV. It is implicit that an animal that reaches stage IV must have suffered stages of chronic hunger and/or sickness during the earlier stages. In other words, the suffering may not be evident at the time of stage IV, but it is implicit from what must have gone before. In either case (hunger or sickness), one could ask whether the stock owner failed to rectify the situation from ignorance, inexperience, incompetence or inconsideration.

The behaviour of calves, lambs, piglets and cockerels has been examined during chronic under-nutrition. The calf is relatively resilient, and has survived for over 10 days without either food or water, provided it had acquired passive immunity once it was born. This is thought to be due to the calf's more mature renal function at birth. During the first four days of starvation the calves are robust and jump to their feet when approached, but thereafter they become less interested in sucking or other activities. This loss of activity and responsiveness is common to many species.

In laboratory rats it sets in two or three days before death, and they remain curled up in a ball before becoming comatose. Newborn lambs become comatose in about 8 days, when the air temperature is about 21°C. What does chronic hunger feels like? The sensations associated with mild hunger in humans are initially an enthusiasm for food which develops into a gnawing sensation and then a dull ache in the lower thoracic and epigastric regions. This grows into an uncomfortable pang that is less localised and more intense.

The sensations during long-term starvation are hunger pangs, a feeling of being "sick-in-the-stomach", hot flashes, headache, weakness, difficulty in sleeping, and a general disinclination to perform physical or mental work. In monogastrics, (single stomach animals) the faeces are replaced by a semi-liquid bile-stained mucus. Initially the pangs of hunger coincide with gastric hunger contractions, but during advanced starvation they involve almost the entire abdomen. The hunger contractions disturb the normal sleeping pattern. If there is a fever at the same time as starvation, hunger and gut contractions are reduced or absent. When a monogastric dies from starvation, the stomach is often in a state of strong tonic contraction.

The physiological satiety signals that exist in ruminants are reasonably well understood, but the hunger signals are less clear. It would be helpful if we knew whether forestomach contractions in ruminants are analagous to the hunger contractions that we experience, and whether the severely underfed beast has comparable whole-abdomen contractions.

A cow starved to the extent that it is no longer ruminating, in my opinion, would be lethargic from sleep deprivation as well as depletion of energy reserves. In the event of extreme hunger, animals would be weak. They would have difficulty finding the energy to remain standing and in my opinion would have felt severe distress, lethargy, exhaustion. Inability to stand is likely to mean inability to drink, causing thirst and dehydration as well as hunger.

When combined with lack of feed, animals will feel the cold more especially when there is lack of shelter. In that situation, cattle will not have the rumen (first stomach) full of food, and will not be able to generate sufficient heat to maintain body temperature at normal levels. A significant amount of the heat produced by a ruminant animal comes from micro-organism activity in the fore stomach. In my opinion, therefore, lack of feed, combined with lack of shelter and poor ground conditions, would produce significant stress, distress and suffering to the cattle. Those conditions are exacerbated by poor body condition, lack of energy reserves and lack of 'insulation'. Shivering may occur, even at temperatures normally well tolerated by better fed, better conditioned animals. Shivering is stressful.

In cattle, signs of frustration related to reduced feed availability (i.e. bellowing, restlessness) may not be seen where the underfeeding is chronic. Low dry matter intake often results in poor rumen capacity. Satiety may be signalled and the animal actually stops eating when energy demands have not been met because the small rumen is full. Protein energy malnutrition to the point of recumbancy because of poor muscle mass and muscle weakness can occur without prior signs of obvious hunger. The degree and rate of condition loss due to under feeding or hunger will influence the behavioural, metabolic and clinical signs seen, influenced by the starting body condition score and energy demand.

Survival for prey animals depends on "alertness" to the presence of potential predators, and maintenance of normal behaviour and posture. Alertness and the will to survive are often lost in ruminants in negative energy balance – this is life threatening. Delay in feeding or feeding a smaller feed may constitute a stressor which may become stressful causing restlessness and vocalisation. If feed is provided, the stressor is removed. If not, frustration will follow. If provision of inadequate feed becomes routine the stress response evoked becomes distress, causing responses that are abnormal and ultimately harmful.