

Welfare of Large Animals In Scientific Research

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Summary

For the purpose of this paper, large animal species are taken to be those animals that are commonly used as farm livestock animals namely: cows, pigs, goats, sheep, horses, camelids and deer. The numbers of procedures in the UK in 2006 involving such animals amounted to around 56,000 out of a total of around 3 million. It may be that human perception of these animals as livestock animals impairs our consideration of their needs, compared to say those of common pet animals, dogs or cats. As the perception of their environment, and the potential to suffer, of livestock animals is likely to be similar however, we should not neglect their needs. The use of large animals in scientific procedures has advantages in some respects – the animals are in the main domesticated, and are therefore comparatively docile and have been bred to cope with captivity. Nevertheless they can display aggressive behaviour and are capable of causing significant injury, so an understanding of their behaviour can reduce risks to staff caring for and working with these animals. This presentation considers the behaviour of these animals, their needs, signs of discomfort and pain, and means to ameliorate both their welfare and the safety of staff engaged in their use.

Large Animals in Context

Large animals, an inexact term, is taken here to mean domesticated production animals, those animals used in livestock production systems namely: Cows, pigs, goats, sheep, horses, camelids and deer. Primates and other 'large' animals are not considered. The numbers of such animals used in scientific experiments are, although comparatively small compared to other animals such as rodents, nevertheless significant. Figures from 2006 for the United Kingdom (Home Office, 2006) show that over 56,000 scientific procedures involving these animals were carried out, compared with 3 million procedures involving all species.

There are a number of sound reasons why large animals might be the species of choice. Their history of domestication has ensured that they are adapted to living in close association with humans. They are,

compared to the wild types, relatively docile and show low levels of aggression. Their natural behaviour, that leant them towards human domestication, is also as advantageous to the scientific investigator as to prehistoric man: they have a relatively short flight distance (the distance at which an animal will flee from human approach), are gregarious, and (mostly) nonterritorial. In addition, large animals can provide much larger volumes of sampling material: plasma, urine, faeces and tissue, and these can be taken with greater frequency. Large animals have a much longer lifespan than small mammals, up to about 20 years. This might be of particular importance in long term studies, particularly those looking at the long term impacts of, say, drugs, toxins or disease. Finally, they are relatively easy to source and are inexpensive considering their size.

Societal attitudes towards large animals

It may also be true that society is more accepting of the laboratory exploitation of domestic animals than species that are more commonly kept as pets. Pet owners are known to have an emotional bond with their animals, and highlighting the use of in-

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dividuals of these pet species as laboratory animals has been the target of those against animal experimentation in principle, e.g. the outrage engendered by pictures of smoking beagles in the 1970s. An animal that society has accepted the use of as a source of food may be less sympathetically regarded. The different perspectives of the harm-benefit balance in society between research and farm animals have been extensively reviewed by Wolfensohn and Honess (2007).

In this regard some mention should be made of the feeling of pain. Within this author's own experience there has been occasion when a handler has presumed that farm animals feel pain in a somehow less intense way than other mammals. The reasoning for this was based upon their behaviour at the time of injury. However, there is actually no evidence that they perceive pain substantially differently from other mammals (Fitzpatrick *et al.*, 2007; Saslow, 2002; Short, 1998); and this includes humans. However, as prey animals, they have adapted to not show obvious signs of pain, any individuals that did so would have been selected out of the population by a sharp-eyed predator. So although they can suffer from feelings of pain they might not show it. In other words, just because they do not show obvious signs of pain does not mean that they are not suffering. When considering the pain thresholds of animals it should also be noted that there is considerable variation between individuals within species, between sexes and within the sexual cycle (Wiesenfeld-Hallin, 2005).

Domestication

As these animals have been domesticated for such a long period, this means that we have a vast bank of knowledge of their various husbandry needs. There should be no excuse for not meeting these needs, or at least considering these needs when providing for their housing and nutrition in laboratory conditions.

During the process of domestication these large animals have been selectively bred, for thousands of years, to survive and flourish while in close asso-

ciation with humans. So keeping these animals in captivity in conditions in which their stress is minimised ought to be relatively easy. Unfortunately this is not always the case and there is perhaps not always enough exchange of information between agricultural and laboratory scientists. It may also be that the morality of care of the handlers (as well as society at large) for production animals might be less than for pet species such as dogs, cats and rodents or primates.

It could be argued that the conditions under which large animals are used in science ought to be better than their conditions under livestock production systems. Much tighter legislation is in place for the keeping of animals for research purposes than for production. The proposed experimental protocol and details regarding the animals' nutrition and other husbandry should have been through an ethical review of the scientists' peers, and in most cases will require that the work is overseen by someone holding a license for such work. Unfortunately however, and for whatever reasons, this is not always the case. The following quotation illustrates how this process can sometimes fail to achieve its intended outcome:

Sheep which should have been considered as continuing under project licence controls and personal licensee care were not given adequate diet. Their poor condition was not recognised and a few died.
Animals (Scientific Procedures) Inspectorate Report 2006

Evidently then, problems can occur at the level of care, at the level of the licensing agreement, and at the level of review of such controls within the institution.

Environmental conditions

Regarding production trials, in such cases samples are usually taken from animals under management conditions that are at least similar to those in which they are naturally kept. So there ought not be any

particular welfare problems for the animals with such experiments. The environmental conditions for such animals, whatever the nature of the trial, should insofar as possible, fit with agricultural industry standards for each species. This should incorporate due regard to such factors as: ventilation, light, flooring, bedding, and enrichment.

When accurate measurement of inputs and outputs are required, metabolic crates may be necessary. Confinement in such housing enables the accurate collection of faeces and urine and is commonly used in digestibility trials and trials involving the analysis of nutrient balances. In such conditions the animal will receive no exercise, be necessarily socially excluded from its peers and there may be a need for the animal to be tethered. Nevertheless, the animal should still be able to stand, lie down and stretch. Animals will need an adjustment period while in the crate prior to the beginning of the trial, and this should be of some days, within the limitations of the total number of days permitted in the crate. The minimum number of days for trials of this sort to produce meaningful data is seven days, with a maximum of 10. The total number of days for a large animal to be kept in such conditions should be no longer than 14 days, including the introductory period. For more detailed studies involving gaseous exchange, the animal may be enclosed within a respiration chamber.

The same animals may be used, after a break to recover. It is thought that the advantages of using an animal that may become habituated to such conditions, and therefore suffering less at each subsequent visit, outweigh the disadvantage of subjecting the same animal to repeat exposure. Indeed, such an arrangement would be necessary for a crossover trial, which might be selected to reduce the total number of animals used in a trial. In order to minimise the stress necessarily involved in such work it would be good practice to select animals that have adapted well to such confinement, and not repeat the experience for those individuals that have clearly suffered more than others.

Handling techniques

Again, our differential treatment of production and other animals has an effect on the quality of handling. Unlike dogs, cats and indeed rodents, it may be that large animals are handled less frequently, with less compassion, and less of an emotional bond between handler and animal. Touching, but also talking to and being close to animals (*Kiley-Worthington, 1990*) encourages empathy in the human-animal relationship and is important for their wellbeing. Large animals are more difficult to handle when stressed and it is known that, with all farm animals, frequent positive handling reduces fear of humans, and other familiar objects and therefore eases the duties of stockmanship as well as improving the welfare of the animals.

If production parameters are an important part of the trial, the positive effects of sympathetic handling, including both touching and talking, should be noted. In a classic paper by Seabrook (*1984*) the positive effect of cowman on the production of dairy cows was demonstrated. Likewise, the work of Hemsworth et al. (*1991*) with pigs. Pleasant handling was associated with improved reproductive performance

Signs of Pain, Discomfort and Suffering

In order to assess the quality of their stockmanship and to identify problems early, handlers should be familiar with signs of stress and suffering in the animals under their care. Physiological measures (such as the pulse and respiration rate), and a decline in production measures can indicate problems, but also important are behavioural changes. These include: increased aggression and vocalisation, sensitivity to stimuli near an affected limb (*Driessen, 2004*), isolation from other group members, lameness (postural changes – *O'Callaghan et al., 2003*), drooping ears or a hunched posture, reduced activity (though older animals are generally less active than younger animals and activity can change throughout the oestrus cycle in female animals), reduced appetite and an increase in stereotypic behaviours.

With respect to stereotypic behaviours, Broom and

Johnson (1993) proposed the use of the observation of such behaviours as a tool to assess welfare, particularly in relation to their housing conditions. Occasional observations of such behaviour do not indicate a problem with welfare, should the animal spend 5% of its active time in stereotypes, this indicates that welfare is compromised; and as high as 40%, their welfare can be estimated to be very poor.

Risks to handlers

Large animals can be a danger to their handlers. As mentioned earlier this is particularly likely if the animal is stressed, but will vary with individuals, dominance and stage in the sexual cycle. The danger may come from the animal panicking and trying to escape. Injury can be caused by butting, biting or kicking of the animal. There is also a risk from innocuous acts, such as the tossing of a horned head to remove flies, and accidental treading on feet. Zoonoses are also a risk. Handlers should therefore wear protective clothing at all times.

Possible signs of aggression for different species include:

- Horses: Ears back, tail lifted or tucked between legs.
Cattle: Tail lifted or between legs, vocalisation, lowered head, pawing the ground, a side-on stance.
- Pigs: Sideways posture, chomping, raised hackles, pawing the ground.
- Sheep: Head-on posture, preparation for butting
- Camelids: Ears flat back, charging, butting, spitting.

Identifying behaviour problems

Training is clearly important in ensuring that handlers are aware of the various needs of large animals, particularly perhaps if they are familiar with small animals. However, Wemelsfelder (2007) has reported that, irrespective of professional expertise,

observers' interpretation of animals' behavioural expressions, including their emotional state, are in close agreement. This ability of humans to accurately judge the emotions of an animal is true for pigs, cattle and poultry as well as sheep, so there should be no excuse for not identifying a stressed animal, and addressing the problem to ensure a satisfactory solution both for the welfare of the animal and for the safety of the handler.

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