



## Basic Neuroscience

# Progress in assessing animal welfare in relation to new legislation: Opportunities for behavioural researchers



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## HIGHLIGHTS

- Laws and guidelines on animal care and use require suffering to be minimised.
- To achieve this, good recognition and assessment of pain and distress are essential.
- Behavioural researchers can help to make welfare assessment more effective.
- The paper explains how and suggests some action points.

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## ABSTRACT

Recent revisions to international legislation and guidelines on the care and use of animals in research and testing emphasise the importance of minimising suffering and improving welfare. Achieving this requires effective systems for recognising, recording, analysing and assessing animal behaviour, in order to identify relevant indicators of pain, suffering, distress or lasting harm so that any suffering can be rapidly recognised and ameliorated. Behavioural researchers can assist by disseminating information on developments in techniques and approaches for recognising, observing, monitoring, analysing and interpreting behaviour, both within their own facilities and more widely. They can also help to facilitate better welfare assessment by continuing to develop systems for measuring behaviours – including indicators of positive welfare – while also ensuring that harms within behavioural research are minimised.

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## 1. Introduction – principles within legislation and guidelines

Many laws and guidelines that regulate animal use in research and testing include a requirement to minimise pain, suffering and distress. For example, the US Government principles for the utilisation and care of vertebrate animals used in testing, research, and training emphasise that ‘*proper use of animals, including the avoidance or minimization of discomfort, distress, and pain when consistent with sound scientific practices, is imperative*’ (National Research Council, 2011). The same approach is incorporated into Directive 2010/63/EU, which regulates animal care and use throughout the European Union (EU). This directly refers to the Three Rs (replacement, reduction and refinement) as a guiding principle, and requires Member States to ‘*ensure refinement of breeding, accommodation and care, and of methods used in procedures, eliminating*

*or reducing to the minimum any possible pain, suffering, distress or lasting harm*’ (European Commission, 2010).

These requirements clearly reflect the need to minimise animal suffering, taking the animals’ entire lifetime experiences into account. For example, suffering may be caused not only by scientific procedures and their effects, but also by many other factors including suboptimal housing, husbandry and care; transport; identification techniques; and euthanasia. Efforts to reduce pain or distress associated with all of these factors are taken into account by regulators and ethics or animal care and use committees, when weighing harms and benefits in order to make decisions about the justification for individual research projects. Besides the legal and ethical imperatives to minimise suffering, it is widely accepted that better welfare equals better science, as physiological and behavioural responses to avoidable suffering can act as experimental confounds, to the detriment of scientific quality (Poole, 1997).

In order to achieve the goal of minimising harms to animals – for all of the reasons outlined above – it is clearly essential to be able effectively to recognise, assess and monitor indicators of pain,

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suffering or distress. The recent revisions to both the US *Guide* and EU Directive recognise the need to assess welfare day to day, to review the nature and level of harm caused to the animals during their lifetimes (e.g. as a component of prospective and actual severity assessments, which are legal requirements in several countries), and to identify opportunities to replace, refine and reduce animal use in future studies.

For example, the 2011 US *Guide* defines and explains postapproval monitoring (PAM), the continual oversight of animal care and use by the Institutional Animal Care and Use Committee (IACUC). In its broadest sense, PAM includes reviewing observations of animals made by animal care, veterinary, and IACUC staff and members, as well as any adverse or unanticipated effects on the animals (National Research Council, 2011). Directive 2010/63/EU expands upon these principles, with a number of requirements that depend on the effective assessment of animal behaviour and welfare (European Commission, 2010). For example,

- the Animal Welfare Body (AWB<sup>1</sup>) must establish and review internal operational procedures regarding monitoring, reporting and follow up in relation to the welfare of the animals housed or used;
- the AWB must follow up the development and outcome of projects, taking into account the effects on the animals used;
- any 'defect' or avoidable pain, suffering or distress discovered must be eliminated as quickly as possible;
- 'retrospective assessment' of projects must include the actual severity of procedures; and
- actual severity must be reported annually.

## 2. How to achieve these principles

Achieving all of the requirements outlined above will clearly require a process of welfare assessment and classification, beginning with making good day to day observations of animals, using effective protocols for assessing appropriate behaviours and clinical signs (e.g. body weight, reduced rearing, decreased social interaction, changes in faeces). These protocols should be tailored to the species, strain (where appropriate) and procedure; for further explanation see ILAR (2008, 2009), Joint Working Group on Refinement (2011) and European Commission (2012, 2013).

### 2.1. Identifying and observing behavioural indicators of animal welfare

Careful review is necessary to identify the behavioural indicators and other clinical signs that are most relevant for each project, with input from people with a range of different expertise and perspectives. Good teamwork involving animal technologists and care staff, the researcher and the attending veterinarian, should help to identify sources of suffering and the most effective indicators of pain or distress (Joint Working Group on Refinement, 2011; European Commission, 2012, 2013). This is where additional input from behavioural researchers can contribute further towards ensuring an effective protocol to recognise and alleviate suffering, because of the expertise behavioural researchers can provide in understanding and interpreting behaviour, in addition to raising awareness of new techniques for monitoring animals and identifying novel indicators.

A look back at past guidance illustrates the recent progress that has been made with defining and recognising clinical signs, which

has been assisted by developments in behavioural research. For example, some 1996 guidance on recognising suffering in rodents suggested indicators for routine use that would be associated with severe suffering today, including hunched posture, piloerection, laboured respiration, vocalisation (presumably audible) and self mutilation (National Research Council, 1996).

Today, there is a growing literature on more subtle behavioural indicators of animal suffering – and wellbeing – much of it produced by researchers using rapidly developing technologies for observing and analysing animal behaviour and physiology. In the case of mice, rats and rabbits, new ways of looking at animals, such as analysing animals' facial expressions (e.g. Langford et al., 2010; Keating et al., 2012), or monitoring previously unnoted indicators such as 'flank twitching' post laparotomy (Roughan and Flecknell, 2001), have provided valuable insights into the presence of acute pain. There is also greater emphasis on observing the enclosure environment; e.g. faecal pellet production, reduced burrowing and nest building behaviour have all been evaluated as indicators of discomfort, pain, distress or sickness (see Jirkof, this section). Other techniques such as gait analysis are primarily used to characterise relevant animal 'models' (e.g. motoneuron disease, Wooley et al., 2005), but there is scope for using such techniques in other fields.

There is often a knowledge gap with respect to the above types of approach, in that many researchers are unaware of the range of techniques that could be at their disposal to help them improve both science and welfare. However, it is important to note that an effective, objective welfare assessment protocol will always use a combination of methods, and each new technique should be critically considered regarding its applicability to the species, strain and procedure, and how it could further understanding of the animal's experience. Behavioural researchers could play a vital role in both disseminating information about new approaches and helping with their interpretation; a point well made by the National Research Council (2008): 'animal welfare scientists, and researchers and scientists who use animal models, should communicate with each other more frequently in order to compare objectives and progress and to identify opportunities for dialogue'.

### 2.2. Balancing human vs. automated observations

Those new techniques and approaches that have made it to the 'cageside' have provided useful, objective tools for observing animals, some of which lend themselves to automated detection and analysis to further enhance objectivity (see van der Harst and Spruijt, this section). However, note that automated assessments should only be used to complement, and not supersede, the judgement of a properly trained, competent, empathetic human observer (e.g. Wright-Williams et al., 2013). This is particularly important with respect to implementing humane endpoints, which can be defined as 'criteria that allow early termination of experiments before animals experience significant harm, whilst still meeting the experimental objectives' (see <http://www.humane-endpoints.info>). As a simplified example, the humane endpoint may be a nest quality score of '1', denoting very poor nest quality; but an experienced animal technologist may use other criteria to judge that an animal is suffering excessively, and should be removed from the procedure, while nest building ability has not completely deteriorated and the score is still '2'. The technologist's judgement should be respected in cases such as this.

In addition to considering how to achieve a balance between human judgement and automation, it is also necessary to take account of technological and practical limitations associated with both the use of new technologies, and with monitoring animals per se (Table 1). It is necessary to consider the potential harms and benefits of different approaches, with the aim of selecting that which is

<sup>1</sup> Known as the Animal Welfare and Ethical Review Body in the UK, this is a local committee which advises on matters related to animal welfare and the Three Rs.

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