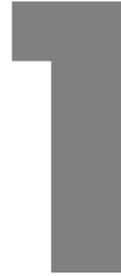


Part 1

Introduction

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Focus of Animal Welfare



Key Concepts

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This book is about the way different scientific disciplines contribute to our understanding and management of animal welfare. At the outset we note that particular scientific ideas, once they have been rigorously and systematically formulated and objectively and critically reviewed, do not remain fixed. Rather, they develop continuously as related scientific perspectives and knowledge evolve. Thus, few scientific conclusions remain unaltered for long. In time most are refined, changed markedly or replaced. Moreover, conflicting interpretations of scientific data may arise as particular areas are explored in greater depth or in different ways, so that there may be two or more

scientific explanations of a particular phenomenon. Accordingly, there is often no single, immutable interpretation at a scientific-functional level by which issues may be resolved, and judgements need to be based on the weight of scientific evidence for or against particular propositions. Yet the creative tension between alternative explanations of particular phenomena motivates further research and thinking and contributes to the continuing development of the discipline.

These general dynamics apply just as much to animal welfare science as to all other scientific disciplines. Elements of this are illustrated in the following chapters. We will show that various disciplines have contributed to improving animal welfare in the past, and that reference to insights from other disciplines may now redirect thinking about animal welfare in ways that will provide new perspectives on its assessment and management in the future. As a starting point for this some key concepts are outlined briefly to focus thinking in preparation for the chapters that follow.

1.1 Animal Welfare is a Driver for Ethical Behaviour Towards Animals

After many years of reflection, contemporary societies generally hold the view that it is acceptable to use animals for human purposes provided that such use is humane and justified (Banner *et al.*, 1995). It is also recognized that animals can suffer and that it matters to them how they are treated. In using animals for our purposes we exercise varying degrees of control over the quality and duration of their lives. That control gives us the *opportunity* to manage them humanely. Moreover, using them for our own purposes, not theirs, *requires* us to do so. Accordingly, we have an ethical 'duty of care' towards the animals in our control and this translates into a practical obligation to keep their welfare at acceptable levels. To do this we need an understanding of what animal welfare is.

1.2 There is no Single Unified Definition of Animal Welfare

To date, no single unified definition of animal welfare has emerged. This is partly because, at any one time, scientists, scholars and other contributors have emphasized different facets of animal functionality and animal–human or animal–environmental interactions. It is also partly because changes over time in our understanding of the ways animals may experience their functional status or their participation in interactions with people and the environment have drawn attention to limitations in extant definitions. Moreover, when assessing the welfare status of animals in practical contexts different emphasis has been placed on different facets of current definitions (Nordenfelt, 2006). At present, three general orientations can be recognized; they focus largely on biological function, affective state and natural state (Fraser, 2003).

The *biological function* view holds that, in general, welfare is good when the animals are healthy, growing and reproducing well, and, for farm animals in

particular, when good meat, milk, egg and fibre productivity of individuals is broadly aligned with good health and reproductive performance (e.g. Barnett and Hemsworth, 2003). The *affective state* orientation emphasizes the potential for animals to suffer or have positive experiences (e.g. Duncan, 1996; Dawkins, 1998). Thus, good welfare is said to be present when an animal adapts without suffering and/or with positive emotional experiences (feelings) during its interactions with other animals, people and the environment. Finally, according to the *natural state* view, an animal's welfare may be compromised in proportion to how far the conditions in which it is kept deviate from the original wild state of the species and, in particular, by the extent to which the animal is or is not able to express most of its natural behaviours (e.g. Rollin, 1992; Alroe *et al.*, 2001).

The outcomes of judgements made about the acceptability or otherwise of the ways we manage animals are likely to differ depending on which of these three orientations is emphasized (Fraser, 2003). They will also depend on how an animal's welfare status may be assessed (Nordenfelt, 2006), for instance in terms of how well it copes with the environment (Broom, 1996), its fitness in terms of survival and reproductive success (Barnard and Hurst, 1996), or whether its needs are being met (Dawkins, 1983). With a needs focus, for instance, understanding animal welfare will depend critically on what an animal's needs are considered to be, and in what ways and to what extent the non-satisfaction of those needs affects the animal adversely (Mellor and Reid, 1994).

1.3 Animal Welfare is a State in an Animal and Requires both Consciousness and Sentience

The welfare status of an animal, whether good, neutral or bad, represents the integrated outcome of all sensory and other neural inputs from within its body and from the environment, inputs which are processed and interpreted by the animal's brain according to its species-specific and individual nature and experience, and then perceived consciously. Accordingly, for an animal to perceive states which we consider reflect its welfare it must be both alive and conscious, and it must also be sentient; that is, it must have a brain of sufficient functional sophistication to transduce sensory inputs into cognitive or emotional experiences it can interpret as good, neutral or bad (Mellor and Reid, 1994; Mellor and Diesch, 2006). This implies that consideration of welfare is limited to higher animals, but it is not clear whether only (or all) vertebrates should be included, and if not, where the line of exclusion should be drawn among the invertebrates (Davie and Kopf, 2006; Kirkwood, 2006; Kendrick, 2007). Within sentient animals, there is also the question of when, during their development from immature to more mature stages, fetal and newborn animals, marsupial pouch young and pre-hatched young of avian and other species become conscious (Mellor and Diesch, 2006, 2007; see also Chapter 10 in this volume).

1.4 Animal Welfare may be Characterized in Terms of Five Domains

Notwithstanding the various definitions of animal welfare and approaches to welfare assessment (see Nordenfelt, 2006), we have found it useful to focus on animals' needs in five domains of potential welfare compromise, and the degree to which those needs are or are not met (Mellor and Reid, 1994; Mellor and Stafford, 2001; Chapter 5). Thus, we recognize nutritional, environmental, health, behavioural and mental domains of welfare, and describe good welfare as existing when an animal's needs in these interacting domains are largely being met (Figure 1.1). We also note that an animal's status can vary on a continuum between high welfare and its opposite of extreme suffering. Accordingly, it is proposed that sensory and other neural inputs associated with the nutritional, environmental, health and behavioural domains (considered to be largely physical or functional), together with additional cognitive inputs, are processed and then express themselves (within the mental domain) in terms of the animal's conscious subjective experience. It is the character of this conscious experience and its associated position on the welfare-suffering continuum which determine the animal's overall welfare status (Mellor and Reid, 1994; Mellor and Stafford, 2001).

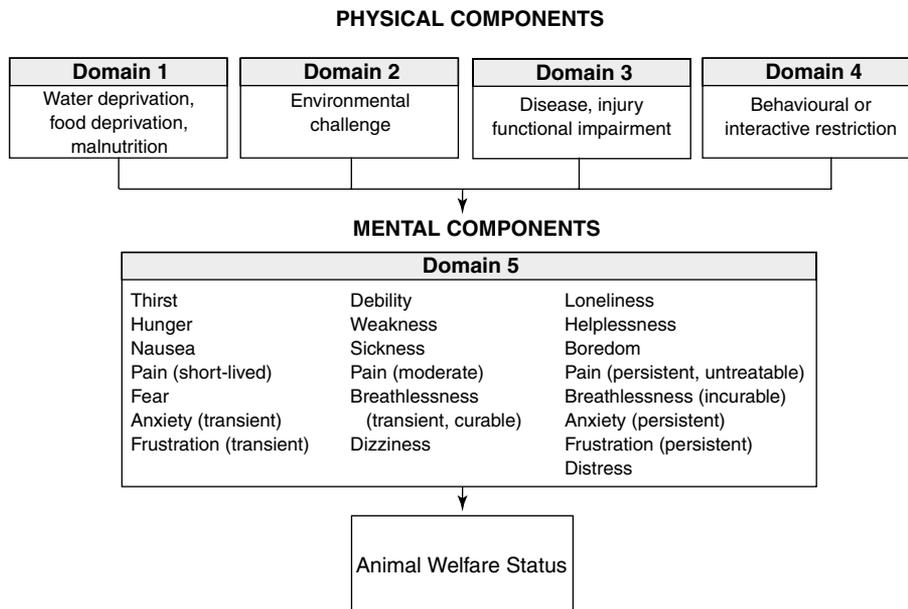


Figure 1.1 The five domains of potential welfare compromise divided broadly into physical and mental components. Modified from Mellor and Reid (1994) and Mellor (2004).

Compromise to welfare within these five domains may be illustrated thus.

- *Nutritional* compromise may result from inadequate fluid or food intake or from dietary nutrient imbalances (deficiency or excess), which in turn may lead to greater than normal thirst or hunger, or to feelings of weakness or debility.
- Compromise in the *environmental* domain may be due to outdoor exposure to extreme weather (cold or hot) or, indoors, to uncomfortable or injurious floors or other physical structures, and these may lead, respectively, to hypothermic or hyperthermic distress or to persistent discomfort or pain from bruises, joint problems, skin irritation and so on.
- Compromised *health* may occur in response to traumatic injury, disease agents or toxins, genetic disorders or other forms of functional impairment, and these may lead to a wide range of unpleasant experiences including breathlessness, nausea, sickness, pain, distress, fear or anxiety.
- *Behavioural* compromise may result from severe space restrictions, or overcrowding and agonistic interactions. There may be a lack of substrates allowing the expression of species-specific motivation to perform behaviour patterns such as foraging/hunting, play and exploration, developing a safe resting area, normal mating or parenting behaviour, and positive social interaction, or a general lack of productive occupation, stimulation and opportunity for performing actions with satisfying consequences. Outcomes in terms of mental experience may include anxiety, fear, frustration, helplessness, loneliness and boredom.
- Compromise in the *mental* domain arises from sensory and other neural inputs linked to compromise in the four largely physical or functional domains (nutritional, environmental, health, behavioural), together with cognitive-neural inputs and activity related to external challenge (e.g. situations eliciting 'fight' or 'flight' responses), which are all integrated and expressed mentally as varying degrees of thirst, hunger, weakness, debility, breathlessness, nausea, sickness, pain, distress, fear, anxiety, helplessness, boredom and so on.

Clearly, the greater the intensity of these negative subjective experiences or feelings (in the mental domain), the greater is the associated compromise to an animal's welfare. Although it is not clear how the relative noxiousness of these different experiences may be compared, it is likely that any associated suffering increases as the negative intensity of each rises towards its maximum (see Chapter 5).

1.5 Good Animal Welfare is more than the Mere Absence of Negative Experiences

Minimizing or avoiding such welfare compromises would obviously be beneficial for animals, but the mere absence of such negative experiences cannot necessarily be

taken to represent *good* welfare. Nevertheless, a ‘neutral’ state might be regarded as *acceptable* welfare and could be a considerable improvement in some circumstances. Also, the minimization or avoidance of negative feelings such as those listed above may free the animal to have some positive experiences without further intervention.

A view that is gaining ground is that good welfare probably also depends on the presence of positive experiences or feelings as well as the absence of negative ones (Duncan, 1996; Fraser and Duncan, 1998; Yeates and Main, 2008), and this may require additional interventions. It follows from this view that other forms of animal welfare compromise may arise from an absence of positive mental states related to absence of feelings of reward or satisfaction. Such compromise may therefore occur in circumstances which hinder an animal’s capacity to experience, for instance vitality, companionship, contentment, satiety, happiness, curiosity, exploration, foraging and play (Fraser and Duncan, 1998).

The notion that a good state of welfare exists when the nutritional, environmental, health, behavioural and mental needs of an animal are met accommodates all of these considerations. That is because meeting the mental needs of animals can be taken to incorporate both the absence of demonstrably negative experiences and the presence of positive experiences that are shown to be important to the animal.

1.6 Synopsis: A Needs-Based View Integrates Several Key Features of Animal Welfare

Based on the considerations outlined above, it is now possible to characterize animal welfare using a needs-based orientation. A good state of welfare may be said to exist when the nutritional, environmental, health, behavioural and mental needs of conscious higher (sentient) animals are met. This occurs when negative states are absent and/or positive states are present. The five areas of need represent domains of potential welfare compromise, the first four being largely physical or functional, and the last, mental state, representing cognitive and affective attributes of the animal’s experience. Thus, sensory and other neural inputs associated with the nutritional, environmental, health and behavioural domains, together with additional cognitive inputs, are processed and then express themselves within the mental domain in terms of the animal’s conscious subjective experience. In other words, the welfare status of an animal, whether good, neutral or bad, represents the integrated outcome of all sensory and other neural inputs from within its body and from the environment, inputs which are processed and interpreted by the animal’s brain according to its species-specific and individual nature and experience, and then perceived consciously.

1.7 Animal Welfare can be ‘Assessed’ but not ‘Measured’

Although the notion of scoring a particular aspect of the welfare of an animal or group of animals (e.g. pain status) may be attractive in some respects

(Scott *et al.*, 2003), no single, specific or decisive measurement of *overall* animal welfare status has yet emerged, and nor is that likely. This is because such a notion is too simplistic. As indicated above, an animal's welfare status reflects its internal subjective experience, and this represents the integrated outcome of numerous inputs to the animal's brain that result in a wide range of positive, neutral or negative experiences or feelings, none of which can be measured directly. Moreover, each such experience differs in character. For instance, with regard to negative experiences, thirst is not the same as pain, hunger is different from boredom, breathlessness and nausea differ, and frustration is not the same as any of these. Thus, deriving a single number from a composite of several such attributes of welfare that have previously been scored numerically using indirect indices implies a greater understanding of the attributes themselves, and of relationships between them, than is possible now and is likely in the foreseeable future. Assessment of welfare status requires the exercise of scientifically informed good judgement (see below) supported by comprehensive and careful evaluations of those factors that contribute to an animal's internal subjective experiences. Reference to the five domains of welfare and grading non-numerically the extent of compromise an animal may experience in each of them (Mellor and Reid, 1994; Chapter 5) has been used to effectively support such judgements in the context of the impact of experimental procedures on animals.

1.8 Science is the Vehicle for Revealing Animals' Needs

The generalizations above help to characterize animal welfare in terms of animals' needs. The vehicle for revealing what those needs are and how they can be met is science, allied to rigorous and critical practical field observations (e.g. Kirkwood *et al.*, 2001, 2004).

Nutritional, environmental, production and veterinary sciences have contributed hugely to animal welfare during the last 50 years by defining functional responses and the corrective management of animals faced with, for example, nutrient deficiency or excess, thermal challenge, pathogenic microorganisms, injury and the metabolic demands of high productivity (Mellor and Bayvel, 2008; Chapters 2 and 3). Such production-orientated research improved animal welfare because of the close links between animal health and welfare. However, during the last 20–25 years there has been, in addition, a progressive increase in research with an explicit animal welfare focus. This occurred at least partly because the earlier advances in our understanding of nutrition, environmental impacts and disease allowed research attention to be redirected towards the assessment and management of the behavioural and mental needs of animals (Mellor and Bayvel, 2004, 2008). This same period saw the birth of the new discipline area of animal welfare science; that is, the science concerned with the acquisition and application of the knowledge required to characterize, maintain, restore and promote animal welfare. It currently depends heavily on contributions from disciplines including animal behaviour science and cognitive-neural sciences in particular, but also animal husbandry,

biochemistry, genetics, immunology, nutrition, physiology, pharmacology, veterinary pathology and veterinary clinical sciences, as we shall see.

1.9 Science and Good Practice are both needed to Advance Animal Welfare Practically

Advances in welfare management are based on scientific knowledge applied, where necessary, to improve currently accepted 'good practice', and on existing good practice that has been validated scientifically. Good practice may be characterized thus (Mellor, 2004b):

- it represents a standard of care that has a wide level of acceptance among knowledgeable practitioners and experts in the field;
- it is based on good sense and sound judgement;
- it is practical and thorough;
- it has robust experiential or scientific foundations;
- it prevents unreasonable or unnecessary harm to, or promotes the interests of, the animals to which it is applied.

Good practice therefore highlights the importance of direct experience with the practical care and management of animals in the circumstances of their use, as well as common sense which has been carefully evaluated. It also depends on knowledgeable observation of animals' health and welfare status, veterinary medicine, and the use of available technology. Scientific knowledge alone is not enough; it must be allied to sound practical experience.

1.10 All Systems for Managing Animals have Positive and Negative Attributes, and Evolve

Systems used to manage animals are retained because they largely meet the purposes for which they were originally devised and because those purposes are judged at the time to be generally acceptable. Positive attributes of commercial farming systems include, for example, high levels of animal productivity, health and, during the last 20 years, welfare, and must also include economic viability (McInerney, 1998; Mellor and Stafford, 2001). Likewise, the beneficial purposes of keeping pet, recreational and sports animals relate to an evident human desire for, among other things, animal-based companionship and nurturing, leisure pursuits and competition (Chapter 7).

However, all such systems have some negative impacts. In farm animals, requiring high productivity may lead to metabolic 'burnout' (e.g. high-yielding

dairy cows, end-of-lay or 'spent' hens), space restrictions may hinder normal behavioural expression or produce aberrations (e.g. layer-hen cages, sow stalls), infectious disease problems may be greater in animals kept indoors on deep litter (e.g. indoor lambing), distressing or fatal exposure to weather extremes may be greater outdoors (e.g. pastorally farmed animals) and so on. Examples in other animals include leaving pet dogs (pack animals) alone at home for much of each day, grossly overfeeding or otherwise mismanaging the diet of pet dogs or cats, keeping flocking pet birds alone in extremely small cages, keeping recreational horses in isolation from others, exposing competition horses to a high likelihood of severe injury (e.g. during show jumping, eventing and racing) and so on.

Despite such negative impacts, no system is static. Over time, systems may be modified in an attempt to reduce their detrimental effects on the animals, or new systems may be created to replace ones with apparently intractable problems (Chapters 2 and 3). Further drivers for change are increases in scientific understanding about the nature of animals' needs, how those needs can be met, and on that basis what are then regarded as acceptable and unacceptable ways of managing animals (Chapters 7 and 8). Moreover, public interest in, and concern about, how animals are managed in specific circumstances (e.g. layer hens in cages, sows in stalls), with input from animal advocate organizations, also influences the approach of animal users, professional advisors (including veterinarians) and regulators (Mellor and Bayvel, 2004, 2008; Chapter 9).

All of these drivers have led to changes in the management systems for farm animals during the last 50 years, and especially the last 25 years (Chapters 2–4). Although the focus for change was always improvement (however judged), unforeseen negative consequences sometimes arose. For instance, improving the then poor hygiene, nutritional management, health and productivity of free-range layer hens by introducing the first cages led, among other things, to the foot or bone problems and the overcrowding and behavioural restrictions which are now of concern. Likewise, use of sow stalls to more efficiently and effectively manage nutrition, hygiene, health and aggression-induced injuries, and to improve productivity, led to leg and back problems, vaginal-vulval inflammation, contact-rubbing injuries or behavioural anomalies (including stereotypies) in a significant proportion of animals.

In terms of animal welfare, therefore, most systems for managing animals have strengths (i.e. the welfare benefits) and weaknesses (i.e. the welfare compromises of different types that may occur), but they also have safeguards. These safeguards are the recommended minimum standards in codes of practice which are directed both at minimizing particular compromises and at promoting positive welfare. Although consideration of all three features (strengths, weaknesses, safeguards) is required when deciding whether or not the *net* welfare status of animals in different systems will be acceptable, the extent to which the safeguards are successfully implemented is clearly of major importance.

1.11 Animal Welfare Trade-Offs should be Managed Responsibly and Re-Assessed Regularly

Many current problems can now be seen as issues that have been ‘over-solved’. For instance, the layer hen completely removed from contact with faeces is entirely protected from disease vectors found within them with 100% success: in those terms. Taking a wider view, however, it is evident that no animal is ever really 100% protected. Trade-offs *must* be made, often in broad terms, between the human-centred purpose of using the animal and the animal’s own needs, as well as trade-offs between the animal’s safety and its freedom. The more opportunities and choices an animal has the more injuries and suffering it may experience if it is unlucky or if those responsible for it are not fully conscientious in their care and monitoring.

We, all of us, decide how to balance these various considerations even as we try to make improvements in all of the domains of welfare and the overall success of the animal, as well as any associated industry and community. To achieve this we not only need agreement between observers within our immediate discipline but between a wider group representing other disciplines and allied professions, and in our wider society (providing social licence). We need to satisfy, as best we can but inevitably not fully, a range of diverse economic, social and ethical imperatives (Fisher and Mellor, 2008).

The discipline of animal welfare science requires as a fundamental quality what could be summed up by the old latin motto of *circumspice*, i.e. ‘look around’. This book is an attempt to highlight the need for all of us in the animal welfare arena to constantly *look around* in order to appreciate what we are doing, where we have made progress, and not only when we fail but *whom* we fail, how we fail them and whether what we are doing is really the best that we can do. If we must make trade-offs with an animal’s care, it behoves us to do so openly, ethically and mindfully.