My research interest is in the diagnosis of pain, distress and suffering in animals, no matter what they are used for. It covers the recognition of those adverse states, followed by an assessment of their intensity and duration. One of our first papers was on trying to understand what carers, such as veterinarians, animal nurses, and stockpersons, were observing when they thought an animal was in pain, or "not right" (Morton & Griffiths 1985). This led to recommending that a staged approach to the recognition of pain etc., starting by observing the appearance and posture of animals, as well as their natural behavior in their cage or pen, whether they be singly housed or with other animals. The animals are then approached and a more detailed examination made including clinical measurements such as body weight, temperature, heart rate and so on, as well as provoked behaviors e.g. response to the observer, pressure on potentially painful sites. This strategy yields information on the relevant clinical signs for that animal in that experiment or under those circumstances. Assessment of its intensity is then linked to how far that animal has deviated from normality, or how often a specific sign is reported (see Roughan & Flecknell, 2001). This approach requires that there is a sound knowledge of what is normal behavior and physiology etc for that animal, under that system of husbandry, in that particular experiment, or in that specific situation. The observations are then recorded on a "score sheet". However, the way in which score sheets are made up and used is crucial to minimize inter- and intra-observer variation, and consistency of clinical judgment. This has been further refined and developed (see e.g. Morton 2000) and can be used in a pain or distress management system (Soulsby & Morton 2001). Not only does the system provide for monitoring and recording the relevant signs indicative of animal wellbeing, but also in the response of an animal to the scientific variable under study, as well as to any alleviative therapy. Often useful extra scientific information on clinical signs is gained and can provide useful insights into both animal and human disease states. The score sheet approach has been used to refine scientific research and to help eliminate death as an endpoint in some standard safety or potency tests, as surrogate signs indicative of impending death can be predicted at an early stage (e.g. Cussler et al. 1999; OECD 2001). The interest in humane endpoints led to an international conference in 1999 and several approaches to the development and implementation of humane endpoints were reported as being useful or as having potential (Hendricksen & Morton 1999). This has led to validated endpoints for several standard vaccine tests (pertussis, rabies, erysipelas) and the setting up of an international organization called HELP (Humane Endpoints for Lethal Parameters). This group is particularly interested in looking at pharmacopoeial monographs and their requirement for severe endpoints such as death, and to try to develop refined alternatives that cause less pain and suffering.

Another approach we have adopted has been the investigation of animal responses to various common routine procedures and surgery, through the use of radio-telemeters. This is potentially a useful technique to show at how quickly an animal habituates to a procedure, or acclimates to a new environment, or returns to normal homeostasis after surgery e.g. by measuring its heart rate, activity, body temperature and even its circadian rhythm. It is of interest in the latter case to see how this can be modulated by the provision of different anesthetic or analgesic regimens. More recently we have been looking at the amputation of the tail tip in mice as part of genetic profiling, with particular respect to anesthetic death rates, effectiveness of local anesthesia, evidence of pain at the time and after surgery, hemostasis, and methods of NSAID administration.

Finally, Matt Leach and I have been looking at the aversiveness of various gases used for anesthesia and euthanasia in animals (Leach et al. 2002a,b). This involves monitoring their behavior in tests where they have a choice of staying or exiting a box filled with the gas mixture, and to re-enter if they so wish. We exposed animals to various concentrations of the fluorinated hydrocarbon anesthetics (e.g. halothane, enflurane, isoflurane, desflurane, sevoflurane), carbon dioxide, carbon monoxide, and to the inert gas, argon, that kills by hypoxia. We also look at alternative methods for killing animals such as
high concentrations of sodium pentobarbitone injected into the peritoneal cavity. Our results have clearly showed that carbon dioxide was very aversive compared with all other gases at any concentration above 20%, regardless of species (rats or mice) or strain (two strains in each species). Animals rapidly withdrew from carbon dioxide and rarely returned compared with all the other gases, spending less than 3 seconds or so in CO2 in contrast to between 30 and 60 seconds in all the other gases (out of a 3 minute exposure period). Moreover, animals killed with carbon dioxide hemorrhaged into the lung but it was not entirely clear whether this happened before or after a loss of consciousness. We concluded from this work that carbon dioxide is not a humane method to kill animals and that argon was better, but best of all would be to anesthetize an animal with one of the traditional fluorinated gases and then to use CO2 to kill an animal more quickly.

References
Leach M, Bowell VA, Allan TF and Morton DB. Degrees of aversion shown by rats and mice to different concentrations of inhalational anaesthetics. Vet Rec, 2002; 150:808-815.
Guidance Document on the Recognition, Assessment, and Use of Clinical Signs as Humane Endpoints for Experimental Animals Used in Safety Evaluation. OECD, 2001 Environmental Health and Safety Publications Series on Testing and Assessment No. 19. - Available at OECD

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