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Welfare is to do with What Animals Feel

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Abstract *Although it is not possible to give the term "welfare" a precise scientific definition, nevertheless it is a useful term which describes a distinct phenomenon. It is argued that it is only appropriate to consider the welfare of sentient animals such as the vertebrates and higher invertebrates. Sentient is defined as "capable of feeling" and the view is expressed that welfare may be all to do with what animals feel. The "pine tree argument" is developed, according to which one questions whether or not the phenomenon suspected of being welfare can be applied sensibly to pine trees; if it can, then it is not welfare. Application of the pine tree argument leads to the conclusion that welfare is not simply health, absence of stress, or biological fitness. It is concluded that welfare is indeed all to do with what animals feel. The consequence of this conclusion is that methods to assess welfare should be aimed at asking animals what they feel about the conditions under which they are kept and the procedures to which they are exposed.*

Keywords: animal welfare, feelings, fitness, health, sentience, stress.

"Welfare is a wide term that embraces both the physical and mental well-being of the animal. Any attempt to evaluate welfare, therefore, must take into account the scientific evidence available concerning the feelings of animals that can be derived from their structure and functions and also from their behaviour." This statement was made by a committee under the chairmanship of Professor Rogers Brambell set up in the United Kingdom 26 years ago (Command Paper 2836, 1965). In my opinion, the important word in the description above is "feelings"; the members of the Brambell Committee were extremely far-sighted in realizing that welfare is all to do with what animals feel.

Since the Brambell Report, there have been many attempts to define what animal welfare is. After reviewing many of these studies, Duncan and Dawkins (1983) decided that it was impossible to give welfare a precise scientific defintion. A broad working definition would be one that included the following ideas: (l) the animal

should be in physical and mental health, (2) it should be in harmony with its environment, (3) it should be able to adapt to its environment without suffering, and (4) account should be taken of its feelings. More recently, it has been been suggested that welfare is mainly (Dawkins, 1990) or solely (Duncan and Petherick, 1989) dependent on what animals feel.

Welfare is a Distinct Phenomenon

In spite of the difficulties encountered in attempts to define "welfare," there seems little doubt that it is a useful term which describes a distinct phenomenon. The fact that interest in this topic has increased almost exponentially since the publication of Ruth Harrison's book *Animal Machines* in 1964 (Harrison, 1964) and that throughout this period the term "welfare" has been used, suggests that there is some distinct phenomenon to be described. There has been some slight resistance to the term in the United States, but this has come about, not because citizens of the U.S. deny the existence of the phenomenon, but because in their minds "welfare" is associated with social programs and money handouts. The term "well-being" has also been used to describe the phenomenon (e.g., Duncan and Dawkins, 1983), but it would not seem sensible to try to give the terms "welfare" and "well-being" distinct meanings.

Sentience is a Prerequisite for Welfare

It is generally agreed that sentience is a necessary prerequisite for welfare (Dawkins, 1980; Wood-Gush, Dawkins and Ewbank, 1981). Thus, welfare is not an issue for the phylogenetically lower organisms, such as the lower invertebrates, protozoa, bacteria and plants. This is not to say that life below a certain phylogenetic level has no value, but only that if an organism is insentient, it is inappropriate to consider its welfare. Thus, one may consider that a pine tree has some value, and one may consider it unethical to damage or destroy it for a variety of reasons, such as that it is a valuable resource, or an integral part of the ecosystem, or a thing of beauty, etc. However, this stance and these reasons have nothing to do with welfare.

The actual phylogenetic level at which there is sentience is still open to debate. In trying to reach a decision about this level, it can be helpful to consider exactly what is meant by "sentience," "feelings," "awareness" and other terms that are commonly used in this debate. These processes are discussed in some detail by Bunge (1980) and Bunge and Ardila (1987). Briefly, "sensing" or "detecting" is a process in a sensory system. A sensory system of an animal is a subsystem of its neurosystem, composed of neurosensors and neural pathways leading to the integrating unit which in vertebrates would be the primary sensory cortical area in the brain and in the higher invertebrates would be somewhere in the "brain" or in the larger ganglia. A "sensation" or "feeling" is a specific activity in a sensory system of which an animal is aware. This is the most primitive type of cognitive process. Even the higher animals are only aware of a fraction of the sensory input that assails their central nervous system at any one time (Miller, 1956). Thus "awareness" has a lot to do with

attention. Attention is accompanied by activity in other neural systems (additional to those in the sensory systems), perhaps located in the thalamus (Hebb, 1972). These sytems have been likened to a "gate" (Dawson and Furedy, 1976) or a "searchlight" (Crick, 1984), serving to select a small amount of the sensory input for further processing.

"Sentient" means capable of feeling. Animals without a central nervous system but with a nerve net, such as coelenterates, can sense or detect various aspects of their environment and respond accordingly. However, they show no evidence of any ability to learn or to be aware of what is happening to them; they can sense but are not sentient.

Moving higher on the phylogenetic scale, the nervous systems of the flat worms (Platyhelminthes) and segmented worms (Annelida) are more centralized and they show some ability to learn at a very simple level. However, there is no plasticity in their responses suggesting that this learning could be explained in "hard-wired" terms. There is also little evidence that they are aware of what is happening to them. (Remember that a ballistic missile or a "smart bomb" can change its behaviour in response to changing circumstances and can even show some "learning". However, it is definitely not aware of what is happening to it or what it is doing!)

The evidence regarding sentience becomes much more difficult to interpret at the level of the insects. The richness of communication amongst some of the social insects, such as honey bees, has suggested to some researchers that these animals have a low level of cognition and are aware of what is happening to them (Griffin, 1984). Others contend that the learning and memory exhibited by insects can be explained in hard-wired terms and so these animals cannot be said to have cognition (Bunge, 1980). On the other hand, there is much greater acceptance that the higher invertebrates, such as the cephalopods, do exhibit cognition. For example, the common octopus (*Octopus vulgaris*) has a brain of one to two million nerve cells and shows good learning ability, including being able to respond to a stimulus A when this is reinforced, and then switch to B when this is reinforced, and to do this repeatedly (Wells, 1962). This difference between the higher and lower invertebrates is well illustrated by an elegant little experiment described by Buytendijk (1953). He showed that when certain of the higher invertebrates such as octopodes (*Octopus*) were deprived of visual cues, they could distinguish between touching something actively and being touched passively. The lower invertebrates, such as starfish (*Asterias*) were unable to make this distinction due to insufficient integration between receptor and effector control. Buytendijk's interpretation was that animals above a certain phylogenetic level have some sort of cognitive representation of their immediate environment, the space occupied by their bodies in that environment and the stability (or otherwise) of stimuli in that environment. There has also been some debate as to whether or not invertebrates feel pain (Wiggelsworth, 1980; Eisemann et al., 1984; Fiorito, 1986). The fact that some higher invertebrates can show (to a limited extent) learned avoidance of, or learned aggression to, a potential painful stimulus, suggests that they may have some noxious subjective experience.

At the present day, the animal species farmed by human beings are mainly the higher vertebrates, namely mammals and birds. There is no doubt that they are all sentient and that it is therefore appropriate to consider their welfare. However, there is a trend towards farming species lower on the phylogenetic scale, for example fish and shell fish, and so a consideration of the general principles governing welfare is timely.

In order to clarify exactly what welfare is (or more accurately, what it is not), a useful strategy is to apply "the pine tree argument". This is a method of testing a candidate phenomenon suspected of being "welfare" by questioning whether or not it can be applied sensibly to pine trees. If the candidate phenomenon can be applied sensibly to pine trees, then this is contrary to the accepted view (discussed above) that the term "welfare" can only be applied to sentient animals, and the candidate phenomenon is not, therefore, welfare. The steps of the pine tree argument are as follows: (1) the term "welfare" can only be applied to sentient animals; (2) "X" can be applied sensibly to pine trees; (3) pine trees are not sentient; (4) therefore "X" is not "welfare".

In the following section, the pine tree argument is applied to several of the candidates that have been linked in some way to welfare in recent years.

What Welfare is not

Welfare is not health; as has been argued elsewhere (Duncan and Petherick, 1989) it is not *being* ill that reduces welfare but *feeling* ill. Of course when an animal *is* ill, it will usually also *feel* ill, so that health and welfare will be reduced together. However, there may be cases in which an animal is not in full physical health, but feels all right. The logical conclusion from the argument being proposed here is that, in this case, the animal's welfare is all right. Of course, there may be many other reasons why poor animal health is undesirable, such as hygiene, productivity and aesthetics, but from a welfare point of view it is feeling ill that matters. Pine trees can be unhealthy but cannot feel unhealthy.

Neither is welfare simply a lack of stress (Rushen, 1986), although stress may reduce welfare if the animal feels stressed. The fact that some obviously rewarding activities, such as the sexual act, can be accompanied by a glucocorticoid response (Szechtman et al., 1974; Colborn et al., 1991) would argue that stress and welfare are not inexorably linked. Pine trees can be stressed (in a general biological sense) e.g., by exposure to acid rain, but cannot feel stressed.

Finally, welfare is not fitness, which is a biological concept indicating the ability of genetic material to perpetuate itself. Again, as has been pointed out by Dawkins (1990) and Duncan and Petherick (1989), there will usually be a close correspondence between welfare and fitness, since the subjective feelings which govern welfare have probably evolved as a mechanism for protecting fitness. However, it should be pointed out that, in animal agriculture, artificial selection may have led to divergence between subjective feelings and fitness. For example, some meat strains of poultry and pigs have been selected to such an extent for fast growth rate and increased appetite that their subjective feelings governing satiety do not protect fitness; unless they are kept on a severe food restriction regime, they become obese and their biological fitness is reduced. In any case, pine trees may or may not repro-

duce themselves but they have no cognitive representation of this.

These applications of the pine tree argument indicate that welfare is not simply health, lack of stress or fitness. There will usually be a close relationship between welfare and each of them. However, there will also be enough exceptions to preclude equating welfare with any of them. Thus, neither health nor lack of stress nor fitness is necessary and/or sufficient to conclude that an animal has good welfare. Welfare is dependent on what animals feel. If animals cannot or do not feel, it is not appropriate to consider their welfare.

Is Welfare Simply the Absence of Negative Feelings?

Welfare is reduced when animals suffer, i.e. when they have negative feelings (Dawkins, 1980, 1990; Duncan, 1981, 1987; Duncan and Dawkins, 1983). States of suffering in animals include states such as frustration, fear and pain which can be defined operationally, have analogous states in human beings and have been reasonably well investigated. Animals may also suffer from loneliness and boredom, which are more difficult to define and tackle experimentally and which have therefore not received so much examination. Animals may even suffer from other states not experienced by human beings.

Notwithstanding the fact that welfare is reduced by suffering, the question can be asked "Is welfare simply the absence of negative feelings, or, can animals, in addition, experience positive feelings?" The evidence seems to indicate that rewards are often accompanied by positive emotional experiences (Glickman and Schiff, 1967). What exactly we should call these positive emotions is open to question, the problem being that there are many terms used for human positive emotions such as "contentment," "pleasure," "happiness," "joy," "rapture," "ecstasy," and so on, all of which have different shades of meaning. However, the question of the possession by animals of subjective positive feelings is no different from the question regarding their negative subjective feelings. Subjective feelings, by their nature, are not accessible to scientific investigation. However, as has been pointed out before (Duncan, 1987), even an approximate indirect measure of how positive or negative these feelings are would be helpful in the welfare debate. Thus, states of suffering such as frustration, fear and pain can be defined operationally and then the negative feelings of the animal can be investigated by seeing, for example, how hard it will work to avoid these states. From a welfare point of view, it does not really matter whether a frustrated hen, or a frightened pig, or a cow that is in pain, feels exactly the same as we do when we are in these states; the important thing is how negative it finds them. Exactly the same approach can be taken with positive subjective feelings. With regard to priorities, it would seem sensible to make every effort to eliminate or reduce suffering in agricultural animals. In the future, it is to be hoped that we could also try to maximize their positive feelings.

Sequelae

Once it is accepted that welfare depends on what animals feel, then the methods to be used in assessing welfare become much more obvious. We must devise ways of asking the animal what it feels about the conditions under which it is kept and the procedures to which it is exposed.

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A Usable Definition of Animal Welfare

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Abstract *A definition of the welfare of an animal which can be used in scientific studies, legislation and other practical work is: the welfare of an individual is its state as regards its attempts to cope with its environment. A variety of measurements can be used to pinpoint the individual's state on a continuum from very good to very poor welfare. Welfare can be poor because the individual is having difficulty in coping or because of failure to cope. Poor welfare includes stress, which is defined as an environmental effect on an individual which overtaxes its control systems and thus reduces its fitness or appears likely to do so. It also includes situations in which behavioural, physiological or immunological measures indicate that coping is difficult even if biological fitness is not reduced. Suffering is an important aspect of poor welfare. While much of poor welfare involves suffering, examples are given of situations in which welfare is poor in the absence of suffering. If suffering occurs in addition to injury or immunosuppression, then welfare is even poorer. Scientific studies of welfare should include direct measures of poor welfare as well as measures of the strengths of preferences and aversions. Measurements should be carried out in an objective way and moral judgements about what is tolerable should be made afterwards.*

Keywords: animal welfare, stress, suffering, pain, adrenal function, immunosuppression, abnormal behaviour, animal production.

Introduction

A definition of animal welfare is needed for scientific study, for legislation and for practical use. This definition must refer to a characteristic of an individual which is measurable. The measurement should be separate from any judgement which is made concerning what is morally acceptable. Almost all possible measurements will involve variation over a range rather than something which exists or does not exist. Such variation is assumed in normal usage of the term welfare and in its origin: how