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Teaching animal welfare to veterinary students

Xavier Manteca[1], Donald M Broom[2], Ute Knierim[3], Jaume Fatjó[1], Linda Keeling[4] and Antonio Velarde[5]

[1]School of Veterinary Science,Universitat Autònoma de Barcelona, Bellaterra, Spain, [2]Dept. of Clinical Veterinary Medicine, University of Cambridge, Cambridge, United Kingdom, [3]Department of Farm Animal Behaviour and Husbandry, Faculty of Organic Agricultural Sciences, University of Kassel, Germany, [4]Department of Animal Environment and Health, Section of Animal Welfare, Swedish University of Agricultural Sciences, Skara, Sweden, [5]Institute for Food and Agricultural Research and Technology (IRTA), Meat Technology Centre, Monells, Spain

Abstract

As public concern over the welfare of animals has increased in many European countries and elsewhere, Veterinary Schools have to include animal welfare as a subject in their curricula. Although some schools have already done so, many others have not. Animal welfare is a relatively new subject and as a consequence there is a lack of knowledge among the academic community as to what contents should be included in a general course on animal welfare aimed at veterinary students. This chapter is intended to help those that have the responsibility to start such a course. We hope that it may be useful as well to those who simply want to compare the courses they teach with other courses taught elsewhere. The specific objectives of this chapter are: (1) to provide a syllabus of the main contents to be included in a general course on animal welfare for veterinary students, (2) to explain why those contents should be included and how they could be taught, and (3) to provide a set of useful references and sources of information for those responsible for teaching animal welfare to veterinary students.

This chapter is largely based on the authors' experience. We hope, nevertheless, that in the long-term it will contribute to build a common set of guidelines for teaching animal welfare to veterinary students in Europe, so that in the future all European Veterinary Schools share at least the main elements of their curricula as it relates to animal welfare.

The chapter is divided into six sections. The first section covers the basic principles of animal welfare, whereas the following five sections deal with animal welfare in each of the main fields in which veterinarians are professionally involved: farm

animal housing and husbandry, transport and slaughter of farm animals, companion animals, laboratory animals and wildlife.

1. Basic principles

We suggest that there are three main issues to be dealt with in this section: the concept of welfare, the relationship between welfare and concepts such as needs, feelings, stress, health and pain, and the assessment of welfare.

1.1 Concept of welfare

The term welfare requires strict definition if it is to be used effectively and consistently. A clearly defined concept of welfare is needed for use in precise scientific measurements, in legal documents and in public statements or discussion. It is therefore important that students are exposed to a discussion of the concept of welfare. There are many different definitions of animal welfare and the chapter by Duncan and Fraser (1997) provides an useful summary of the different approaches that have been used to define and study welfare. One of the most widely used and useful definitions is that by Broom (1986), according to which the welfare of an individual is its state as regards its attempts to cope with its environment. This definition refers to a characteristic of the individual at the time. The origin of the concept is how well the individual is faring or travelling through life and the definition refers to its state at a particular time (for further discussion, see Broom, 1991a,b, 1996, 2001c, Broom and Johnson, 1993). The concept refers to the state of the individual on a scale from very good to very poor and includes its feelings and its health.

1.2 Welfare and needs, feelings, stress, health and pain

The concept of animal welfare is related to the concepts of needs, feelings, stress, health and pain. The environment is appropriate if it allows the animal to satisfy its needs. Animals have a range of functional systems controlling body temperature, nutritional state, social interactions etc. (Broom, 1981). Together, these functional systems allow the individual to control its interactions with its environment and hence to keep each aspect of its state within a tolerable range. The allocation of time and resources to different physiological or behavioural activities, either within a functional system or between systems, is controlled by motivational mechanisms. When an animal is actually or potentially homeostatically maladjusted, or when it must carry out an action because of some environmental situation, we say that it

has a need. A need can therefore be defined as a requirement, which is part of the basic biology of an animal, to obtain a particular resource or respond to a particular environmental or bodily stimulus (Broom 2001a). As pointed out by Broom (1997), these include needs for particular resources and needs to carry out actions whose function is to obtain an objective (Toates and Jensen, 1991; Broom, 1996). Needs can be identified by studies of motivation and by assessing the welfare of individuals whose needs are not satisfied (Hughes and Duncan, 1988a,b; Dawkins, 1990; Broom and Johnson, 1993). The question of the importance of different needs is a good subject for discussion with students.

The feelings of an animal are an extremely important part of its welfare (Broom 1991b). Information can be obtained about feelings using preference studies and other information giving indirect information about feelings can be obtained from studies of physiological and behavioural responses of animals. Feelings are aspects of an individual's biology which must have evolved to help in survival (Broom 1998), just as aspects of anatomy, physiology and behaviour have evolved. They are used in order to maximise its fitness, often by helping it to cope with its environment. It is also possible, as with any other aspect of the biology of an individual, that some feelings do not confer any advantage on the animal but are epiphenomena of neural activity (Broom and Johnson, 1993).

The word stress should be used for that part of poor welfare which involves failure to cope. A definition of stress as just a stimulation or an event which elicits adrenal cortex activity is of no scientific or practical value (Mason 1971, Broom 2001c). A precise criterion for what is adverse for an animal is difficult to find but one indicator is whether there is, or is likely to be, an effect on biological fitness. Stress can be defined as an environmental effect on an individual which over-taxes its control systems and reduces its fitness or seems likely to do so (Broom and Johnson, 1993, see also Broom 1983, 2001c, Fraser and Broom 1997). Depending on the year on which the course is taught, students may or may not be familiar with the physiological changes associated with stress, and this should be taken into account when allocating time to deal with this in the course.

The word "health", like "welfare", can be qualified by "good" or "poor" and varies over a range. However, health refers to the state of body systems, including those in the brain, which combat pathogens, tissue damage or physiological disorder. Health may be defined as *"an animal's state as regards its attempts to cope with pathology"* (Broom 2000). In this statement, animals include humans. The meaning of pathology is discussed at length by Broom and Kirkden (in press). Welfare is a broader term than health, covering all aspects of coping with the environment and taking account of

a wider range of feelings and other coping mechanisms than those which affect health, especially at the positive end of the scale. Health is a part of welfare and hence disease always has some adverse effect on welfare (Broom and Corke 2002).

The pain system and responses to pain are part of the repertoire used by animals, including man, to help them to cope with adversity during life. Pain is clearly an important part of welfare. Pain is defined here, following the International Association for the Study of Pain, as an aversive sensation and a feeling associated with actual or potential tissue damage (Broom 2001b).

1.3 Welfare assessment

If animal welfare is to be compared in different situations or evaluated in a specific situation, it must be assessed in an objective way. The assessment of welfare should be quite separate from any ethical judgement but, once an assessment is completed, it should provide information which can be used to take decisions about the ethics of a situation. It is important that the students realise that welfare assessment requires the combination of several measures, some of which appear in Table 1. Most indicators will help to pinpoint the state of the animal wherever it is on the scale from very good to very poor. Some measures are most relevant to short-term problems, such as those associated with human handling or a brief period of adverse

Table 1. Measures of welfare (after Broom, 2000).

- Physiological indicators of pleasure
- Behavioural indicators of pleasure
- Extent to which strongly preferred behaviours can be shown
- Variety of normal behaviours shown or suppressed
- Extent to which normal physiological processes and anatomical development are possible.
- Extent of behavioural aversion shown
- Physiological attempts to cope
- Immunosuppression
- Disease prevalence
- Behavioural attempts to cope
- Behaviour pathology
- Brain changes, e.g. those indicating self narcotisation
- Body damage prevalence
- Reduced ability to grow or breed
- Reduced life expectancy

physical conditions, whereas others are more appropriate to long-term problems (for a detailed discussion of measures of welfare, see Broom 1988a, Broom and Johnson 1993, and Fraser and Broom 2002).

Signs of poor welfare can be conveniently divided into the following categories:

- Physiological measurements. For instance increased heart-rate, adrenal activity, adrenal activity following ACTH challenge, or reduced immunological response following a challenge, can all indicate that welfare is poorer than in individuals which do not show such changes. The impaired immune system function and some of the physiological changes can indicate what has been termed a pre-pathological state (Moberg, 1985).
- Behavioural measures are also of particular value in welfare assessment. The fact that an animal avoids an object or event strongly gives information about its feelings and hence about its welfare. The stronger the avoidance the worse the welfare whilst the object is present or the event is occurring. An individual which is completely unable to adopt a preferred lying posture despite repeated attempts will be assessed as having poorer welfare than one which can adopt the preferred posture. Other abnormal behaviour such as stereotypies, self mutilation, tail-biting in pigs, feather-pecking in hens or excessively aggressive behaviour indicates that the perpetrator's welfare is poor. In some of these physiological and behavioural measures it is clear that the individual is trying to cope with adversity and the extent of the attempts to cope can be measured. In other cases, however, some responses are solely pathological and the individual is failing to cope. In either case the measure indicates poor welfare.
- Disease, injury, movement difficulties and growth abnormality all indicate poor welfare. If two housing systems are compared in a carefully controlled experiment and the incidence of any of the above is significantly increased in one of them, the welfare of the animals is worse in that system. The welfare of any diseased animal is worse than that of an animal which is not diseased.
- Indicators of good welfare which we can use are obtained by studies demonstrating positive preferences by animals. Early studies of this kind include that by Hughes and Black (1973) showing that hens given a choice of different kinds of floor to stand on did not choose what biologists had expected them to choose. We should try to assess the specific functioning of the brain when welfare is good in humans and other animals. Good welfare in general, and a positive status in each of the various coping systems, should have effects which are a part of a positive reinforcement system, just as poor welfare is associated with various negative reinforcers.

An issue that merits discussion is that in all welfare assessment it is necessary to take account of individual variation in attempts to cope with adversity and in the effects which adversity has on the animal (Koolhaas *et al.*, 1983, Cronin and Wiepkema, 1984, von Holst, 1986, Broom, 1987, Benus, 1988). After informing students about different measures of welfare it is useful to discuss with them how to resolve issues where different measures give different information and also the extent to which different individuals use different strategies.

Finally, each assessment of welfare will pertain to a single individual and to a particular time range. In the overall assessment of the impact of a condition or treatment on an individual, a very brief period of a certain degree of good or poor welfare is not the same as a prolonged period. However, a simple multiplicative function of maximum degree and duration is often not sufficient. If there is a net effect of poor welfare and everything is plotted against time, the best overall assessment of welfare is the area under the curve thus produced (Broom 2001c).

2. Farm animal housing and husbandry

2.1 General issues

Farming animals means that they are fed, cared for and given shelter, but housing and management may restrict their performance of natural behaviour and that breeding may lead to traits that are for example associated with pain, ill-health or behavioural restriction. They may be subjected to painful or fear eliciting procedures, and they are usually finally killed by man. The ultimate reason for the farmer to keep the animals is to make his or her living from farming. Other aspects such as working quality and health standards of the farmer, and issues of environmental and consumer protection in society come also into view when tackling the ethical question of which, if any, limitations to animal welfare are acceptable. The basic question about the ethical acceptability of farming and killing animals per se can be treated, for example, based on texts of Sandøe *et al.* (1997) or Comstock (2002).

In general, it should be an aim to enable the students to clearly distinguish between animal welfare and other arguments, such as economics. Both should be based on facts with scientific foundation. The students should further understand that the final weighing of the different arguments against each other involves a subjective decision that is influenced by the basic attitude, including ethics, of the decision-maker. We believe that this intellectual process is especially important with regard

to farm animals, as discussions of farm animal welfare often tend to focus on economical aspects. Furthermore, some students will have an agricultural background and may be 'home blind' or want to stay with certain husbandry practices because of tradition. One didactic approach can be to have for example a panel discussion, after sufficient information has been collected, about cases of farming practice that have opposing advantages and disadvantages in the different areas, and to let individual students present and discuss the topic only from the viewpoint of animal welfare, economy, consumer protection etc..

A good understanding of farm animal welfare is essential for those veterinary students that will go into farm animal practice and so are likely to need to deal with welfare problems on farms. In modern veterinary medicine that focuses on prophylaxis and herd health surveillance programmes, knowledge about how to improve animal welfare by good housing and management become increasingly important. Furthermore, quite a number of veterinarians are associated with animal production when they are employed by the industry or when they are working as State veterinarians being responsible for food control including animal welfare.

The basic principles of animal welfare apply to all species, but it is inevitable that many examples even in discussions of principle are taken from animal agriculture (e.g. in Dawkins, 1980; Webster, 1995; Appleby and Hughes, 1997), as, compared with the other categories of species discussed in this chapter, we generally have better knowledge about their welfare and welfare problems. Moreover, many students have some experience of visiting farms and farm animals are relatively easy to access. This therefore provides opportunities for case studies or to involve students in role playing since the facts are often more readily available or the students already have the basic knowledge to contribute in more spontaneous discussions in the classroom.

2.2 Behavioural restriction

A considerable number of animal welfare problems result from a mismatch between the natural behavioural repertoire of the animals and their housing and management. The veterinary students should therefore understand that, in general, animal welfare questions can only be properly tackled on the basis of knowledge of the biology of the species. The range of farm animal species is very wide, from insects such as honey bees, fish kept in aquaculture, birds such as domestic fowl, turkeys or even the relatively undomesticated ostriches to mammals such as pigs, cattle and sheep, but also animals kept for fur production or deer. It will not be possible to cover all possible species used for farming purposes, but we propose that

important aspects of behavioural biology and the associated welfare problems should be presented for the more common farm animal species. Here the use of video resources is recommended. The advantage of using video resources is that behavioural processes are more easily understood from a moving image, but also that it is easier for the students to relate to the animals, that they often experience in situations where there is not much opportunity for variable natural behaviour. In our view this is a good impetus for developing a greater respect for the animals. For written information about the natural behaviour of horses, cattle, sheep and goats, pigs, rabbits and domestic fowl the textbook of Jensen (2002) or, in a more general form, Fraser and Broom (1997) can be used as starting points. When basic aspects such as natural behaviour are discussed, it is worthwhile remembering that in most veterinary schools there is relatively little education about poultry, although welfare problems and numbers of affected animals can be considerable in these species. Another aspect is the stage of domestication of the species (Grandin, 1998; Price, 2002) The types of species kept for farming purposes is changing and welfare problems can occur especially in newly domesticated species, partly because their needs may be less known, partly because their capacity to adapt to the new and possibly unfavourable conditions is smaller. Therefore, some knowledge of the effects of domestication on the adaptability of animals should be conveyed, and possibly some ethical aspects of the domestication and selection process be discussed.

One consequence of the mismatch between husbandry conditions and biology of the animal may be abnormal behaviour. This is an example of where the basic principles apply to all species but where it may be easier to teach it in farm animals. Although abnormal behaviour patterns can occur in pets and laboratory animals, a lot of basic research in this topic has been on farm animals (e.g. Lawrence and Rushen, 1993). Students should be aware that rather than being the exception, for some species the type of housing and management results in a very high proportion of animals showing abnormal behaviour patterns, e.g. stereotypies, and this may be regarded by the farmer as normal for that species. The same is for example true for certain physical damage, such as loss of hair or feathers, swellings or injuries, that may be inflicted by repeated collisions with ill-adjusted housing equipment.

More or less specific to farm animals are welfare problems associated with early separation of the mother and young, disruption of social groups or keeping the animals singly or in very large groups. The most severe case is the one of poultry where the eggs are separated from the mother and incubated artificially, and the birds are often kept in extremely large groups. The effects on the behaviour of the animals is only partly understood yet, but certainly of high importance for animal

welfare. Useful information about those social issues can be found in Keeling and Gonyou (2001).

2.3 Breeding for high performance

Veterinary students should also be aware of welfare problems associated with high production achieved by intensive directional selection. Problems may include direct effects of rapid growth such as increased risks of leg or cardiac problems in fattening species, especially poultry (Scientific Committee on Animal Health and Animal Welfare, 2000), hunger in the parent generation of the animals kept for fattening purposes (e.g. poultry: Savory and Lariviere, 2000; or pigs: Appleby and Lawrence, 1987; Robert *et al.*, 1997) or increased risks of so-called production diseases such as metabolic problems, lameness and mastitis in dairy cows. The actual incidence of such disorders (except the hunger of the breeders), however, depends on the quality of housing and management. In laying hens another effect of high selection on egg-laying is the killing of about half of all chicks, the male layers, right after hatching, because it is not economical to fatten them. For example in Germany the Animal Welfare Act states that killing of vertebrates is only allowed with an acceptable reason (such as food production, disease control etc.). This practice is therefore often discussed on ethical and legislative grounds.

2.4 Painful or fear-eliciting procedures

Farming practices often include routine procedures that are painful for the animal, such as dehorning, beak trimming, tail docking or castration. Discussion of such procedures should not only weigh the wanted effects against possible negative consequences on behaviour and well-being through pain, sensory or communicative deprivation, but also consider the ethical idea of integrity of species and individuals (see for different views e.g. Rollin, 1995 or Verhoog, 1997). In association with mutilations, but also surgical and other treatments, pain recognition and alleviation is an important issue that should be part of the curriculum. Students should also become aware of the national and possibly European legal requirements regarding permissibility, the necessity for analgesia and methods for the above mentioned procedures. It may also be enlightening to compare standards for different species with each other.

Even procedures that should not lead to significant pain in the animals such as shearing, for example, can be very aversive because they can induce fear. This is one of the areas where the importance of stockmanship and human-animal

relationship is becoming increasingly evident (e.g. Hemsworth and Coleman, 1998). By this the stockperson does not only influence production, but also animal welfare.

2.5 Killing

Apart from the general ethical question about killing discussed above, veterinary practitioners will often have to decide on individual farms which treatment to give or what course of action to recommend. Even if a disease or injury is easily treatable, the farmer may decide that the animal is not economically worth the cost of the treatment and so the veterinarian may be asked to put down the animal in any case. With poultry or very young animals the farmer will probably not even call the veterinarian, so by definition the decision is not an easy one for the farmer when veterinary help is requested. The veterinarian will be expected to give advice and this will involve balancing the welfare costs to the animal against the economic worth of the animal to the farmer. This may even involve advising in favour of killing if the suffering to the animal will be high during the course of the treatment, even if the animal is very valuable, such as in the case of a breeding bull or competition horse. However, in other cases, such as killing for diagnostic purposes or for disease control, it is not the welfare of the individual animal concerned that is considered, but the effects on the herd or even the national herd, and economical aspects form an important basis for the decisions. We think that it is very valuable if students have the chance to test and clarify their attitudes regarding such issues before they get in respective situations that need quick and efficient decisions.

The future veterinarian should also be able to give the farmer advice on the humane killing of animals in accordance with animal welfare legislation and be knowledgeable enough to choose the most humane method of killing (see publications form the Humane Slaughter association, http://www.hsa.org.uk; for disease control: Scientific Veterinary Committee, 1997).

2.6 Legislation and other measures to improve animal welfare

Since farm animals represent a very large proportion of the total number of animals in a country, there is usually more legislation on this category than there are on other animals on national as well as on European level (Council of Europe, European Union). Furthermore, unlike veterinarians employed in laboratory animal units, where often strict procedures are in place and training to ensure that the legislation is followed, veterinarians will be visiting farmers who may be unaware or uninformed about legal requirements on even simple points such as stocking density or handling procedures. Thus veterinarians should have a working knowledge of

this legislation in their country or where to find it, already when they leave university.

A further aspect is the implementation of animal welfare legislation, for instance in cases of animal neglect or cruelty or other offences with which quite a number of future veterinarians will be confronted. Not only scientific, but also administrative and practical aspects need to be considered such as how to possibly relocate or kill large numbers of animals. We have the experience that it is very interesting for the students to discuss such matters with a veterinarian being in charge of implementation issues, or with lawyers, police or community services to get an idea of how such cases might be handled later in the course of their profession.

Animal welfare standards can also be improved by economical incentives through the public in the case of subsidies for certain types of housing or farming practices, or through the single consumer in the case of quality food schemes. Often veterinarians may also be involved in the setting up of subsidy or food schemes, and in the control of them. An important issue for the control of legal and other standards is how to monitor and assess animal welfare on the individual farm. For instance, a number of papers from a workshop on this topic can be found in Sørensen and Sandøe (2001).

3. Transport and slaughter of farm animals

Transport and slaughter of farm animals are undoubtedly among the most stressful procedures in livestock production. Veterinarians may deal with these issues either as official veterinary surgeons or as consultants on animal welfare.

3.1 Transport and lairage

Transport and lairage are likely to adversely affect animal welfare due to stress, fear or pain. Therefore, we suggest that the students are first exposed to a discussion on the welfare problems encountered by animals during transport and lairage. The reference by the European Union Scientific Committee on Animal Health and Welfare (2002) may be particularly useful. It is also important to discuss how the animals may perceive the stressors encountered during transport and lairage (see Grandin, 1997). The students should bear in mind that not all animals react in the same way to the same stressor. Depending on the previous knowledge of the students, it may be useful, therefore, to allow some time to describe the most important features of the anatomy, physiology and behaviour of the farm species.

The books of Fraser and Broom (1997), and Keeling and Gonyou (2001) are good references on this. Behaviour and stress responses may be different between animals from the same species depending on their genetics, previous experience and breeding conditions (intensive vs. extensive). The references by Grandin and Deesing (1998) and Manteca and Ruiz-de-la-Torre (1996) are very useful.

A second point is how to assess welfare during transport and lairage. Much of this has been covered in the section on basic principles. It may perhaps be useful to include a discussion, even if brief, on the relationship between animal welfare and meat quality in different species. The book by Gregory (1998) is a good reference.

The effect of transport-related stress on the animals's health is increasingly important. Pathogens that do not induce disease in farm animals kept under good conditions may become activated during transport, often due to immunosuppression resulting from stress.

The students should become familiar with the European and national legislation regarding the protection of animals during transport. They should know the minimal requirements to protect welfare during transport. The web page of the European Union provides all the current legislation on welfare during transport.

Finally, students should gain some knowledge of practical measures to improve the welfare of animals during transport. The book by Grandin (2000) provides useful information on this.

3.2 Stunning

The objective of stunning is to render animals unconscious prior to slaughter so that death can occur through bleeding without causing unnecessary pain, suffering and distress. The key point is that the student understands that bleeding does not cause immediate death to the animal, and that unconsciousnsness must last until death ensues. The time to die after sticking depends on the species but also on the sticking methods. Gregory (1998), and Blackmore and Delany (1988) provide useful information about time to brain death after sticking in different species, using different procedures.

Stunning procedures are based on disruption of normal functioning of neurones. It may be useful to allow some time to describe the physiology of the central nervous system as well as the theoretical basis of the unconsciousness induced by the most common stunning methods, including the following:

- Mechanical methods based on concussion and/or physical destruction of brain tissue. Finnie (1997) is a good reference.
- Electrical methods based on the induction to epilepsy. Cook *et al.* (1992, 1995) provides useful information.
- Carbon dioxide stunning based on depression of the central nervous system due to hypercapnic hypoxia and decrease of the intracellular pH. Forslid (1988) is a good reference.

One of the responsibilities of veterinarians is to advise the slaughter personnel on the best stunning system as well as on the welfare requirements of each system. The book by Gregory (1998) provides useful information on this.

Although European legislation requires pre-slaughter stunning, students should know that there is an exemption for animals slaughtered by religious methods. The most important religious methods are the Jewish, called *schechita* and the Muslim, called *halal*. Both faiths state that meat must come from animals that are alive at the time of slaughter. Anil and Sheard (1994), Grandin and Regenstein (1994) and the National Welfare Advisory Committee of New Zealand (NAWAC, 2001) provide useful information on this.

4. Companion animals

Small animal practitioners must frequently face situations where difficult ethical decisions must be made. Some of the main welfare issues that could be addressed in a general course on animal welfare are euthanasia, non-therapeutic surgery, behavioural problems, breed standards, housing of dogs and cats and pain management.

4.1 Euthanasia

The decision of putting an animal down should always be carefully analysed by the veterinarian and the owners as well. The need for euthanasia is easy to understand when the veterinarian is dealing with an animal that experiences severe chronic pain or that is otherwise suffering. Nevertheless, there are certain situations where euthanasia should be applied not for the direct benefit of the animal, but for the benefit of people around it. The small animal practitioner must frequently face other situations where the convenience of euthanasia is at least objectionable, including, for example, pets that are dangerous to people or show otherwise objectionable behaviour, pets whose owners can not afford medical treatment, etc. We suggest that

it may be useful to devote some time to discuss these situations with the students. The case of dangerous animals is particularly interesting, as the student must weigh human health and safety against the animal's life. Further, aggression is the most frequent canine behaviour problem referred to specialists (Beaver, 1999). To stimulate the discussion, the students may be asked, for example, to think about possible risk factors that can be useful when deciding if the pet should or should not be put down, including the dog's weight, the intensity of the attacks, the presence in the family of children, elderly or disabled people and whether the aggression seems unpredictable.

4.2 Non-therapeutic surgery

Non-therapeutic surgery is a broad category that includes any surgical procedure that is carried out in the absence of a disease. The list of the commonest procedures includes castration, spaying, declawing, debarking, ear-cropping, tail-docking and teeth-cutting. From a welfare point of view, some of these interventions can be of benefit for animals whereas others can harm them greatly. Some authors believe that all these procedures are in fact mutilations and consequently ethically unacceptable (Young, 1996). However, this is a position not shared by the vast majority of veterinarians. The veterinary student must be trained to differentiate between acceptable and unacceptable non-therapeutic surgical procedures. The factors that can help the veterinarian to decide to perform this procedures can be reviewed in the form of three questions:

- What is the main purpose of the intervention?
- Are there any alternatives to the procedure?
- Is it a painful or a dangerous surgery?

The reasons for such a surgery fail into three broad categories: the control of reproduction, the modification of behaviour (Horwitz et al., 2002) and what can be considered cosmetic surgery.

The prevention of unwanted reproduction can be very beneficial for the entire species, for it helps to control overpopulation. In this respect, most humane societies and veterinary associations around the world endorse campaigns to promote neutering of dogs and cats. The treatment of behaviour problems is also essential, since they can lead to euthanasia and abandonment. According to this, some of these interventions can be understood as truly therapeutic procedures. Regarding cosmetic surgery, it is important to keep in mind that it is never helpful for the animal and has as the only aim to accomplish some arbitrary morphological standard. These points can be discussed using a case-study such as castration, declawing, debarking, ear cropping or tail-docking.

4.3 Behaviour problems

Dogs and cats frequently show behaviours that are either annoying for people, or dangerous for people or themselves. The vast majority of behaviour problems are in fact normal responses that simply bother people. As already mentioned, behaviour problems are one of the main causes of abandonment and euthanasia in companion animal medicine. Also, some behaviour problems involve different degrees of animal stress and anxiety. Thus, the treatment of behaviour problems it is also essential to prevent the animal from suffering. Stress and anxiety can often pass unnoticed to the owners and even to the veterinarian. Separation anxiety can be used as a paradigm of all these facts. It should be stressed that diagnosis and treatment of behaviour problems should be based on the causes of the behaviour and not on its symptoms. Also, the use of positive techniques should always be encouraged. In this sense, commercial electronic devices that can deliver an electric shock to the animal whenever it behaves improperly are a focus of major concern for the majority of veterinary behaviourists. There are many good sources of information on canine and feline behavioural problems, e.g. Horwitz et al. (2002).

4.4 Breed standards

The current concept of a pure dog breed refers to a list of characteristics, both physical and behavioural, that a given dog must fit to be considered member of that particular breed. This relatively new concept started in the United Kingdom back in the nineteenth century and is responsible for the strict selective pressures applied to dogs by professional breeders. Breed standards are often based in pure aesthetic criteria, that can increase the prevalence of physical and behavioural abnormalities. Examples of the former are the high prevalence of respiratory problems in the English Bulldog or the higher rate of elbow dysplasia in Labrador Retrievers. Regarding behaviour problems, examples include stereotypic tail-chasing in Bull Terriers and flank-sucking in Doberman Pinchers. For these reasons, veterinarians must play an active role in the promotion of rational breed standards. Also, veterinary students must understand that euthanasia should never be applied to dogs and cats that do not meet a breed standard, a practice that is still unfortunately found within our profession. The book by Ruvinsky and Simpson (2001) is a good source of information on inherited disorders of pure breed dogs.

4.5 Housing of dogs and cats

There are few studies on the welfare of housed dogs and cats (Hubrecht, 1995; Rochlitz, 2000). Some of the issues that could be considered include pen size, environmental enrichment and the need for social interaction.

4.6 Pain management

Pain management is of obvious importance in a course on animal welfare. Students should be familiar with the most common signs of pain in dogs and cats as well as with methods to alleviate it. Since some of these issues may be dealt with in other subjects of the curriculum, the amount of time devoted to them will depend on the year in which the animal welfare course is taught, among other things.

5. Laboratory animals

5.1 Introduction

The use of live animals in research and for teaching purposes raises a number of ethical questions related to the welfare of animals. Veterinarians may face these questions either as a consequence of their research activity, if they pursue a scientific career, or as a result of being employed in laboratory animal units or as members of an Institutional Animal Care and Use Committee (IACUC). We believe veterinary students should be exposed both to the general principles around which the ethical debate over the use of live animals in research revolves as well as to more "technical" issues. Also, students should become familiar with the legislation on the use of animals for research and teaching, both the European regulations and the laws of their own country. The final aim of teaching, rather than making the students remember a list of facts, would be to provide them with the intellectual tools to understand the problem and develop their own opinion.

Most veterinary students are, or should be, reasonably familiar with the general biology of the most common domestic species, such as dogs, cats, cattle, pigs, horses, sheep and chicken. They may not be so familiar, however, with the general biology of the species most commonly used in biomedical research, i.e. rats and mice. This knowledge, however, may be important to understand some welfare problems related, for example, to the housing of these animals. It may be useful, therefore, to allow some time to describe the most important features of the anatomy,

physiology and behaviour of these species. The book by UFAW (1999) is a very good source of information on this.

FELASA (Federation of European Laboratory Animal Science Associations) has elaborated a set of recommendations for the education and training of persons involved in animal experiments (FELASA, 2001). Although these recommendations are intended for very specialised courses, rather than for general courses on animal welfare, they are still worth looking at.

5.2 Basic principles

In 1959, Russell and Burch put forward the so-called *Three Rs Principle*. This is now widely accepted by the scientific community as one of the main guiding principles in the use of live animals in research. Besides, we believe it may provide a very useful framework to discuss some of the important concepts that should be taught in a general course on animal welfare. According to Russell and Burch, three issues must be taken into consideration when using live animals in research or for teaching purposes:

- *Replacement*, i.e. whether the use of live animals can be replaced by an alternative method, such as "*in vitro*" or computer-simulation models. The web pages of the University of California Center for Animal Alternatives (UCCAA), the Norwegian Inventory of Alternatives (NORINA) and the Animal Welfare Information Center (AWIC) -among others- provide useful information on alternative methods that may help to illustrate this concept. Also, the reference by Balls (1994) be very useful
- *Reduction*, i.e. whether the same objectives can be achieved with fewer animals, for example by improving the experimental design. The references by Festing *et al.* (2002) and Festing (1994) are very useful.
- *Refinement*, i.e. whether the amount of suffering caused to the animals used in the experimental procedure can be reduced to a minimum. The possibility to refine an experiment largely revolves around the ability to assess the pain and discomfort caused to the animals and this is dealt with below. The reference by Flecknell (1994) provides a good summary of the issue of refinement.

The key point when teaching the *Three Rs Principle* is that the student understands that laboratory animal welfare is not only about reducing the amount of suffering caused to the animals, but also about considering the possibility to reduce the number of animals used.

A second point of general interest about the ethical acceptability of animal experiments is whether the benefits of the experiment outweigh the suffering of

the animals (see Bateson 1986 and Stafleu *et al.*, 1999). In fact, this question should be a main concern for the members of an IACUC and is therefore important that veterinary students are exposed to it. In practical terms, however, it is often very difficult to balance the significance of a particular piece of scientific research against the welfare of the animals. We believe that it is important that veterinary students realize this difficulty and, therefore, become aware of the problems faced by those having the responsibility to decide which experiments are ethically acceptable. To illustrate these difficulties, it may be very useful to use a case-based approach, in which the students are given an experimental procedure and have to think about its benefits and the suffering caused to the animals, and reach a conclusion about its acceptability. The book edited by Orlans *et al.* (1998) provides several good examples of this approach.

In order to balance the benefits of an experiment against the suffering caused to the animals, it is imperative to be able to assess the amount of suffering before actually starting the experiment. One possibility is to use an analogy-based reasoning, so that a procedure that would probably cause pain or distress in a human is considered in principle as being painful or distressful to a laboratory animal. We think it may be very useful to discuss the benefits and shortcomings of such an approach, as it is commonly used in any debate over the ethical acceptability of animal experiments. Both Bateson (1996) and Stafleu *et al.* (1992) are good references on this.

Apart from this analogy-based reasoning, one of the tools commonly used to do this are the so-called "invasiveness scales" or "severity banding", that are currently used by IACUCs in many countries. In 1990, for example, a working party of the Laboratory Animal Science Association provided a system for assessing severity as minimum, intermediate or maximum (Wallace *et al.*, 1990). We also found the reference by Orlans (1996) very useful. Even though a general course on animal welfare may be too short to analyse in detail how these scales have been worked out, it may still be useful that the students know, at the very least, their existence.

5.3 "Technical" issues

An important point to be taught to the students is that laboratory animals may experience suffering in a variety of forms, including not only pain but also stress and behavioural restriction (see section 1 and 2 in this chapter). Also, it is necessary for the student to realize that suffering may occur not only during the experimental procedure, but also afterwards, and that it may be caused as well by the housing system. The book by UFAW (1999) is a very good source of information on housing

of laboratory animals. An issue that is related to housing and that should be mentioned in the context of laboratory animal welfare is environmental enrichment. Some references on this topic are given in the next section on wildlife.

As already mentioned, one of the requirements set out by the *Three Rs Principle* is that of refinement. We believe that a discussion on how to refine different experimental procedures is well beyond the scope of a general course on animal welfare. Nevertheless, a discussion on how pain and distress in laboratory animals can be assessed is, in our opinion, one of the most important contents to be included in such a course. Indeed, this knowledge can be applied -with some modifications- to any experimental procedure and recognising pain and distress should be one of the main concerns for any veterinarian involved in laboratory animal care. On this issue, we suggest the paper by Morton and Griffiths (1985) as a very interesting source of ideas. Although published almost 20 years ago, this paper is still widely cited. The authors discuss the main signs of pain and discomfort in laboratory animals, including changes in body weight, appearance, clinical variables and behaviour. Also, they suggest a system to obtain an overall assessment of how much the animal is suffering. Obviously, the methodology suggested by Morton and Griffiths to assess pain and discomfort should be taken only as a starting point, among other reasons because each experimental procedure requires a slightly different protocol. It may be useful, therefore, to present this paper first and then ask the students to develop their own system to assess pain and discomfort for a given experimental procedure. The references by the NRC (1992), by Flecknell (1994) and by Morton (1997), as well as the web page of *Laboratory Animals*, may also be very useful.

Another issue that is related to the assessment of pain and discomfort is that of the so-called "humane end-points". In many procedures, it is a main ethical requirement to establish a set of criteria that will allow the experimenter to identify those animals that are experiencing intense pain and that should therefore be humanely killed to avoid further suffering. As one of the responsibilities of the veterinarians that are responsible for laboratory animal welfare is to help the researchers on this issue, we believe a discussion on "humane end-points" should be included in the course. Some of the references we find most useful are those by the Canadian Council of Animal Care (1998) and by Hendriksen and Morton (1998). This discussion could be enriched with an overview of the different methods of euthanasia and its advantages and disadvantages from an animal welfare point of view (AVMA, 2001; Close *et al.*, 1996, 1997).

Finally, and also on the issue of refinement, analgesia is obviously an important topic. This, however, is usually covered in other subjects of the veterinary curriculum. Thus, depending on the year on which the course on animal welfare is taught, it may be useful to refer to these other subjects.

5.4 Legal issues

Students should be made aware of the main points raised by the Council Directive 86/609/EEC on the protection of animals used for experimental and other scientific purposes. It is important to realise that this directive is in train to be modified, particularly in relation to housing conditions of laboratory animals. Also, they should be exposed to the national legislation of their country. Finally, in countries were IACUC are mandatory or common, it could be useful to allow some time for one member of the University's IACUC to deliver a short presentation on the function and type of work done by the IACUC.

6. Wildlife

6.1 Introduction

Veterinarians are increasingly involved in wildlife medicine, husbandry and conservation and should be familiar with a number of welfare issues related to these professional activities. Veterinarians employed in zoos, captive breeding centres and wildlife rehabilitation centres are responsible for the welfare of the animals and therefore should know how to assess it and how to apply measures to improve it; environmental enrichment is probably the most widely used of such measures. Wildlife conservation in nature often involves the capture, handling and transport of animals; as veterinarians are ideally suited to carry out these operations, they should be aware of their animal welfare implications. Finally, some wildlife species are increasingly popular as companion animals and a basic knowledge of their needs may be useful. It is likely, however, that a detailed discussion on the care of exotic pets is well beyond the scope of a general course on animal welfare, even more so if the course is in the first years of the curriculum. Nevertheless, it may be advisable that the person responsible for teaching animal welfare discuss this particular aspects with those teaching exotic animal medicine.

6.2 Basic principles

We suggest that a course on animal welfare that deals, even if very briefly, with wildlife, should start by considering the biodiversity crisis. This would include a description of the current rate of species extinction as well as a discussion of its main causes. There are many good textbooks on conservation biology that may be useful as a source of information, including those by Caughley and Gunn (1995), Meffe and Carroll (1997), Primack (1998, 2000) and Pullin (2002). The book by Leakey and Lewin (1995) is also interesting. Although habitat destruction is by far the main cause of extinction, there are other causes, some of which are particularly relevant to veterinarians. The trade in wild animals that results from the pet market is one of them and has been identified as an important factor threatening several species, including, for example, many parrots and related species. A discussion on the effects of international trade on wildlife as well as on the *Convention on International Trade of Endangered Species* (CITES), should therefore be included. The reference by Hemley (1994) may be useful. Also, the book by Stattersfield and Capper (2000) on threatened birds may be of interest to illustrate the effects of the pet trade on wild birds; also, it provides a lot of information on the causes of extinction.

Another issue that should be included is related to zoos. Even though zoos have been criticised on animal welfare grounds, it is also true that they have played an important role in conservation. The main elements of the debate over the goodness of zoos can be included in the course. Special emphasis should be given to the widely accepted principle that modern zoos should be devoted to research, conservation and education, and should give a high priority to the welfare of animals. The role of zoos in conservation can be highlighted by giving examples of successful captive breeding programmes. The references by Bostock (1993), Mench and Kreger (1996), Norton *et al.* (1995) and Tudge (1991) are particularly interesting. The booklet published by the *Universities Federation for Animal Welfare* (1988) is also useful.

6.3 Assessing and improving the welfare of captive wild animals

As with other animals, the welfare of captive wild animals should be assessed by combining different types of welfare indicators, such as disease, changes in behaviour and physiological measures of stress. This has been explained elsewhere in this chapter.

As already mentioned, environmental enrichment is one of the most commonly used methods to improve the welfare of captive wild animals and we suggest that a discussion of its basic principles -even if cursory-should be included in the course.

The book edited by Shepherdson *et al.* (1998) is an important reference. Also, Carlstead and Shepherdson (2000) give a good review of the effects of environmental enrichment on the welfare of captive wild animals. The web pages of the *Animal Welfare Information Center* and *The Shape of Enrichment* are also particularly interesting, among many other reasons because they provide examples of environmental enrichment programs for several species. The issue of environmental enrichment can be approached by asking the students to design a program of enrichment for a particular species. They can be required to gather information on the natural history of the species and to review enrichment methods that have been already used in that species, and then to suggest their own enrichment method. It may be also useful to relate this issue with that of how to assess welfare, so that the students might think how to find out whether their enrichment program is improving the welfare of the animals. Environmental enrichment has oftentimes positive effects on welfare, but it is not without problems, and this should at least be mentioned. Haemisch *et al.* (1994) provide a god example of the potentially negative effects of environmental enrichment.

6.4 Welfare issues related to the capture, handling and transport of wild animals

The welfare of wild animals can be put at risk when captured, handled and transported. As veterinarian may have an active role in these operations, a discussion on their welfare implications may be of interest. The references by the American Society of Mammalogists (1998) and by Gaunt and Oring (1999) may be useful. Depending on the background of the students -mainly whether they have already had a basic course on pharmacology-, a discussion on the use of drugs to alleviate stress in wild animals could be included in the course. Ebedes (1992) provides a good overview of this topic. We suggest, however, that it is important to emphasize that using drugs is simply an aid and should never replace good handling.

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Wallace, J., Sanford, J., Smith, M.W. and Spencer, K.V., 1990. The assessment and control of the severity of scientific procedures on laboratory animals. Report of the Laboratory Animal Science association Working Party. Lab. Anim. 24, p. 97-130.

Webster, J., 1995. Animal welfare: A cool eye towards Eden. Blackwell Science, Oxford.

Legal texts

Council of Europe: European convention for the protection of animals kept for farming purposes 1976, supplemented by a protocol of amendment 1992 (http://book.coe.int/gb/cat/liv/htm/l76.htm) with a number of recommendations concerning different farm animal species (available under http://www.admin.ch/bvet). National ministries should also be able to provide copies of those.

European Union

Commission of the European Communities (1986). Council Directive 86/609/EEC of 24 November 1986 on the approximation of laws, regulations and administrative provisions of the Member States regarding the protection of animals used for experimental and other scientific purposes. Official Journal L 358, 18/12/1986, pp. 0001-0028;

Council directive 93/119/EC of 22 December 1993 on the protection of animals at the time of slaughter or killing;

but also regulations on marketing standards, e.g. for eggs, poultry meat and organic products, may effect animal welfare (http://europa.eu.int/eur-lex/en/), see Knierim and Jackson (1997)

National legislation: Some animal welfare legislation can be found on the Internet, e.g.:

Germany: http://www.verbraucherministerium.de/

Animal welfare act in English: http://www.tiho-hannover.de/einricht/tsb/act_transl.pdf

Switzerland: http://www.admin.ch/bvet

United Kingdom: http://www.defra.gov.uk/animalh/welfare/default.htm

Some selected web pages

Courses and general information: http://www.animal-info.net

European legislation on animal welfare:
http://europa.eu.int/comm/food/fs/aw/aw_references_en.html#95-29

Laboratory Animals: http://www.lal.org.uk

University of California Center for Animal Alternatives:
http://www.vetmed.ucdavis.edu/Animal_Alternatives/main.htm

Animal Welfare information Center: http://www.nal.usda.gov/awic/

Norwegian Inventory of Alternatives: http://oslovet.veths.no

The Shape of Enrichment: http://www.enrichment.org

Some selected video resources

Verhaltensweisen von Rindern (behaviour of cattle) I-III
(http://www.iwf.de/iwfger/3medien/medien_in.html)

Verhalten beim Hausschwein (behaviour of the domestic pig) I-IV
(http://combi.agri.ch/lmz/lehrbuch/video.htm - website only in German)

Verhalten beim Haushuhn (behaviour of the domestic fowl) I-III
(http://combi.agri.ch/lmz/lehrbuch/video.htm - website only in German)