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The Scientific Assessment of Animal Welfare

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ABSTRACT

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The welfare of an individual is its state as regards its attempts to cope with its environment. Welfare varies on a continuum from very good to very poor, and it can be assessed precisely. Information about what conditions might result in good welfare can be obtained from studies of preferences, but the importance of the preference to the individual must be assessed. Measures which show how poor welfare is when animals encounter short-term or long-term problems may be physiological, behavioural, or concerned with individual production or disease. Individuals vary in the coping methods which they use, so any one measure may indicate poor welfare and absence of evidence using one measure does not mean that there is no welfare problem.

INTRODUCTION

In order that proper decisions about issues concerning animal welfare can be accepted by the general public and by legislators, there is a great need for clarity in the terminology used when considering the subject and precision in the measurement of welfare. There is confusion concerning the different concepts of wildlife conservation, animal rights or human obligations towards animals, and animal welfare. This paper is about assessing welfare, but it is necessary to explain how the word welfare is used and how it is related to moral questions.

The welfare of an individual is its state as regards its attempts to cope with its environment (Broom, 1986a). When conditions are difficult , individuals use various methods to try to counteract any adverse effects of those conditions on themselves. These attempts may be unsuccessful or they may succeed, but the effects of lack of success and the extent of what is done to try to cope can be measured. Hence welfare varies on a continuum from very good to very poor, and it can be assessed precisely. The assessment of welfare can be carried out in a scientific way without the involvement of moral considerations. The ques-

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tion which is asked after the measurement is made is "how poor must the welfare be before people consider it to be intolerable". A moral decision must be taken here and different people will draw the line, marking what is unacceptable, at different levels in the welfare continuum. The moral decision depends upon the availability of evidence about welfare, but the process of deciding about morality and the process of assessing welfare are quite separate.

It is also essential to appreciate that questions about whether or not man should kill animals or exploit animals need not be related to questions about welfare. If an animal is suddenly shot, with no previous warning that this might happen, and it dies instantaneously, then there is a moral question about whether such killing should occur but there is no welfare problem. If an animal dies slowly with much pain, or is wounded by shot which results in pain and difficulties in normal living, then its welfare is poor. Some indicators of how poor its welfare is can be made from observation of the animal, and some extrapolation from other studies of similarly wounded animals is possible. It is much easier, of course, to assess welfare in domesticated animals, but the same distinction between moral decisions and such assessments needs to be made here. If animals are kept in order that they will eventually be eaten, their welfare could be good throughout their lives even up to the point of slaughter. Some people, however, do have moral objections to eating animals in such a situation, although there is no welfare problem. Many other people object to the keeping of animals because of their welfare in the conditions in which they are kept. Most people would not tolerate the keeping of animals such that their welfare is extremely poor, especially if they are demonstrably in pain, but the level of poor welfare which people find morally unacceptable varies greatly. There are national differences here as well as individual differences, but both within and among countries, people's attitudes to welfare can be changed by informing them about the complexity and sophistication of the animal's life.

RECOGNISING GOOD WELFARE

The majority of this paper is about the use of measures which demonstrate that the individual is having difficulty in coping with its environment. It is also desirable to be able to recognise that welfare is good by positive evidence rather than by the absence of negative evidence. Our ability to make direct measurements which identify pleasure is, however, extremely limited. There are centres in the brain which can be stimulated electrically by the animal itself in the appropriate operant situation. Animals, including farm animals (Baldwin and Parrott, 1979), may work hard in order to be able to self-stimulate in this way so these have been called pleasure centres. It is very difficult, however, to relate such centres to everyday life. Some behaviours, such as tail wagging by dogs, are assumed to indicate pleasure because of the situations in which they occur and again because the animal may work in order to be in that situation. How-

ever, tail wagging may sometimes be used to appease a dominant dog or owner rather than to indicate pleasure. If, indeed, an individual does feel pleasure, communication of that pleasure to others may be of no advantage, so natural selection will not have favoured such communication and individuals may avoid communicating it. Hence pleasure detection and assessment will often be difficult. Research on behaviour like tail wagging and on the practicality of direct behavioural or physiological indicators of pleasure is much needed.

The major technique which is available to discover what is good for animals is to observe their preferences and to measure how hard they will work for the preferred event or object. One technique which has long been used is to watch the animals in an environment which is rich in the complexity of stimuli and opportunities for activities which it offers. The stimuli which are chosen and the ways in which the animals spend their time provide information about the preferences of the animals. Studies like this with farm animals, e.g. McBride et al. (1969), Duncan et al. (1978), Wood-Gush (1983), Jensen (1986) and Jensen et al. (1987), can be used when designing farm accommodation for these animals, for example the family pen for pigs (Stolba, 1982). Different types of farm housing conditions can also be compared. The simplest experiment of this kind merely involves giving the animal the choice of two conditions where the choice is expressed by moving from one place to another. Hughes and Black (1973) found that, contrary to the previous expectations of some people, hens preferred to stand on a hexagonal mesh floor rather than a coarse rectangular mesh or a perforated steel sheet. Hughes (1975) and Dawkins (1976, 1977) found that, after a brief period of becoming accustomed to new conditions, hens preferred a large cage to a battery cage. In similarly designed preference tests, piglets were found to prefer to lie on perforated plastic or concrete rather than wire mesh, to spend more time in a pen with a straw container and to avoid lying in pens with 0.23 m^2 per piglet if an adjacent accessible pen offered more space (Marx and Schuster, 1980, 1982, 1984).

The simple preference-test experiment has been criticised in two ways. Firstly, as Duncan (1978) pointed out, the animal may not choose what is best for it. In most situations the repeatedly expressed choices of animals are those which increase their biological fitness, but some animals do choose to do things which harm them, for example over-eating. Hence choice tests alone are sometimes inadequate. A much more general criticism is that the action required in order to make the choice in an experiment is often very easy. As a result there is little indication of the importance of the choice to the individual. An individual may make a clear choice between two foods which are both very palatable and very beneficial to it. If the preferred food of these two could be obtained only by expending energy for a long time or by taking a risk, the preference might well be reversed. Hence, in order to be able to apply data from preference tests to practical situations where an improvement in welfare is sought, the

strength of a preference must be assessed by discovering what costs the individual is willing to incur in order to be able to express the preference.

One situation in which the strength of a preference could be assessed was that studied by van Rooijen (1980, 1981). Gilts given the choice of two pens with different floors on which to lie had another gilt beside one pen but not beside the other. Since pigs like to occupy the pen next to another pig, the preference for flooring was balanced against the social preference. The preference for earth over concrete was sufficient to overcome the social preference (Table 1), but that for straw over wood shavings, although apparent from Table 2, did not overcome the preference for being near another gilt. A more precise comparison of one preference with another was the assessment by Dawkins (1983) of the importance of litter to hens by balancing it against the extent to which the hens had to work for food. The extent to which individuals will work for a resource has also been used in several other welfare studies. Wood-Gush and Beilharz (1983) found that piglets in small cages utilised earth if it was provided, and G.D. Hutson (personal communication, 1984) has found that they would press a key in order to gain access to earth in which they could

TABLE 1

Relative times gilts spent in two adjacent pens with different floors (modified after van Rooijen, 1980)

Earth	Concrete	Concrete	Earth
78	3	9	72

Concrete	Earth	Earth	Concrete
4	81	79	4

TABLE 2

Relative times gilts spent in two adjacent pens with different floors (modified after van Rooijen, 1980)

Wood shavings	Straw	Straw	Wood shavings
21	94	79	33

Straw	Wood shavings	Wood shavings	Straw
50	63	54	64

root. The importance of the earth to the pigs was such that they would press keys many times in succession in order to reach it. Recent work by Duncan and Kite (1987) with hens used a weighted door to assess how much work the bird would do to reach an objective on the other side. Where animals do show that they are willing to work hard in such ways, it is reasonable to conclude that their welfare is improved by their achieving that objective. The experimental studies must be carried out at different times of day and over long periods since some objectives, although they are utilised only occasionally, have a very great effect upon welfare. A problem where such studies are carried out on animals which have been living in difficult conditions for long periods is that they may have adopted coping strategies which make it unlikely that they will learn the task or show sufficient activity to carry out the task. Here, again, it is necessary to incorporate studies of poor welfare with investigations using preference tests.

RECOGNISING POOR WELFARE

The various regulatory and emergency systems which animals use to try to cope with environmental conditions may fail in that the fitness of the individual is reduced. The individual may die, or its growth may be impaired so much that its potential for producing offspring is reduced, or there may be some direct effect on its reproductive ability. Where this occurs, the individual is under stress and its welfare is poor. Stress is an environmental effect on an individual which over-taxes its control systems and reduces its fitness (modified after Broom, 1983, 1985). A reduction in individual fitness can be measured directly. If a pig dies during a journey or a dog dies because it has been starved or physically abused over a long period, then few would question the statement that the welfare of those animals was poor. As mentioned earlier, however, instantaneous death is not a welfare problem. Other indicators of reduced fitness are injuries and diseases which reduce life expectancy, e.g. a chicken which has been severely pecked, a lame animal which cannot compete for food, or any of a wide range of diseases. Direct effects on reproduction include the effects of rough handling, transport, social disturbance, confinement and social isolation.

Another type of situation where welfare is poor is that where the individual's coping systems do succeed, in that fitness is not reduced, but this is possible only with difficulty, taking much time and energy. Coping attempts can be measured, giving a scale of welfare from good, where little needs to be done, to poor, where extreme physiological or behavioural responses are necessary in order that coping is possible. The measures which can be used differ somewhat according to whether the environmental problem is of short duration or is prolonged.

ASSESSING SHORT-TERM WELFARE PROBLEMS

When animals are handled, transported, exposed briefly to a predator or subjected to some operation they show a range of behavioural and physiological changes which have the general effect of helping them to survive the treatment. Although the changes may be biologically adaptive in some situations, they do not always have beneficial effects. The behavioural responses are diverse, and most are altered according to the stimuli received. The initial responses involve orientation to one of the stimuli, suppression of normal activities and preparation for flight, defence or hiding. If the situation continues and the physical conditions are outside the tolerable range, then regulatory behaviour, for example huddling in cold conditions, occurs. Both suppression of activities such as feeding or grooming and increases in modifications of posture or signalling may continue throughout the period of difficult conditions. Alternatively, all active behavioural responses may cease and the individual may relapse into quiescence.

Physiological responses to difficult conditions also include orientation, regulatory responses, suppression of function such as that of the gut, and preparations for flight or defence. Changes which can be measured include those of heart rate, ventilation rate, adrenal functioning and brain chemistry. Heart-rate responses often involve an initial bradycardia (slowing of heart rate), and some animals such as the ptarmigan (Gabrielsen et al., 1977) use bradycardia when a predator is close. The major response, however, is tachycardia (increase in heart rate). In a recent study by Baldock et al. (1988), those aspects of sheep heart-rate increase which were a direct consequence of increased activity were allowed for statistically so that the non-motor heart-rate response to various situations could be calculated. Sheep showed a large heart-rate response to the approach of a dog, to introduction to a new flock and to being visually isolated from their companions. A smaller response was shown to spatial isolation, being loaded onto a vehicle and being transported in a vehicle (Baldock and Sibly, 1988) (Table 3). Work by Duncan and Filshie (1979) on

TABLE 3

Mean heart-rate change, corrected for motor activity, of ewes subjected to various treatments (data from Baldock and Sibly, 1988)

	Heart-rate change (beats min^{-1})
Spatial isolation	+1.4
Stationary trailer	−0.3
Moving trailer	+14.3
Visual isolation	+20.0
New flock for 0–30 min	+30.0

hens demonstrated that different strains of hens showed different responses to a traumatic event; the close approach of a person. A strain of hens which had been described as flighty because of its behavioural response to man was compared with a strain considered to be placid. The flighty strain did show a much greater behavioural response, but its heart-rate response rapidly declined after the person had moved away. The supposedly placid strain showed a greater heart-rate response which took very much longer to decline to normal levels. This work emphasises the need for combining behavioural and physiological indicators of welfare, for both strains were clearly very much affected by the approach of the person. Duncan (1986) has also been able to use heart-rate changes in assessing the responses of broiler chickens to an automatic broiler harvester. This was found to cause much briefer tachycardia than the catching of the birds by people.

There have been many studies which included the measurements of levels of adrenal products in the blood as an indicator of the responses of animals to short-term periods of difficulty. An example of a study in which this measure was combined with other physiological measures involved the assessment of the effects of different handling procedures and of transport on hens which were being removed from battery cages and taken to slaughter (Broom et al., 1986, and in preparation). Handling and transport of hens led to higher ventilation rates, increased blood cortisol levels, and increased utilisation of noradrenaline in the brain as measured after death. In this study the rough handling which is normal when hens are being removed from battery cages to vehicles had much greater effects than did gentle handling or a short period of transport. Adrenal cortical activity is not confined to adverse conditions as it occurs during courtship, mating and active food acquisition, none of which could be described as activities with adverse effects on the individual. It is quite illogical, therefore, to equate adrenal cortex activity with adversity. Attempts to define stress in a way which limits its use to occasions when adrenocorticophic hormone (ACTH) is acting so that glucocorticoids are produced in the adrenals are biologically absurd.

The welfare indicators described so far could be used whether or not the animals were in pain because of their treatment. Some of these measures could also be used to give some idea of the extent of pain, but the assessment of pain is difficult. If individuals are in pain then their welfare is not good, but there are different degrees of pain, just as there are different degrees of poor welfare. The symptoms that animals are in pain have been reviewed by Morton and Griffiths (1985).

ASSESSING LONG-TERM WELFARE PROBLEMS

When difficult conditions are encountered for long periods, the same responses as those described for short-term problems occur at first. Some of them

continue, but others cease to occur after some time and may be replaced by different responses. These changes necessitate the use of different measures, and some early attempts to assess the effects of long-term problems have given spurious results as a consequence of a failure to recognise this factor. We are still learning about the mechanisms used by animals to try to cope with adversity, but our current knowledge is sufficient for some useful assessment of the conditions in which animals are kept.

The adrenal system functions when more available energy is required and, as mentioned above, not all adrenal cortex activity occurs when the conditions are adverse. The adrenal medullary responses are very brief and adrenal cortex responses, although considerably more prolonged, decline after a few hours. This leads to problems in the use of measures of adrenal function as indicators of long-term welfare problems. If adverse conditions continue for many hours, however, bursts of glucocorticoid production can be detected. Ladewig (1984) found that after bulls were tethered, there was a peak of cortisol in the blood every few hours. Free-moving bulls also showed peaks of cortisol production at intervals, but these were less pronounced and less frequent. Frequent sampling is needed to discover that more cortisol peaks are occurring in a given condition. Single or occasional samples are of little use because of these substantial peaks and troughs and because of substantial diurnal variation in cortisol levels. As frequent blood sampling is often impractical, some method of discovering the activity of the adrenal cortex enzymes is desirable. A method which can be carried out on live animals is the ACTH-challenge technique. If an animal has used its adrenal cortex frequently, then its cortical enzymes are likely to be more active than are those of an animal which uses its adrenal cortex less often. Hence an injection of a large dose of ACTH will reveal the maximal amount of glucocorticoid which can be produced. The method has been used on farm animals (Friend et al., 1977; Dantzer et al., 1983) and has shown that cattle social mixing and calf confinement do result in higher levels of adrenocortical enzyme activity. Table 4 shows that pigs housed at higher stocking densities show a larger cortisol response to ACTH (Meunier-Salaun et al., 1987). Negative results of this test need not mean the absence of welfare

TABLE 4

Plasma cortisol level after ACTH challenge in pigs housed at three stocking densities (modified after Meunier-Salaun et al., 1987)

	Floor area (m^2) per pig			
	0.51	1.01	1.52	SE
Males	158.9	85.9	87.7	29.9
Females	107.1	58.1	90.0	12.4

problems, however, because in adverse conditions some animals do cease to use the adrenal response after a while but this does not mean that they do not find the conditions difficult.

Frequent adrenal activity has another effect on animals and that is to suppress the functioning of certain aspects of the immune system. Siegel (1987) explains this for poultry in the following way. When glucocorticoids bind to protein in lymphoid cells they alter enzyme activity and nucleic acid production. Glucose uptake and protein synthesis are reduced so that the production of interleukin II is reduced. The primary immunological effect of corticosterone in chickens appears to be on T-cell populations. Other examples of effects of adverse conditions on the immune system of farm animals are the reduction in recently tethered sows of antibody production to sheep red blood cells (Metz and Oosterlee, 1981) and reduced delayed-type hypersensitivity to foreign protein and reduced contact sensitivity to dinitrofluorobenzene in calves kept at -5 or $35\,^{\circ}C$ (Kelley et al., 1982). Hence it might be possible to use a measure of immune-system functioning as an indicator of welfare. Any system of housing or management which resulted in the individual being less good at combating disease could be said to be worse for the welfare of the animals. A system which can be criticised because it results in improved immune-system functioning is not made better by using vaccination, or other methods of combatting any disease which does arise. An alternative to looking directly at the immune system is to monitor the incidence of disease. The welfare of most diseased animals is poor, and a system which leads to higher levels of disease than does another system is less good for the welfare of the animals. In any comparison of systems, however, it is essential to be sure that other factors which might affect the incidence of disease are balanced effectively.

There are many behavioural measures which allow some assessment of the abnormality of behaviour (Wiepkema et al., 1983). Some of these use individual measures whilst others are actions on the part of one animal which injures another, e.g. tail biting in pigs. An example of a housing system which leads to abnormal behaviour is the confinement of dry sows in stalls or tethers. A general measure of behaviour is level of activity, and confined sows have often been described as being inactive. It is difficult to be sure that a low level of activity is an indicator of poor welfare, but van Putten (1980) has also suggested that pigs may sometimes be "apathetic", which means unresponsive to events in the world around them. In a series of experimental studies on the responsiveness of sows in stalls (Broom, 1986b), behaviour was assessed from videotape recordings of the animals during the presentation of stimuli. The sows were very responsive to stimuli associated with food presentation but were unresponsive to an unknown person who stood in front of them, unless that person's face was within 50 cm. Stall-housed sows were also less responsive than were group-housed sows to another novel stimulus; the pouring of a fixed quantity of water at room temperature onto the sow's back whilst she

was lying with her eyes open (Table 5). These studies provide quantitative evidence to show that confined sows are less responsive to events in the world around them than are group-housed sows.

The other major behavioural response of confined sows is the stereotyped behaviour, or stereotypy. A stereotypy is a relatively invariate sequence of movements occurring so frequently in a particular context that it could not be considered to form part of one of the normal functional systems of the animal (Broom, 1983). Common stereotypies of confined sows are bar-biting, drinker-pressing, head-waving, chain-playing and sham-chewing (Cronin and Wiepkema, 1984; Rushen, 1984; Broom and Potter, 1984) (Table 6). These activities increase in frequency with the time that the animal is confined, and individual sows may change over from one stereotypy to another during their period of confinement (Cronin and Wiepkema, 1984) (Table 7). The type of stereotypy which is shown by the sow may change if her diet is changed by increasing its bulk (Broom and Potter, 1984), and a large increase in the amount of food provided can reduce the amount of time showing stereotypies (Appleby and Lawrence, 1988). The duration of stereotypies is often 10% of waking time and can be as much as 80%. Stereotypy is now generally thought to be a method of coping with difficult conditions. Calves which did not show stereotypies had more abomasal ulceration (Wiepkema et al., 1984), and tethered sows which

TABLE 5

Responsiveness of stall-housed and group-housed sows. Behaviour in the 20 min after stimulus presentation

	Stall-housed	Group-housed	
Median time to sit or stand (s)	27.5	349	$P=0.096$
Median number of other activities	2.5	6.5	$P=0.004$
n	24	12	(2-tailed)

TABLE 6

Duration (min) of stereotypies shown by stall-housed dry sows during 8 h after morning feeding was finished (after Broom and Potter, 1984)

	Median total	Range
Drinker-pressing	10.3	2.3–74.3
Bar-biting	2.5	0.1–10.4
Rub nose on bar	4.2	0–25.5
Sham-chewing	26.4	0–89.5
Others	0.8	0.1–5.0
Total stereotypies	51.0	33.3–114.4

TABLE 7

The incidence of stereotypies shown by tethered sows during pregnancy (data from Cronin and Wiepkema, 1984)

	Period of pregnancy (days)				
	1-20	31-50	51-70	71-80	81-100
Mean proportion of observation time showing stereotypies	7	41	57	57	42
Number of different stereotypies per sow	1.4	2.3	2.7	3.2	3.6

did not show stereotyped chain-playing had higher cortisol levels in the blood than those that did (Dantzer and Mormède, 1981).

Other behavioural indicators of poor welfare include inability to carry out normal behaviour, misdirected behaviour and attacks on conspecifics. Behaviours such as standing and lying can be difficult if the floor is slippery or uneven. Andreae and Smidt (1982) studied cattle on slatted floors and found that lying down was often preceded by many unsuccessful attempts to lie down, and the whole attempt to lie might last as long as 20 min. Sometimes the normal front legs first method of lying was so hazardous because of floor characteristics that the cattle lay down rump first. Rearing conditions can lead to many abnormalities of behaviour; for example calves reared in isolation seemed not to know what social response should be shown to strange calves and were unsuccessful when competing for food. Misdirected behaviour includes sucking at various objects after early separation from the mother. Dairy calves separated from their mother after 24 h may lick and suck at their own coat, at parts of their pen or at the ears, navel, penis or scrotum of other calves. Each of these actions, like behaviour which damages other individuals, can be quantified and used as a welfare indicator.

A possible solution to the problem of how to deal with being confined or kept for long periods in difficult conditions is to utilise naturally occurring analgesics in the brain, and self-narcotise. Opiate peptides such as β-endorphin and metenkephalin have analgesic effects in situations which are either painful or otherwise particularly difficult for the animal. It is possible that both inactivity, associated with unresponsiveness, and stereotyped behaviour are associated with brain chemistry changes which make the problem seem less bad. A link between certain sorts of stereotyped behaviour and the dopamine systems in the brain has been known for some time from studies such as those of Sharman and Stephens (1974) and Fry et al. (1976). However, it is not clear what in the dopamine system can usefully be measured as an indicator of poor wel-

fare. The link between stereotypies and analgesic peptides came initially from studies on rats. Naloxone, when it has an analgesic effect, blocks the receptors in the brain to which β-endorphin attaches; this raises the possibility that stereotypies are used because they promote the action of analgesic peptides. Cronin and Wiepkema (1984), in their study on tethered sows which showed much stereotyped behaviour, found that such activity was abolished temporarily by naloxone but other behaviour was not much affected. Such experiments are difficult to interpret, however, because naloxone may have other effects and stress-induced analgesia in pigs may not be opiate-mediated (Dantzer et al., 1986), but the assessment of self-narcotisation as a coping method is clearly of great importance in welfare research.

CONCLUSIONS

Since welfare is defined in terms of the state of the individual, it can be measured. Much remains to be discovered about the methods which animals use to cope with difficult conditions, but we already have an array of measures which we can use to assess welfare. Where measurements are aimed at discovering whether or not welfare is poor and how poor it is, it is better to make several different kinds of measurement. Each individual animal has several alternative methods of trying to cope with adversity and individuals differ in the methods which they favour. Hence the use of one physiological measure of response to apparently difficult conditions might give the impression that most animals are unaffected by the conditions. If other physiological, behavioural and fitness measures had been taken, however, it might have been apparent that all animals had been affected but that they had used different coping procedures. A consequence of this situation for investigatory studies of animal welfare in different housing or management systems is that a team of people with different expertise is needed for an adequate evaluation of the system. It may still be useful to use one measure, however, for a single measure can indicate that welfare is poor and can give some idea of how poor. A problem arises when a welfare indicator does not show that welfare is poor, for this need not mean that there is no welfare problem. For example, the fitness measures such as survival, growth and reproduction have often been quoted, in this way, as showing that welfare is good. Whilst an inability to grow or reproduce, given a suitable partner, indicates that welfare is poor, the reverse does not apply, since an animal which is growing and reproducing may be able to do so only by extensive use of behavioural and physiological coping procedures and may be very susceptible to disease if disease-challenge occurs.

The assessment of welfare by endeavouring to discover by direct measurement when the welfare of an animal is good is clearly desirable, and attempts to do this should be encouraged. The easier procedure of assessing what the animal regards as being better for its welfare by measuring its preferences and their importance to that animal is valuable, as it leads to possibilities for de-

signing better housing and management conditions. These conditions can then be compared with those in existing conditions by looking for indicators of poor welfare in animals in both conditions. Any recognition of good welfare should be carried out at various times during the animals' daily routine and should be combined with the use of indicators of poor welfare, because an individual's welfare might be good at one time during its life in given conditions but poor at other times. A brief period of enjoyment could be recognisable even when most of the individual's life is difficult. A general conclusion about such welfare assessment is that in the search for conditions which lead to improved welfare, the use of indicators of poor welfare is always necessary at some stage in the study.

Some of those who are concerned about welfare express the opinion that the only adequate conditions are those which exist in the wild. This argument often leads people to assume that extensive conditions are good and intensive conditions are bad for welfare. Extensive conditions, and indeed the conditions in the wild, can lead to major welfare problems, for example those resulting from predation, extreme physical conditions or disease. The welfare of housed animals can be good, and it is important to try to devise conditions for animals which are based on precise measurements of their welfare rather than on pre-conceived ideas about the surroundings in which they will look right. Having said this, however, our current knowledge indicates that the welfare of very many animals on farms, rather smaller numbers kept in laboratories, as pets or in zoos, and many wild animals which are killed or otherwise exploited is so poor that there is a need for urgent action to change this situation.

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