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# UNIT 14 ANIMAL WELFARE ASSESSMENT METHODS

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## Structure

- 14.1 Learning Outcomes
- 14.2 Introduction
- 14.3 Animal Welfare Assessment Process
  - 14.3.1 Defining the Scope of the Assessment Process
  - 14.3.2 Selecting a Framework
  - 14.3.3 Developing Measures or Indicators
- 14.4 Animal Welfare Assessment Frameworks
  - 14.4.1 Five Freedoms
  - 14.4.2 Five Domains
  - 14.4.3 Welfare Quality
- 14.5 Welfare Assessment Measures
  - 14.5.1 Animal-based Measures
  - 14.5.2 Resource-based Measures
- 14.6 Animal Based Measures
  - 14.6.1 Good Feeding
  - 14.6.2 Good Environment
  - 14.6.3 Good Health
  - 14.6.4 Appropriate Behaviour
- 14.7 Characteristics of Measures or Indicators
  - 14.7.1 Validity
  - 14.7.2 Reliability
  - 14.7.3 Feasibility
- 14.8 Uses of Animal Welfare Assessment
  - 14.8.1 Ensuring Standards
  - 14.8.2 Continuous Improvement
- 14.9 Let Us Sum Up
- 14.10 Keywords
- 14.11 Bibliography and Further Reading
- 14.12 Self Assessment Exercises
- 14.13 Answers/Hints to Check Your Progress

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## 14.1 LEARNING OUTCOMES

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- a) Knowledge and Understanding:** After studying this Unit you will be able to:
- Outline the steps required to develop a welfare assessment scheme
  - Explain the meaning and importance of validity, reliability and feasibility in welfare assessment

**b) Practical and Professional Skills:** After studying this Unit you will be able to:

- Describe the uses of welfare assessment and how these can be implemented in practice.

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## 14.2 INTRODUCTION

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In Unit 13 we discussed why we might want to assess welfare, and some of the different types of measures that can be used. We also considered particular attributes of welfare assessment schemes and their implementation. In this Unit we will delve into the process of setting up a welfare assessment scheme in more detail.

There are a number of steps that we need to undertake for any welfare assessment scheme to be useful, particularly as a way to ensure that it truly does assess the welfare state of animals in a system, and in a way that is unbiased and unaffected by the time, place or person who is conducting the assessment. This is an important process if a welfare assessment scheme is to be an effective tool for animal welfare improvement.

In this Unit we will need to consider the welfare framework, as we have discussed earlier in this Course, to ensure that we are taking note of all aspects of animal welfare, and to determine the most appropriate measures to use for each domain of animal welfare. A very important part of welfare assessment is to ensure that assessments are unbiased and based on measures that are related to the welfare state of the animals, and carried out in a consistent manner. We will discuss how we can achieve this in our selection of measures for animal welfare. At the end of this Unit you should have a good understanding of how a welfare assessment scheme is developed and implemented to take forward into the next Unit.

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## 14.3 ANIMAL WELFARE ASSESSMENT PROCESS

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Before designing a welfare assessment scheme a number of decisions need to be made which will define the scope and limits of what can be achieved. As there are no single, clear and unequivocal measures of animal welfare that can apply to all animals in every situation, we typically use a number of indicator measures that allow us to gain some understanding of the welfare of state of the animal or animals within the scope of the welfare assessment scheme. Depending on our welfare framework we may need several measures, and of different types, to adequately cover all areas of welfare. How and why we might choose different indicators or measures will be discussed here under the following heads:

- a) Defining the scope of the assessment process
- b) Selecting a framework
- c) Developing measures or indicators

### 14.3.1 Defining the Scope of the Assessment Process

A welfare assessment scheme will be specific to the species and often to the purpose for which animals are kept. Welfare assessment schemes may also be specific to a particular age or stage of development for the species as well. This

is because the welfare needs for different species, or animals at different stages of development, can vary. In addition, the risks to poor welfare, and opportunities for good welfare, may also be different for the same species when used for different purposes. Thus the measures or levels of assessment that we might want to make will also vary. In addition, some types of measures may only be usefully applied to particular classes or species of animals.

*Example:* Assessing somatic cell count in milk may be a very useful measure of the presence of disease in a lactating animal, but will have no value in an assessment of very young, non-reproductive or male animals.

It may also be possible to make quite detailed measures in a group of animals that are typically kept in small groups, or that are used to close human contact.

*Example:* Animals that are used by humans on a daily basis such as draught animals or farmed livestock.

However, for large groups of animals, or those that will not tolerate close contact or handling, such as some zoo animals or managed wildlife, an entirely different set of measures may be needed to assess welfare. It is important, therefore, before we begin to develop a scheme to define the purpose and animals to which it will apply.

### 14.3.2 Selecting a Framework

As we have covered previously, although the Five Freedoms is the best known of all the frameworks to assess animal welfare, it cannot be immediately used in practice to assess welfare. However, it does clarify that animal welfare is a multi-dimensional concept, and therefore will require a multi-dimensional scheme for it to be adequately assessed.

*Example 1:* For laboratory animals, or animals used in research and teaching, the Five Domains model was developed to ensure that each area or domain of potential suffering was covered.

*Example 2:* For farm animals a similar, but not identical, framework of the Welfare Quality® four principles and twelve criteria, was developed.

*Example 3:* Other welfare definitions, such as the two questions posed by Professor Marian Dawkins: ‘Are they healthy and do they have what they need?’ could also be used to assess animal welfare, although determining what animals need might lead back to the Five Freedoms.

The framework used to assess welfare will direct the way in which indicators or measures are selected for the welfare assessment scheme.

### 14.3.3 Developing Measures or Indicators

As there is no single measure of welfare, we need to make a series of measures or indicators that will allow us to address the different aspects of domains of welfare. This is often done by investigating the scientific literature, to identify potential indicators that may be readily measured in our target population and where there is some evidence that they are associated with the different welfare domains.

How many indicators are included in the assessment scheme will vary, and will be affected by a number of different aspects.

*Example:* For Welfare Quality, there are twelve specific criteria on which welfare should be assessed.

This suggests that as a minimum we will need to make twelve separate measurements, unless some indicators can assess more than one criteria. If we are assessing whether the animal is healthy or not, we may look for evidence of the presence or absence of a number of specific diseases, generally those that are most prevalent for that type of animal in the environment in which they are living.

In designing our welfare assessment protocol or scheme we also need to ensure that we do not focus only on the negative aspects of animal welfare, but also include indicators of measures that assess positive welfare states. These have typically received less research attention than negative aspects of animal welfare, until recently. However, these are now starting to be included in welfare assessment schemes, with some schemes specifically focusing on opportunities for good welfare.

In order to make the process of welfare assessment simpler, and to reduce the number of separate measures, a goal of welfare assessment is to identify single indicators that integrate information about many areas of animal welfare. These are termed ‘iceberg’ indicators, after the notion that only the tip of an iceberg is visible above the water, but much more ice is present below the surface. In the same way a small measurement, or the iceberg tip, could be made but this would allow assessment of a much larger or more integrated view of animal welfare. Although a number of these have been proposed, there is not yet a universally accepted iceberg indicators for welfare assessment.

Before we proceed, please complete activity 1.

**Activity 1:** In this Unit you are going to work through the steps of designing a welfare assessment scheme as part of the activities. In this first step (a) choose an animal species with which you are quite familiar and (b) define the scope of your welfare assessment scheme.

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**Check Your Progress 1**

**Note:** a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

- 1) Outline the main steps in the development of a scheme for assessing animal welfare

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- 2) Why should a welfare assessment scheme be specific to a species?

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- 3) What are the two questions posed by Professor Marian Dawkins?

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- 4) What do we mean by ‘iceberg’ indicators in the context of welfare assessment?

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## 14.4 ANIMAL WELFARE ASSESSMENT FRAMEWORKS

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Selection of an appropriate welfare assessment framework will ensure that all aspects of animal welfare, both positive and negative, are included in an assessment protocol or scheme. A number of frameworks have been developed and are in use for different types of animals. We have previously discussed these in earlier units, so this section will recap and highlight the important points.

### 14.4.1 Five Freedoms

The Five Freedoms clearly defines the five areas we need to consider in assessing welfare, emphasising that we need to ensure that animals do not experience hunger, thirst, discomfort, pain, injury, disease, fear or distress and that they can display normal behaviour. However, this does not easily direct us to the types of measures that we should be making in order to do this. Many of these emotions, such as fear or distress, might be elicited by many different challenges and determining their presence or absence can be quite demanding. For this reason,

when this is used in practice, other methods have been proposed to define animal welfare more explicitly to allow its assessment.

### 14.4.2 Five Domains

The Five Domains model has been used to assess risks to welfare for animals used in research and teaching, and more recently also applied in other contexts. The initial aim of this model was to categorise the negative aspects of the physical environment of the animal, and from there to infer the mental state, and thus the welfare status of the animal. The physical components of animal welfare that could be directly measured or assessed included:

- Nutrition - whether the animal was deprived of food or water, or fed a diet that was not adequately balanced (resulting in malnutrition)
- Environmental challenge – whether the animal was subject to high or low temperatures for example, or some other issue in its environment
- Health – whether the animal was injured or diseased, or had some other functional impairment
- Behaviour – whether the animal was restricted in its ability to perform some behaviours or interactions with other animals of its species.

Although this initially focused only on negative aspects of animal welfare, more recently this has been expanded to consider opportunities in the physical components to allow for positive mental states as well. This then becomes more comprehensive in its assessment of animal welfare.

### 14.4.3 Welfare Quality

The Welfare Quality framework was developed for use in the assessment of farmed livestock. It divides welfare into four principles, which are very similar to the physical components of the Five Domains model. In Welfare Quality these principles are:

- 1) Good Feeding
- 2) Good Housing (or Environment)
- 3) Good Health and
- 4) Appropriate Behaviour.

Within each of these principles are a number of specific criteria (e.g. Comfort around resting, Thermal comfort and Ease of movement belong within the Good Environment principle). The full list of principles and criteria has been given in Unit 6 of Block 2 in this course (see Volume-I, Box 6.4).

The Welfare Quality framework then clearly identifies where we might want to develop specific measures or indicators. To use the Good Environment principle as outlined above we would consider indicators that would be appropriate for the assessment of whether the animals are able to rest comfortably in the environment in which they live, whether they are kept at a suitable temperature and whether they are easily able to move about their living space. This might involve selection of measures that can tell us about the space available to the animal, the amount of bedding present, the floor surface, the ventilation of a building if the animal is housed and so on. To be able to determine whether the

animal is provided with a good environment then we may need to make several measures to provide a complete view of the suitability of where the animal lives.

Before we proceed, please complete activity 2.

**Activity 2:** For your species chosen in the first Activity now decide upon the welfare assessment framework you wish to use. Write out the key parts of that scheme to help you develop the indicators for assessment.

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**Check Your Progress 2**

**Note:** a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) Write out the main characteristics of following welfare assessment frameworks :

a) Five Freedoms

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b) Five Domains

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c) Welfare Quality

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## 14.5 WELFARE ASSESSMENT MEASURES

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Another important area is what types of measures will be made in the welfare assessment. As described in the previous unit, we can measure directly:

- The resources available to the animal,
- The management of the animal, and
- The outcomes for the animal.

Each type of measure has its advantages and disadvantages, and often welfare assessment schemes may contain a mix of more than one type of measure. Let us recap them briefly.

### 14.5.1 Animal-based Measures

Animal-based measures assess the welfare outcomes for the animal directly. These indicators specifically ask how well the animal is doing by measuring the consequences for the animal of how it lives and is managed. As these are direct measures of animal welfare they have become the more preferred measures of animal welfare as they are likely to be the most accurate determinants of welfare state. We will discuss the types of animal-based measures that can be made below. However, good animal-based indicators of welfare are not always available or possible to measure easily in the environment in which the animal lives. Therefore, use of other types of measures may also be included to ensure that all dimensions of welfare are included.

### 14.5.2 Resource-based Measures

Resource-based measures assess the risks to poor welfare, or the opportunities for good welfare, rather than the actual welfare state of the animal. They are an assessment of the input into the system, rather than the outcomes. Although they are useful indicators, and often form part of welfare assessment protocols, alongside animal-based measures, it is important to recognise that they do measure welfare in a different way to animal-based measures. To illustrate this we will consider an example. Typically resource-based measures will involve measurement of inputs like:

- Buildings or facilities
- Assessment of the amount of space available per animal and
- How, when and what they might be fed etc.

If we consider measurement of the availability of feeder spaces for farmed animals: we might determine that there are fewer places for animals to feed than we might expect for the number of animals present. This does not mean that the animals must be hungry, only that the risk of animals being unable to feed whenever they want has increased, which would mean that the less aggressive or subordinate animals are likely to not be able to eat as often or as much as they might like and therefore they are at risk of experiencing hunger (and possibly injury from competition at the feeder). The related animal-based measure might be related to how thin the animals were, which would allow us to determine that the lack of adequate feeder space had indeed resulted in animals losing weight and probably experiencing hunger.

Resource-based measures can also be used to assess positive aspects of animal welfare. For example, we might assess the opportunities for animals to make choices (do they have a choice of different places to rest for example), to engage in social interactions with other animals, to investigate a complex environment and so on. Again, this does not tell us that the animals are experiencing the positive emotional states of interest or pleasure, but it does suggest that there is more opportunity for the animal to experience these states than in a less interesting or complex environment.

Before we proceed, please complete activity 3.

**Activity 3:** Continue to build your welfare assessment scheme by choosing one resource-based and one animal-based indicator for each level of your chosen welfare assessment framework.

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**Check Your Progress 3**

**Note:** a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) Why are animal-based measures more preferred than other types of measures?

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2) Differentiate between resource-based and animal-based welfare assessment measures.

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## 14.6 ANIMAL BASED MEASURES

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In this section we will consider what might be suitable animal-based measurements for assessing welfare, in particular considering those where there is some evidence in support of their validity. We will do this in the context of the Welfare Quality® framework, although the indicators are relevant to any welfare assessment framework using animal-based measures.

### 14.6.1 Good Feeding

The first Principle is Good Feeding, which is composed of two criteria:

- a) Absence of prolonged hunger, and
- b) Absence of prolonged thirst

For the first criteria we would be looking for measures that are indicative of an animal eating a diet which, in either quantity or quality, is unable to maintain it in full health and fitness. Potential indicators of this might be:

- a) Physical indicators (e.g. evidence that the animal is losing weight or fatness such as assessment of body condition score)
- b) Physiological indicators (e.g. increased mobilisation of fat reserves)
- c) Production related indicators (e.g. assessment of growth rate or offspring mortality for breeding females)
- d) Behavioural indicators (e.g. assessment of motivation to eat or seek food, or measures of how hard the animal might work for access to food).

Production indicators are not generally very sensitive to short-term changes in feeding, which means that it may require relatively severe or prolonged hunger to have occurred before the measures are indicative of a welfare concern. Although behavioural indicators may get closest to measuring the state of hunger, and can be very sensitive to availability of food, these are often not feasible to assess in all situations and thus the physical indicator of body condition is often used in assessment schemes. For many species there are already well-validated scales to allow visual assessment of fatness (e.g. in horses, dogs or cattle) or by manual palpation (e.g. sheep or goats), that can be reliably applied to assess this criteria.

Absence of prolonged thirst can be a more challenging aspect of welfare to assess through animal-based measures other than through physiological indicators of dehydration, which are often not feasible to apply. However, some physical indicators such as poor skin elasticity (e.g. how quickly the skin returns to normal following a pinch, sometimes called skin tent test) or sunken eyes associated with dehydration may be possible, or the behavioural indicator of motivation to drink when offered water. None of these indicators have shown good validity or reliability in testing and in many assessment schemes assessment of absence of prolonged thirst is measured by the resource-based indicator of access to water.

### 14.6.2 Good Environment

This Principle is composed of three criteria:

- a) Comfort around resting
- b) Thermal comfort and

- c) Ease of movement (which relates primarily to housed animals).

The first criteria seeks to determine if the animal has a suitable resting place, or a bed, in its normal environment, and that it is able to rest when it needs to do so. Animal-based indicators associated with the first of these can be physical (e.g. does the animal have a clean coat which might indicate that it has been able to lie in a clean and dry bed, do they have injuries that may be related to lying on a hard surface) or behavioural (e.g. assessment of lying time or roosting time in poultry, or the ability of all the group of animals to lie simultaneously).

The second criteria addresses whether the animals are kept at a suitable temperature for the species and for the age of the animals, for example young animals may need to be maintained at warmer temperatures than adults. Animal-based measures for this criterion could assess temperature of the animal directly (although this is often difficult to do in large numbers of animals) but most focus on the effort that animals need to exert to maintain core body temperature, an indication that the animals are outside their thermoneutral range (the range of temperatures at which the animal can comfortably live without need to use behavioural or physiological means to raise or lower their temperature). Potential indicators could be physical assessments of panting, sweating or shivering, and behavioural measures of huddling together or lying in postures or locations that may help them conserve or dissipate heat.

Ease of movement is most relevant in housed systems where animals may be very confined, e.g. caged laying hens, or where animals are tethered for long period or otherwise restricted, but may also be relevant if animals are kept in or need to move through environments where there are risks of slipping and falling. Most indicators for this criterion are behavioural and focus on whether the animal is able to stand, lie and turn around easily in the space or environment they have available to them. Additional indicators may focus on whether animals are able to perform specific comfort behaviours, such as wing-stretching in birds or sitting upright in rabbits.

### 14.6.3 Good Health

Good health principle includes three criteria:

- a) Absence of disease
- b) Absence of injury, and
- c) Absence of painful management procedures.

Welfare assessment under good health generally involves:

- a) A physical inspection of the animal for the presence of wounds, or other injuries, which can be scored on the basis of their severity (e.g. size and depth of a cut or abrasion), and
- b) Presence of the most common diseases affecting the species which includes:
  - Assessing lameness, which is often evaluated by looking at gait and how freely the animal is able to walk or whether they are reluctant to bear weight on one or more limbs
  - Assessing respiration and whether there is evidence of respiratory disease (such as coughing, nasal discharge, wheezing etc.)

- Looking for the presence of eye infections, parasites and digestive problems.
- Mortality rates (e.g. numbers of deaths within a population of animals).

Most common management procedures that are known to cause pain are summarised in Box 14.1.

**Box 14.1: Common Management Procedures Causing Pain**

- Castration
- Tail shortening (or docking)
- Nose-ringing
- Dis-budding of calves or goat kids, and
- Beak-trimming of poultry.

These procedures are often carried out when the animal is very young, but frequently without use of analgesia or anaesthetics. For other species animal-based evidence of painful management procedures or treatments include:

- Hot-iron branding
- Lesions at the corners of the mouth in equids and other working animals where bits are used and
- Other procedures that involve cutting or removing parts of the body such as removal of ear tips in dogs.

Animal-based measures of behaviour can also be used to assess whether the animal is in pain including postures (e.g. hunched or tucked up postures, often with the tail clamped down), vocalisations and facial expression. Facial expressions indicative of pain are known to occur in humans, and have also been seen in several other species including mice, rabbits, sheep, horses and pigs. These seem to be involuntary and involve contractions of the facial muscles that cause squinting, nose and cheek bulging, and the ears to be rotated backwards. These can be scored and defined scoring systems (called Grimace scores (Box 14.2) have been developed and used in several species.

**Box 14.2: Grimace Scale (Animals)**

The Grimace scale (GS), sometimes called the Grimace score, is a method of assessing the occurrence or severity of pain experienced by non-human animals according to objective and blinded scoring of facial expressions. Observers score the presence or prominence of “facial action units” (FAU)

*Examples:* Orbital Tightening, Nose Bulge, Ear Position etc.

These are scored by observing the animal directly in real-time, or post hoc from photographs or screen-grabs from videos. The facial expression of the animals is sometimes referred to as the ‘pain face’. The GS method of pain assessment is highly applicable to laboratory rodents as these are usually prey species which tend to inhibit the expression of pain to prevent appearing vulnerable to predators.

*Source:* NC3Rs: <https://www.nc3rs.org.uk/grimacescales>

## 14.6.4 Appropriate Behaviour

This Principle is made up of four criteria:

- a) Expression of social behaviour
- b) Expression of other behaviours
- c) Good human-animal relationship, and
- d) Positive emotional states.

Many domesticated animals are social, in that they would normally live in the company of other animals of their own species, and therefore this criterion is often addressed by looking at the amount of time that animals can spend interacting with others, and the quality of those interactions. For animals that are housed or kept individually this may be investigation of whether the animal has any opportunity for social contact with others of its species.

For socially housed or managed animals potential animal-based measures include:

- Looking at aggressive or affiliative contacts between animals.
- The opportunity for social grooming, and
- Whether the animals show synchronous or cohesive behaviour (e.g. can all animals lie at the same time, can they all feed together at the same time).

Expression of other behaviours may assess whether the animal shows evidence of stereotypic or other abnormal behaviours, whether the animal is very fearful or seems withdrawn and not engaging with the social environment. Abnormal behaviours can involve very repetitive behaviours that do not appear to have any function (stereotypy), such as pacing, swaying, chewing, walking in circles, jumping up and down (in caged mice), head nodding or twirling or other behaviours that are performed very frequently in the same manner for long periods of time. Other abnormal behaviours might involve the animal licking, biting or chewing parts of its own body, or that of another animal in close proximity, to such an extent that this can lead to injury.

A good relationship between the animal keeper and the animal being cared for can be a very important part of animal welfare, as discussed in earlier Units. To assess the quality of this relationship potential animal-based measures can involve testing how close animals are willing to approach a person (either someone they know or a stranger), whether they seek to avoid human contact, and how they respond when approached or touched.

Assessment of positive emotional states seeks to assess whether animals are able to express states such as contentment, pleasure, interest in the environment, confidence and other positive states. Possible behavioural measures that might be related to this criterion include play behaviours, exploration, and affiliative social contacts. This can also be assessed by looking at the animal's demeanour or 'body language' and whether the animal appears to be relaxed, content and positively engaged with the environment.

Before we proceed, please complete activity 4.

**Activity 4:** Review your chosen resource-based and animal based measures in the light of the information you have just read. Do you need to modify or supplement your list? Add additional measures if you think these would be useful.

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**Check Your Progress 4**

**Note:** a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) Write the two criteria under the Principle of Good Feeding.

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2) Name the three criteria under the principle of Good Environment.

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3) What are the criteria under the principle of Good Health?

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4) Name the most common management procedures that are known to cause pain

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5) Write the four criteria under Appropriate Behaviour principle

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6) Write a good potential animal-based indicator (what it is and why it is a suitable indicator) for each of the following Appropriate Behaviour criteria:

a) Expression of social behaviour

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b) Expression of other behaviour

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c) Good human-animal relationship

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d) Positive emotion state

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## 14.7 CHARACTERISTICS OF MEASURES OR INDICATORS

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To be suitable for use in a welfare assessment protocol our selected indicators need to have certain properties or characteristics that make them robust. This means that we can be confident that they are measuring something about animal welfare state, and that this is reproducible if measured again, i.e. that the measure is not influenced by the time it is taken, or by the person making the measures. For this to be the case for each of our potential measures we need to address the measurements:

- a) Validity
- b) Reliability
- c) Feasibility

### 14.7.1 Validity

Validity is defined as the extent to which a measure is well-founded, and corresponds accurately to the real world. In other words, in animal welfare, that the indicator does indeed measure what it is claimed to measure, and therefore that the indicator truly tells us something meaningful about animal welfare. Within this definition there are several types of validity, where we might have increasing confidence in the accuracy of the measure:

- a) Face validity
  - b) Expert validity
  - c) Construct validity
  - d) Convergent validity
- a) **Face Validity:** The lowest level or least sophisticated assessment of validity is known as *face validity*. This simply asks whether the measure appears to assess what we think it does (taking it at face value). It appears to be related to what we are interested in measuring.

*Example:* If we want to assess whether an animal is getting sufficient food to eat then looking at how hard an animal will work for food, or how long an animal spends searching or foraging for food, would seem to be a reasonable measure.

- b) **Expert Validity:** We can take this a step further by gathering the views of a number of experts in the field as to whether they agree that the measure seems to be well-related to the welfare concept we wish to measure. Their consensus view is sometimes described as *expert validity*.
- c) **Construct Validity:** A more sophisticated version of validity, which still asks whether the measure is internally consistent with the aspect of welfare we are trying to measure, is *construct validity*. This level of validity asks whether measures that are conceptually related to what we wish to assess.

*Example:* To return to our measurement of food availability, assessing a measure such as whether the animal is losing weight, as well as spending a lot of time foraging for food, could be considered as being internally

consistent with hunger. This is because we know that when animals do not have enough to eat they may experience the negative state of hunger, and an increased motivation to search for food, alongside the biological responses of mobilising their energy reserves, which can lead to weight loss.

So this set of measures seems internally consistent with the idea that an animal may not be getting an adequate amount of food to meet its requirements.

- d) Convergent Validity:** We can also consider forms of external validity, when we look at how well our measure is related to other measures that assess similar or different measures. A form of this validity is *convergent validity* which asks how well measures that are conceptually related are empirically related and co-vary.

*Example:* Are searching for food and weight loss (as measures of access to food) empirically related, and do they co-vary?

This means, for example, that our measures would have convergent validity if animals that spend more time searching for food are also those that are thinnest, whereas fatter animals spend less time in looking for food. This association would give us more confidence that these are accurate measures of whether an animal is hungry or receiving adequate food for its requirements.

Within the concept of validity we may also ask about *specificity* and *sensitivity*. The first of these two concepts addresses whether the measure is *specific*, i.e. does the measure reflect what it is supposed to measure and nothing else? In our example, above an animal may lose weight because it is ill or injured and in pain, as well as because it does not have access to sufficient food. Thus this measure, although it can tell us something about the availability of food for that animal, may also be associated with some other welfare challenge. This does not mean that we should not use this measure, just that we might need to be more cautious in how we interpret the outcomes. The other concept is *sensitivity*, which considers whether the measure is capable of detecting small changes in the underlying trait it is supposed to be measuring. We might consider that food searching would increase in an animal, even if there is only a small reduction in food availability, and thus that this measure is sensitive to the underlying trait of whether the animal has an adequate intake of food. Weight loss, on the other hand, would require a more prolonged period of lack of food for there to be a measureable change and therefore this measure would be considered less sensitive.

### 14.7.2 Reliability

Reliability is an assessment of the overall consistency of the measure: that is does it produce similar results under consistent conditions. In animal welfare we usually break this down into two components:

- a) Reproducibility
- b) Repeatability.

**Reproducibility:** This asks about the robustness of the measure when made by more than one person, thus the measure should be able to be reproduced by all assessors or those who want to use the measure. We sometimes call this ‘inter-observer reliability’, where we would determine if more than one person would

still record the same measure in an accurate way and so reach the same conclusion about animal welfare.

**Repeatability:** This asks whether each assessor is internally consistent in his or her own ability to produce accurate results. This is sometimes called ‘intra-observer reliability’, or ‘test-retest reliability’ and would be tested by asking the same person to make several assessments of the same animal or system on several occasions and determining if they reach the same conclusions on every occasion.

The reliability of a measure would determine whether it was possible to assess the measure in the same way on every occasion by more than one person. This would then consider if the measure was free from bias and sufficiently objective that it allows a fair and accurate assessment of welfare state. The ability to measure things reliably may also be related to the experience of the person making the measure, and reliability may improve with training. Thus a measure may be very unreliable in the hands of inexperienced assessors, but become very reliable, and therefore a useful tool for welfare assessment, if the assessors have been properly trained in the use of the measure.

### 14.7.3 Feasibility

Finally, before using a measure, we want to determine if it is feasible; that is are we able to make the measure in the same way in all the situations that we may want to assess. For animals where we have a high degree of control – in a laboratory setting for example – we may be able to make very precise assessments that would not be possible or feasible in a less controlled environment. Measures that require the animal to be handled individually may be very readily applied in settings where animals are used to close contact with humans (pets or farm animals for example), but would not be possible in other settings, such as potentially dangerous zoo animals. Thus for each of our measures, we need to be certain that it is practically feasible to take these measures in the situation we wish to assess, before they can be included in our welfare assessment protocol. Typically, in developing our welfare assessment scheme, we would test our measures in different settings to determine if they can be feasibly applied.

Before we proceed, please complete activity 5.

**Activity 5:** For each measure or indicator on your list think about whether it is valid (face validity is fine for this exercise), reliable and feasible. Remove indicators from your list that don't meet these requirements.

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### Check Your Progress 5

**Note:** a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) Write the meaning of a) validity; b) reliability and c) feasibility in the context of animal welfare assessment

a) *Validity*

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b) *Reliability*

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c) *Feasibility*

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2) Name different types of validity of measurement in welfare assessment

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## 14.8 USES OF ANIMAL WELFARE ASSESSMENT

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A comprehensive, multi-dimensional welfare assessment scheme, as we have been describing, will often result in a number of measures or scores for different aspects of welfare. In some situations it may be useful to reduce this to a single score for a domain or principle of welfare, or even to a single overall score for the facility being assessed. Whether this is a useful or desirable thing to do often

depends on the use to which the welfare assessment is being put. Animal welfare assessment is useful in serving the following two purposes:

- a) Ensuring standards
- b) Continuous improvement

### **14.8.1 Ensuring Standards**

The most common use of welfare assessment is to ensure compliance with standards, either minimum standards or some enhanced system aiming to achieve improved welfare conditions. In this situation it may be required that the welfare assessment determines whether the facility has achieved a particular level or passed a threshold. For this purpose often a single score is required that then places the facility on a scale, which either suggests it has passed or failed an inspection, or is able to make specific claims about animal welfare. These can be calculated as mathematical averages, or weighted if particular criteria or measures are considered of such fundamental importance to welfare that they must be achieved for minimum welfare standards. These measures may be applied as hard and fast rules (e.g. failure to comply results in an immediate penalty) or allow a period of time for the facility to improve. A single score, without explanatory notes, may not be very useful in this second context, when knowing exactly where improvements are required will be needed. Information on the exact measures can then be more informative to lead to welfare improvements.

### **14.8.2 Continuous Improvement**

Welfare assessments may also be used to drive changes and developments in welfare. Regular assessments allow progress towards improved animal welfare to be assessed, and can identify the main areas where additional work or changes are required. These may be self-assessments, conducted by the animal keeper, where progress against a goal can be monitored, or conducted within a welfare scheme which rewards progress as a facility improves welfare. For example, some welfare schemes, e.g. some of those for food animals, which aim to promote high welfare status, may have a series of levels which allow a farm to move up from one level to the next by achieving particular welfare goals.

The goal of most welfare assessment schemes is to ensure minimum standards, below which welfare must not fall, and compliance with legislative or other standards for welfare. Some schemes also aim to reward systems or facilities that provide an enhanced standard of welfare. These schemes can be important tools to bring about improvements in animal welfare. They can act by identifying which aspects of animal welfare needs to be improved, and can also be learning aids, by demonstrating what good welfare should be aiming to achieve. In this function they can show and educate animal keepers in improved ways to keep and manage their animals. Some schemes allow animal managers to see how well they are doing in comparison to others (e.g. whether their farm or facility falls in the upper or lower quartile for a particular measure). This can promote competition and motivation to improve, particularly by demonstrating that it is possible to achieve better welfare, and this is not some idealised or unachievable endpoint.

Before we proceed, please complete activity 6.

**Activity 6:** Let's see how this works in practice. Visit a facility (farm, shelter, zoo or just your local environment) where your chosen species lives. Try out each of your measures or indicators (this might be for individual animals, or at a group level) to see if they are useful and can be made in this context. Please remember if your measures require you to handle animals that you ask permission of the animal keeper first, or consider if this is really feasible in the context you have chosen. Write your experiences / remarks.

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### Check Your Progress 6

**Note:** a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) List 3 uses for the assessment of animal welfare

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## 14.9 LET US SUM UP

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- In this unit we have considered the process of developing a welfare assessment scheme.
- We have worked through the steps of identifying the scope of the scheme, how we ensure that animal welfare is covered from all angles and how welfare can be assessed.
- We have focused on what the types and properties of indicators or measures must be to ensure that welfare assessment is fair and unbiased when applied by different people and in different contexts.
- We have considered possible resource-based and animal-based measures that can be used, and how we need to determine that these are valid, reliable and feasible for use in assessment.
- Finally we considered how welfare assessment schemes might be used to ensure compliance with minimum standards, or to achieve enhanced standards of animal welfare.
- In the next Unit we will consider the different animal welfare assessment schemes that are available, and how they are used in different contexts or with different classes of animal.

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## 14.10 KEYWORDS

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**Abnormal Behaviour:** Behaviours that are performed at an abnormally high frequency, or in an abnormal context or are displayed towards an inappropriate object (sometimes called mis-directed behaviour), usually as a consequence of housing or management that does not meet the animals needs.

**Animal-based Measures:** Outcome-based measures or indicators which focus on the animal (as an individual or group of animals) and assess the actual impact on welfare of the animal.

**Feasibility:** In the context of welfare assessment, this is an assessment of whether the measure or indicator can be recorded in all situations in which we may want to record it, and within an acceptable period of time; whether it is practical to assess.

**Five Domains:** An adaptation of the Five Freedoms developed in New Zealand to allow assessment of the welfare of animal used in research and teaching. This considers welfare in four physical domains which then leads to a further fifth domain of the animal's mental state which defines its welfare.

**Five Freedoms:** The oldest and best known comprehensive welfare assessment framework which was developed in UK in 1970s. This defines animal welfare in terms of five specific areas where animal requirements should be respected and considered.

**Human-animal Relationship:** A measure of the quality of the relationship between an animal and its keeper. This can be positive, in that the animal regards its keeper as a source of food, companionship and care, or negative as a source of fear or pain. This is often measured by willingness to approach and interact with a human, or the behaviours expressed when in close contact to a person.

**Injurious Behaviour:** Abnormal behaviours performed by animals on themselves or others which leads to injury.

**Multi-dimensional Welfare Assessment:** A scheme or system that allows all the different facets or dimensions of animal welfare to be considered.

**Positive Emotional State:** The state of being associated with positive feelings, such as contentment, relaxation, positive anticipation, interest or confidence.

**Reliability:** In the context of welfare assessment, this is an assessment of whether the measure or indicator can be recorded in the same way by more than one person (reproducibility) and by the same person on different occasions (repeatability).

**Resource-based Measures:** Input-based measures or indicators which look at the environment in which an animal is kept and generally look at the risks and opportunities for good and poor animal welfare respectively, rather than the actual impact on the animal.

**Stereotypy:** Repetitive, unvarying and apparently functionless behaviours which are performed usually by animals housed in restrictive conditions that do not meet their behavioural needs, sometimes at very high frequency (e.g. the animal spends large parts of its day performing these activities)..

**Validity:** In the context of welfare assessment, this is an assessment of whether the instrument or measure is actually measuring or assessing what we want it to measure.

**Welfare Quality® :** A large European project which set out to develop welfare assessment schemes, based largely on animal-based measures, for cattle, pigs and poultry. This project defined animal welfare in a set of four principles and 12 criteria which expanded on the Five Freedoms to allow it to be used for welfare assessment of farmed animals.

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## 14.11 BIBLIOGRAPHY AND FURTHER READING

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Blokhuis, H., Miele, M., Veissier, I., and Jones. B. Eds (2013). Improving Farm Animal Welfare: Science and Society Working Together, the Welfare Quality Approach, Wageningen Academic Publishers.

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## 14.12 SELF ASSESSMENT EXERCISES

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- 1) Why should we define the scope of a welfare assessment scheme?
- 2) What is positive animal welfare?
- 3) What are the Five Domains of animal welfare?
- 4) What are the Welfare Quality four principles for animal welfare?
- 5) What sort of welfare measures are body condition score, lameness and coat cleanliness?
- 6) What sort of behaviours might be used to assess the quality of the human-animal relationship?
- 7) Why is validity important in animal welfare?
- 8) What is inter-observer reliability and intra-observer reliability?
- 9) How can animal welfare assessment be used for continuous improvement in animal welfare?

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## 14.13 ANSWERS/HINTS TO CHECK YOUR PROGRESS

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### Check Your Progress 1

- 1) Main steps in development a scheme for assessing animal welfare: define the animals (species, type, age) and management to which the welfare assessment scheme applies; select a welfare assessment framework to ensure a multi-dimensional approach; select appropriate indicators for each level of assessment.
- 2) A welfare assessment scheme will be specific to the species and specific to a particular age or stage of development for the species as well. This is because the welfare needs for different species, or animals at different stages of development, can vary.
- 3) The two questions posed by Professor Marian Dawkins are : Are they healthy and do they have what they need?

- 4) In order to make the process of welfare assessment simpler, and to reduce the number of separate measures, a goal of welfare assessment is to identify single indicators that integrate information about many areas of animal welfare. These are termed ‘iceberg’ indicators.

### Check Your Progress 2

- 1) a) Five Freedoms – defines welfare as freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury and disease; freedom to express normal behaviour and freedom from fear and distress. (b) Five Domains – used to assess welfare in animals used for research; divides welfare into four physical domains (nutrition, environmental challenge, health and behaviour) which lead to the fifth domain (mental state); focused initially only on negative aspects of animal welfare. (c) Welfare Quality – used to assess welfare in farmed animals; divides welfare into four Principles (good feeding, good environment, good health and appropriate behaviour), with 12 criteria that define good animal welfare.

### Check Your Progress 3

- 1) Animal-based measures are direct measures of animal welfare. Hence they have become the more preferred measures of animal welfare as they are likely to be the most accurate determinants of welfare state.
- 2) Resource-based measures – measurements that look at the inputs into the environment, the ‘resources’ which animals are provided such as space, bedding, feed, ventilation in buildings etc. These measures assess the risks for poor animal welfare (and opportunities for good welfare) rather than the welfare state of the animal directly.

Animal-based measures – measurements that look at the physical or health status of the animal and its behaviour directly, to assess how welfare the animal is coping in the environment. These are also known as outcome-based measures.

### Check Your Progress 4

- 1) The two criteria are – absence of prolonged hunger, and absence of prolonged thirst.
- 2) The three criteria are: comfort around resting, thermal comfort and ease of movement (which relates primarily to housed animals).
- 3) Good health principle includes three criteria: absence of disease, absence of injury, and absence of painful management procedures.
- 4) The most common management procedures that are known to cause pain are castration, tail shortening (or docking), nose-ringing, dis-budding of calves or goat kids and beak-trimming of poultry.
- 5) The four criteria under appropriate behaviour principle are: expression of social behaviour; expression of other behaviours; good human-animal relationship, and; positive emotional states.
- 6) a) Expression of social behaviour – possible measures can include amount of physical contact animals have with each other; expression of aggressive behaviours (fighting, biting, pushing); physical evidence

of fighting (scratches and skin lesions from biting); frequency of displacements (when one animal makes another move away from a feeder or a lying area); affiliative behaviour (time spent in licking and grooming one another).

- b) Expression of other behaviour – possible measures include presence of abnormal behaviours (stereotypic behaviours, injurious behaviours); high levels of fear and anxiety (such as being very reactive to sounds or new objects).
- c) Good human-animal relationship – acceptance of the presence of humans in close contact e.g. allowing people to approach to close distances; calm behaviour when touched.
- d) Positive emotion state – frequency of play behaviour for young animals; frequency of positive social contact between animals (time spent licking and grooming); animal demeanour (whether they appear calm and content or anxious and fearful).

### Check Your Progress 5

- 1) a) Validity – assessment of whether the measure actually measures what it is supposed to. This can be face or expert validity – where there is an agreement that ‘on the face of it’ the measure seems to be related to what it is supposed to be; construct validity – where the measure is internally consistent with what we are trying to measure; or convergent validity – where the measure co-varies with other measures relating to the same factor.
  - b) Reliability – assessment whether the measure will be the same when measured by more than one person or by the same person on more than one occasion.
  - c) Feasibility – assessment of the practical ability to make the measure in all contexts in a reasonable period of time.
- 2) Different types of validity of welfare assessment measurement are: face validity, expert validity, construct validity, and convergent validity.

### Check Your Progress 6

- 1) The three uses for the assessment of animal welfare are: ensuring compliance with minimal standards; assessing the level achieved against a welfare bench-mark in an enhanced welfare scheme; to check on the welfare impact of a change in management; to achieve continuous improvements in welfare.