

Does Distress Matter?

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Abstract

In considering the relationship between man and animals in all fields, whether food production, competition, companionship or research, most individuals recognise the importance of pain as a factor impacting animal welfare as well as a being a contributor to poor productivity. Less widely recognised is the role of distress in both these respects, particularly distress which is unassociated with pain. Stress is widely considered to be an important positive factor in an animal's ability to respond effectively to its changing environment. However, when the animal becomes unable to adapt completely to stressors, and consequently manifests abnormal physiological or behavioural responses, we recognise this as distress. This paper considers the definition of distress in relation to the quality of an animal's life, and the ways in which animals mount biological responses to deal with distress. It can be difficult to reliably identify distress and measure the impact it may have on an animal's productivity. This is one reason why it may often be overlooked. However the signs are often recognisable to the experienced eye and this forms part of what we consider to be good stockmanship. Furthermore, a range of devices can be employed to minimise the level of distress which an animal may experience during its lifetime.

Introduction

In 1992, the Institute for Laboratory Animal Research (ILAR), a part of the US National Academies of Science, published a report entitled *Recognition and Alleviation of Pain and Distress in Laboratory Animals*.¹ The report proved to have a remarkable effect on the field and, over the last fifteen years, there has been considerable scientific progress in the areas of animal welfare and behaviour including attention to the subjects of stress and distress. Regulations promulgated in the US Animal Welfare Act

¹ National Research Council Institute of Laboratory Animal Resources, (1992) *Recognition and Alleviation of Pain and Distress in Laboratory Animals*. National Academy Press: Washington DC.

(1985) and the UK Animal Welfare Act (2006) mandate that pain and distress should be minimised or eliminated. When in 2004 ILAR Council considered a revision of the report, it was apparent that the two issues of Pain and Distress were sufficiently different that they deserved separate consideration and separate reports. From a scientific perspective, pain and distress are quite different and should be examined separately so that each receives appropriate emphasis. Hence it was that the ILAR Report on the Recognition and Alleviation of Distress in Laboratory Animals was published in late 2007.²

Whilst the ILAR Report refers primarily to laboratory animals, it is perhaps one of the most comprehensive and up to date reviews of distress in animals, and many of the principles described for recognising, assessing and alleviating distress can be equally applied to animals in other environments including farms, stables, zoos, and homes. Whatever the relationship of an animal with humankind, there is potential for distress to occur, in the absence of recognised pain, and it is equally important to understand that distress really does matter.

The Definition of Distress

It is a widely held view that a degree of stress is a positive factor for both animals and man. Distress is a sign that the animal's attempts to cope are being overwhelmed. During severe, lengthy, or cumulative stress, an animal will divert resources from other, less essential biological functions and these changes may lead to overt pathology or symptomatology. Under these circumstances, the animal will experience distress and its welfare will be threatened. But measuring this distress with confidence can be very difficult and we are led to consider each animal on a case-by-case basis.

The Oxford English Dictionary defines distress as "anguish or affliction affecting the body, spirit or community" and the verb to distress means "to make miserable".³ However it is difficult to see how such a definition may be rationally applied to animals. Most other publications on the subject, including the ILAR Report, fail to agree on a definition apart from the Australian Code on animal welfare which defines distress as "the state of an animal that has been unable to adapt completely to stressors and that

² National Research Council Institute of Laboratory Animal Resources, (2007) *Recognition and Alleviation of Distress in Laboratory Animals*. National Academy Press: Washington DC.
<http://www.nap.edu/catalog/11931.html>

³ Shorter Oxford English Dictionary (1973). Third edition, Oxford University Press, Oxford, UK.

manifests as abnormal physiological or behavioural responses. It can be acute or chronic and may result in pathological conditions".⁴

So why is it so difficult to reach agreement on a definition? Perhaps because some are sceptical whether animals truly feel distress and believe that incorporating feelings and emotions in the repertoire of an animal is anthropomorphic and scientifically unsound. Counter to this is the fact that legislation in many countries recognises the notion of distress. The Animal Welfare Act (1985) in the USA and the Animals (Scientific Procedures) Act (1986) in the UK specifically require scientists to minimise pain and distress caused to animals, and furthermore, the Animal Welfare Act (2006) in the UK makes it an offence to cause unnecessary pain or distress to any animal including farm and companion animals. The implication is that the law courts, at least, feel competent to recognise distress when it occurs.

When does distress occur?

Moberg^{5 6 7 8} perhaps came closest to understanding distress through his model of animal stress which is based upon the fact that animals, under stress, exhibit biological responses in an attempt to cope with the threat to their homeostasis. Four major defense systems exist to mount biological responses to stressors. These are behavioral responses, the autonomic nervous system, the neuroendocrine system, and the immune system. These four systems respond, either alone or in combination, to deliver the signs which may allow us to recognise that an animal is in distress. Although we understand how animals respond physiologically to stress, we still lack objective criteria with which we can reliably tell when stress has become distress. Likewise, if we rely on monitoring clinical and behavioral responses, there are considerable difficulties in validating these measures.

Stressors fall into two broad categories; those associated with specific manipulations, and those resulting from routine husbandry practices. It may be possible to address

⁴ National Health and Medical Research Council (2004) *Australian Code of practice for the care and use of animals for scientific purposes* (2004) 7th Edition. NHMRC: Canberra, Australia.

<http://www.nhmrc.gov.au/publications/synopses/files/ea16.pdf> (accessed 11th August 2008)

⁵ Moberg, GP (1987). *Problems in defining stress and distress in animals*. J. Am. Vet. Med. Assoc. 191(10):1207-1211.

⁶ Moberg, GP (1999). *When does stress become distress?* Lab. Anim. 28(4):422-426.

⁷ Moberg, GP (2000a). *Biological response to stress: Implications for animal welfare*. In *The Biology of Animal Stress*, G. P. Moberg and J. A. Mench, eds. CAB International: Wallingford, UK.

⁸ Carstens, E and Moberg, GP (2000b). *Recognizing Pain and Distress in Laboratory Animals*. ILAR Journal 41(2):15-28.

the former by eliminating the need for the manipulations, for example mutilations, or changing the way in which they are done. To address the latter, there is a need to fundamentally review the husbandry system.

A major problem is the marked variation between species, and even between animals within a species, in their responses to stress. Some species, especially those which are vulnerable to predation, are able to mask distress very effectively, probably thus contributing to their survival. This variation may be affected further by the age and gender, and the genetic and environmental background of the individual animal. Hence we can appreciate that it is often the experienced observation of the watchful stockperson that is most important in identifying behavioural signs of distress in the animals with which they are familiar.

Nevertheless, there are events in an animal's life when we can be fairly certain that they are experiencing distress. These are likely to be associated with 'unnatural events' such as maternal separation from offspring prior to weaning, or housing animals in an environment which lacks a strongly desired element. In addition, events which involve unfamiliar handling procedures are also likely to trigger distress responses.

In reviewing some of these 'unnatural events' in an animal's life, it is important to consider the responses, both in intensity and duration, and the mitigating actions which we can take to ameliorate the impact of the distress. This is clearly in the interests of good animal welfare. But it is also important to remember that distressed animals are more vulnerable to other stressors they may encounter (e.g. pathogenic organisms) and may succumb thus impacting the success and profitability of a livestock production system.

In considering distress in animals, I have selected three particular situations in which we routinely cause distress, and examined some of the possibilities for ameliorating that distress.

The Distress of Maternal and Sibling Separation.

Maternal separation from an offspring is an event which occurs in many species as part of normal husbandry practices. By understanding the distress response we can determine whether we can ease the distress, possibly by altering the timing of

separation, or determining ways to mitigate the causal factors. Thomas et al⁹ observed vocalisation in day old dairy calves following separation from their dams. The level of vocalisation increased markedly approximately sixteen hours after separation. However, by supplementing the feeding of the calves from the time of separation with *ad lib* milk from an artificial nipple, they were able to prevent this rise in vocalisation. A relatively easy refinement step to achieve significant reduction in distress and welfare benefit. Furthermore, since we know this is a time of vulnerability to disease, this additional care is probably highly profitable.

Behavioural studies in sheep have shown how strong the bond between ewe and lamb develops during the first twelve hours after birth. It is no accident that the good shepherd houses ewes with their lambs for this period before releasing them into the field. By this time, the maternal bonding is such that the ewe can recognise the call of her particular lamb amongst the dozens of others which, to our untutored ears, appear to be bleating with the same sound. The basis for this recognition has been shown to be dependent on characteristics of the voice as well as odour and appearance, and maternal responsiveness fades significantly after 4 to 12 hours separation during this critical period.¹⁰

Other species may appear to respond differently. For example it has long been thought that separating rodent pups from their dam is relatively stress free provided adequate nutrition is provided. However it has now been shown that maternal care is a critical regulator of rat pup physiology and behavioural development and, furthermore, there are marked similarities with the delay in growth and development observed in touch-deprived premature human neonates. These studies have led to trials of supplemental massage in isolated very-premature human babies with dramatic results as the infants showed marked weight gain and improved behavioral development.¹¹ As a breeder of dogs, I know my retriever bitch will not be separated from her litter for more than a few minutes for many days after their birth. Gradually she will spend more time apart from them until, at around six or seven weeks of age, she seems more than happy to be rid of them! The distress at this point is largely on the part of the puppies which are separated from their siblings and my role, as a good stockwoman, is to

⁹ Thomas, T.J., Weary, D.M., Appleby, M.C. (2001). Newborn and 5-week old calves vocalize in response to milk deprivation. *Appl. Anim. Behav. Sci.* **74**: 165-173.

¹⁰ Poindron, P, Martin, GB, & Hooley, RD. (1979) *Effects of lambing induction on the sensitive period for the establishment of maternal behaviour in sheep.* *Physiology & Behavior*, 23: 1081-1087.

¹¹ Kuhn CM & Schanberg (1998) Responses to maternal separation : mechanisms and mediators. *International Journal of Developmental Neuroscience*, **16**: 261-270

ensure those who acquire a puppy are as well prepared as possible to deal with that distress. We use a range of devices including immersing a blanket or cloth in smells of the litter and providing extensive puppy notes which educate the new owner on the current daily routine of the puppy. We ensure each puppy has experienced a lot of human handling prior to weaning. We send food with each puppy to ensure no sudden change of diet and we avoid the additional stress of vaccinations and wormings around the time of separation.

This level of personal attention may seem too great to practically achieve in many livestock production systems. But producers should never underestimate the degree of distress which is occurring during maternal or sibling separation, and the impact that may be having on your bottom line of profitability. Perhaps the greatest criticism of “puppy farming” is the lack of this care and attention at this particularly stressful time in a puppy’s life.

Possibly the most extreme example of maternal separation is seen in Harlow’s studies in the 1950s in young macaques which were deprived of all parental contact from birth.¹² These famous studies have demonstrated how important is early social experience to these animals which subsequently manifested profound anxiety disorders to the point of despair. It would nowadays be extremely difficult, if not impossible, to justify studies of this nature due to the substantial distress caused to the subjects.

Distress due to Environmental Factors

The distress caused by the absence of certain important elements in an animal’s environment has been recognised for many years. Nearly forty years ago, Ian Duncan showed that one of a hen’s strongest instincts is to seek out a nest in which to lay her eggs¹³. Although genetic selection has substantially reduced this broody behaviour, commercial hens remain motivated to perform a substantial amount of work to gain access to a nest at the point of lay¹⁴. Hens are also strongly motivated to peck, scratch, forage and dustbathe,¹⁵ all behaviours which conventional battery cage

¹² Harlow, HF, Dodsworth, RO, and Harlow, MK (1965). *Total Social Isolation in Monkeys*. PNAS 54(1): 90-97

¹³ Duncan, I. J. H. (1970). Frustration in the fowl. Pages 15–31 in *Aspects of Poultry Behaviour*. Eds. B. M. Freeman and R. F. Gordon. Oliver and Boyd, Edinburgh, UK.

¹⁴ Duncan, I., Kite, V., (1987). Some investigations into motivation in the domestic fowl. *Appl. Anim. Behav. Sci.* 18:387–388.

¹⁵ Nicol, C., Dawkins, M.S., (1990). Homes fit for hens. *New Scientist* 125 (1708):46–51.

systems do not permit. We can measure this strength of motivation, and thus the degree of distress, by seeing how hard the bird will work to gain access to the desired environmental factor at the time when she desires it.

Georgia Mason has done similar studies with American mink which are active, partially aquatic carnivores yet are often raised in barren cages for fur production. In the wild, mink show a wide repertoire of behaviours including swimming, surveying from a high position, burrowing for prey, and building multiple nests. When asked to push against a weighted door for access to various resources including a small pool of water, a raised platform, a tunnel and an alternative nest box, mink showed a strong drive for all these elements, but would work hardest for access to the pool of water¹⁶.

In these two examples we gain an insight into the complexity of needs which animals have, defined not only by availability but sometimes also by specific timing of the needs. In the absence of precise measures of distress, we can only assume that the frustration caused by the lack of these important environmental elements over the extended period of an animal's lifetime causes significant distress.

Distress due to inappropriate handling

Whilst we may think that historical farming methods were more humane than our modern systems, this is certainly not universally the case. Many of the methods which our ancestors used for handling their livestock might be severely criticised today for the levels of distress caused. For example, traditional branding of cattle was not only painful, but the handling methods used were undoubtedly distressing. Temple Grandin has dedicated much of her life to persuading livestock producers, slaughter plant managers, and major food retailers of the importance of good handling of livestock, not only for the benefit of their animals but also for improving their profitability. Furthermore, the solutions are often found in good planning and design¹⁷.

Good attention to flooring designs to avoid slipping is well recognised but not always achieved. Restraint boxes which apply excessive pressure have been shown to cause struggling and vocalization. Adjusting lighting so animals are tending to move from darker to lighter places is important in equipment design. Providing solid screens to

¹⁶ Mason, G (ref available from David Fraser's paper)

¹⁷ Grandin, T. (2003). Transferring results of behavioral research to industry to improve animal welfare on the farm, ranch and the slaughter plant. *Applied Animal Behavior Science* **81**: 215-228.

prevent animals, especially cattle, being distracted by people or other activities is also important. Equally important however is training and motivating personnel to use good handling practices.

The two important times in an animal's life when handling may be critical are during transport and at the slaughter plant. It is well recognised that the most stressful events associated with transport are during the loading and unloading processes. Greater attention to how these are done and training of the individuals responsible could contribute significantly to animal welfare. Indeed many hypothesise that the duration of the journey is largely irrelevant from a welfare perspective (provided adequate food and water is supplied) but that the potential for welfare insult lies mainly at the start and finish of the journey. If this is true, one might argue that rest stops imposed after a specified period of travel, and which involve unloading the animals, may be counter-productive from a welfare perspective.

The distress of handling prior to, and at, slaughter has been well studied. In addition to the benefits of a well designed race for bringing the animals from their transport vehicle into the slaughter plant, there is great benefit for some species such as sheep in being kept in a group. The evidence shows that sheep are not distressed by having conspecifics slaughtered within their sight. Indeed the stress of separation prior to slaughter is much greater than simply keeping the group together.¹⁸

With regard to experimental animals, steps should be considered which will reduce the level of distress caused, whether as part of the normal husbandry practices or during procedures. For example, well trained husbandry staff who provide consistent care and minimise disruption to the animals are extremely important. They can use social housing systems and environmental enrichment to minimise distress. They can also provide appropriate care following procedures, such as assisted feeding and additional warmth where appropriate.

Likewise, in preparing animals for experimental procedures, much can be done to minimise distress by good planning. Often animals can be trained using operant conditioning to perform tasks for reward. Providing buddy animals (a companion which accompanies the research animal but is not subjected to any experimental procedures) can also alleviate distress in social species, especially if they undergo painful

¹⁸ Mohan Raj work – mid 90s

procedures. Planning through appropriate pilot studies, selecting the least invasive methods and allowing the animal to remain in, or return promptly to, its home environment have also all been shown to be important.

Conclusions.

In conclusion, it is obvious that distress surely does matter, both from the perspective of the animal and its welfare, but also as a potential impact on profitability. It may be difficult to define and precisely measure distress but it can be recognised by experienced observers. Nevertheless, it is clear that we need more research in this area of animal welfare to better understand distress. In the meantime, there are three ways in which those working with animals can best ensure that distress is minimised. Firstly, through careful planning they can minimise distress during routine husbandry procedures. Secondly, through effective team-work they can ensure good communication between all those responsible for the care and welfare of the animals. Finally, through good observation they can pick up signs of distress before an animal's condition may deteriorate and possibly become moribund or even die.