



# Module 15

## Environmental Enrichment

### Lecture Notes

#### Slide 1:

This lecture was first developed for World Animal Protection by Dr David Main (University of Bristol) in 2003. It was revised by World Animal Protection scientific advisors in 2012 using updates provided by Dr Caroline Hewson.

Much of this presentation has also been drawn from: Young, R. J. (2003). *Environmental enrichment for captive animals*. Oxford: Blackwell.

#### Slide 2:

This module deals with the principles of environmental enrichment, which we will refer to in this lecture as 'EE'.

First we will discuss how EE was developed in response to observing the stress experienced by animals in captivity. We will define EE and consider the general benefits and limitations of enriching the environment of captive animals.

Then we will look at how to provide effective EE, starting with general principles and then considering their application for different groups of confined animals.

#### Slide 3:

We start with the effects of confinement on animals.

Typical confinement is potentially stressful for any species, whether domesticated or not. For animals such as zoo species, circus animals and some exotic pets who are either wild-caught or not fully domesticated, captivity may be particularly stressful.

However, in all cases, confinement creates stress in animals because it has generally been designed without their needs in mind. Housing and restraints etc. have been designed for human safety, efficiency, ease of animal oversight and care, and other largely logistical benefits. This means that confinement has typically tended to involve environments that are barren or impoverished when looked at from the animals' perspective.

Such environments create a number of stressors for the animals, as listed on the slide. They are:

- Lack of sensory stimuli that are important to the species and which the species is adapted to respond to; for example, particular light–dark cycles, sounds, smells and substrates.
- Restrictions in movement, feeding and other behavioural opportunities so that the species' most typical behavioural adaptations cannot be expressed.
- Abnormal social groups and lack of area to retreat to, e.g. pigs and other farm species tend to be kept in uniform groups based on age, which may give rise to aggression; barn-raised laying hens are often kept in groups of thousands which may predispose them to cannibalism and aggression. In both cases, affected animals may lack an area to retreat to in order to avoid engaging in aggressive behaviour. Another form of abnormal social group occurs at lairages at markets and abattoirs, when unfamiliar animals may be mixed together. On farms, the stress caused by mixing of animals at weaning is associated with reduced immunity and increased infectious disease.
- Forced proximity to humans: this is a particular concern with non-domesticated and wild-caught species kept in zoos, circuses and homes where there is no area for the animal to retreat to away from humans.
- Too little environmental control: in impoverished environments animals do not have the stimuli or substrates to make decisions and enact choices. Such cognitive and behavioural processes are a natural part of an animal's agency as a sentient individual from species that have evolved to engage with and adapt to their environment.
- Predictability vs. unpredictability:

Predictability has value where animals lack environmental stimuli and control, e.g. they cannot forage for food when they feel hungry. It makes human labour easier, e.g. feeding animals in a certain way, at certain times, or turning the lights on and off at a certain time. Predictability may also reflect our modern human preferences to know what the future holds for us.

However, unpredictable feeding regimes have been beneficial in a range of species. For example, a study conducted on captive chimpanzees demonstrated that an unpredictable feeding regime increased the chimpanzees' activity and increased species-appropriate behaviour compared with a predictable feeding regime.

Note that predictability may also be a feature of the care of companion animals. While those animals may have environmental control, they may not be prepared for the unpredictability of being hospitalised or surrendered to a shelter. Research comparing stress levels in feral cats and owned cats at an animal shelter indicated lower levels of stress in the feral cats, perhaps because they were more used to novelty and unpredictability than were domestic cats.

## Slide 4:

As noted, all the negative features of typical confinement situations increase the risk of animals suffering from frustration and boredom, as outlined on this slide.

In particular, too much predictability in a barren environment predisposes animals to show a high prevalence of behaviours that are not common in their wild counterparts or in a naturalistic, less confined setting. This is probably in part because animals are adapted to respond to passing novelty and negative stressors that may cause them to move to new locales, even temporarily, and to explore. Lacking such opportunities and the opportunity to engage in a range of behaviours that may provide pleasure seems to create a combination of boredom and frustration.

- Boredom occurs when there is a lack of general behavioural opportunity such as novelty or new space to explore.
- Frustration occurs when important motivations cannot be acted on, e.g. in hens, nesting before laying an egg; in horses, moving about to forage.
- Lack of behavioural opportunity also reduces the possibility of animals experiencing positive emotions such as pleasure from new sensory experiences caused by exploring novel objects, smells or substrates, and pleasure from playing.
- Because confinement predisposes animals to such emotional imbalances, confined animals may tend to show a reduced behavioural repertoire compared to their counterparts in a natural environment, or a more complex one that accommodates more species-typical adaptations.

The reduced behavioural repertoire may include lack of behavioural variety, with either frequent occurrences of certain behaviours or relatively large amounts of time spent in performing them. The most common behaviours reported are:

- abnormal repetitive behaviours (stereotypies) which are often locomotory or oral
- aggressive behaviours, e.g. fighting
- passive behaviours that are consistent with a very depressed mental state.

It is the occurrence of such behaviours that led to the idea of environmental enrichment. Research into this is ongoing, but some principles are emerging.

## Slide 5:

You may recall from Module 7 that stereotypies are repetitive behaviours that are constant in form and that serve no obvious purpose in the context in which they are performed. Stereotypies may have complex motivations but they can often be linked to some normal activity (such as foraging) that is frustrated in a particular environment or was the case in an earlier one.

If the frustration occurred during a critical period of development, the result may be a permanent change in brain functioning which makes the behaviour hard to alter even with enrichment. For example, zoo elephants that have been previously confined in a small enclosure for a significant duration of time may continue to rock even when offered access to plenty of space and a stimulating environment.

It is not clear why this is so. It may be because of some earlier neurobiological change whereby the stereotypy has become the animal's non-specific response to any degree of arousal, or it may also be because of endorphin release, i.e. performing the stereotypy has become a rewarding experience.

Stereotypic behaviour not only indicates poor welfare but can also cause poor welfare. For example, some stereotypies result in physical harm, such as mouth sores from bar-biting, or weight loss, sores and other tissue injuries due to increased locomotory activity.

### Slide 6:

This slide shows some examples of stereotypies in captive animals and their probable causes.

- Horses develop a characteristic behaviour called 'crib-biting' whereby they rest their top teeth on a solid horizontal surface and perform swallowing movements. This can lead to marked overdevelopment of neck muscles and weight loss. It is likely that the behaviour results from a combination of the animals' genetic predisposition and lack of opportunities to forage. The behaviour is not seen in horses living wild, and seems to develop when horses are kept in stalls where they cannot move around or select from various forages.
- Many captive carnivores, such as polar bears, develop locomotory stereotypies, e.g. pacing. It seems likely that these behaviours are due to the enclosure being too small to permit the normal ranging activity that the animals perform as part of their food-seeking behaviour.
- Caged rodents commonly show stereotypies too, such as bar-biting in hamsters and gerbils – a behaviour that you see in laboratory animals and pets alike.

### Slide 7:

First, a definition: environmental enrichment is the alteration of the environment of captive animals in order to increase their behavioural diversity with the aim of improving their welfare.

Specifically, this includes:

- providing opportunities to show species-typical behaviour that is important to the animal
- increasing their ability to cope with the challenges of confinement such as relatively high stocking density compared to the wild, or interaction with handlers for the taking of blood, or the presence of visitors in zoos

- reducing the frequency of abnormal behaviours such as repetitive behaviours (stereotypies), aggression, or passivity
- increasing interaction with the environment.

More recently, academics have also noted the importance of EE for maximising welfare by promoting positive emotions. For example, species such as rats and pigs are naturally curious and exploratory behaviour is thought to induce a positive emotional state for them. It follows that providing pigs with rooting substrates and rats with housing that incorporates tunnels that can be changed seems to be important for their wellbeing.

Overall, then, EE is concerned with increasing animals' environmental control and it is a legal requirement for some categories of animals in some countries. For example, since March 2009, EU member countries have been legally bound to provide certain "minimum standards for the protection of pigs". In particular, the EU Directive states: "pigs must have permanent access to a sufficient quantity of material to enable proper investigation and manipulation activities, such as straw, hay, wood, sawdust, mushroom compost, peat or a mixture of such, which does not compromise the health of the animals" (EU, 2009).

Pigs are highly motivated to root, both to explore their environment and to obtain food. The EU's directive is an attempt to give farmed pigs the possibility of expressing their rooting behaviours, i.e. to provide them with some environmental control.

## Slide 8:

There is scientific evidence that EE improves welfare in each of the three welfare domains, i.e. animals' physical functioning, their mental state/feelings and the performance of behaviours that are important to them.

Examples in terms of physical functioning are as follows:

- keeping sows in pens or outside allows them to exercise their limbs which strengthens their musculoskeletal system and reduces the likelihood of them falling to the ground as they lie down and killing their piglets
- providing variety in the diet of growing calves and allowing them to select what they eat has been found to be associated with a faster growth rate and lower feed costs than if they are all fed a complete mixed diet
- environmental complexity is associated with improved learning ability in laboratory rats
- preliminary research indicates that keeping farm animals in stable social groups of appropriate size and make-up enhances their ability to resist infectious diseases and increases their productivity
- EE may increase breeding success of some zoo species
- increasing the amount of time each day that horses' have access to pasture or forage can reduce the occurrence of gastric ulceration and associated crib-biting.

Neurological evidence in rats and mice has shown improved cognition, spatial memory, increased brain weight and size after EE.

Physiological evidence included increased immune response (rats, monkeys); increased body weight although the amount fed was not changed (mice, goats); reduction in stomach ulcers (rats).

## Slide 9:

Examples of how EE benefits an animal's mental state/feelings include the following.

- Providing a more complex environment that is appropriate to the species reduces the occurrence of behaviours that are thought to reflect frustration or boredom. For example, providing growing pigs with chains to chew on or a rooting substrate can reduce aggression and increase exploratory behaviour.
- Transporting horses with a mirror (or a companion) rather than alone is associated with fewer behavioural signs of stress.
- It is likely that social support from known conspecifics enhances animals' ability to adapt to novelty, whether in transport, housing, etc.
- EE also improves learning ability in rats, and has been found to increase the utilisation of space by some zoo animal species, which would be much less likely to take place if the animals were in a negative emotional state. So EE seems to be beneficial for the 'feelings' aspects of welfare.
- EE manifestly increases animals' welfare in terms of them performing species-typical behaviours that are important to them. The classic example of this was research done on intensively reared pigs in the 1980s, whereby the sows were moved to a semi-wild outdoor enclosure, having been confined in gestation crates until then and having no experience of outdoor living. They soon showed a very wide and varied range of behaviours, typical of wild pigs, including rooting, and creating a nest before farrowing.

EE also benefits people.

- Zoo animals in enriched environments tend to use the space more, and if the enrichment is naturalistic the public like this too, which may then increase the both the educational value and popularity of the zoo.
- Care-givers also like to use EE because when the animals respond positively to EE they may also become easier to handle, ostensibly less stressed, and more likely to interact with the care-givers.

## Slide 10:

While we have seen that EE has many potential benefits for animal welfare, please note that it is not always effective for all animals in all situations. In particular, it does not always prevent the development of abnormal repetitive behaviours that are common in zoo animals. Its success is likely to depend on factors such as:

- the animal's early experience: if that is negative – e.g. rearing in isolation – there may be permanent changes in brain function that are similar to those found in autism. For such animals, EE may not affect their performance of abnormal repetitive behaviours
- the self-reward of endorphins released when the animal performs the abnormal behaviour
- individual animals' genetics and individuality
- visitors often cause stress to zoo animals, which could also limit the positive effects of EE.

However, it is important to allow plenty of time for EE to have an effect and not to abandon it because only limited behavioural change is observed in the early days or weeks.

Cost considerations: it is true that providing animals with, for example, bedding or a rooting substrate in housing (instead of bare floors) or with furniture that needs to be cleaned all adds extra time to the overall cost of keeping animals. However, care-givers can gain greater satisfaction from their role if they see animals showing a wider behavioural repertoire and having more opportunities for interaction.

Nevertheless, the fact that EE cannot guarantee to eliminate or reduce the performance of abnormal behaviours may lead facilities not to commit themselves to it at all, as the outlay may not bring a return. However, that tends to mean that many animals whose behaviours are not so ingrained and who would benefit from a more complex enriched environment do not receive it. It is also important to keep in mind that reducing or stopping stereotypic behaviours is not the only goal of EE; for example, if the activity time-budget of the captive animals is improved to match their wild counterparts, this is also an achievement and an indication of improved welfare. Furthermore, EE may improve the mental wellbeing of an individual, even if some stereotypic behaviour is still present.

Most EE can be added at minimal cost, if carefully thought-out. In zoos, the relatively small numbers of each species concerned means that the cost is relatively low, whereas on farms some forms of EE are less feasible due to the higher number of animals being kept, increased economic constraints and limitations associated with pre-existing facilities and resources. However, if EE is considered when an animal housing facility is being designed and built, the overall cost is relatively low.

Where the cost of labour is a concern (e.g. animal shelters cannot afford to hire staff simply to spend time with the animals), volunteers might be used, or methods of EE might be employed that rely on design rather than human contact.

The use of EE for laboratory animals may interfere with the performance of certain studies, e.g. those where social animals need to be fed exact amounts of food and so must be housed singly. Researchers are also concerned that EE may introduce too much variability into experimental data. However, there are a number of studies which show that by allowing laboratory animals to express a range of species-typical behaviours through EE, the results of any study are more likely to be valid and more easily generalised to non-laboratory settings. The following slide gives some examples of this.

### Slide 11:

Laboratory rats and mice are commonly used to test the effect of anti-depressant and anti-anxiety drugs that have the potential to treat depression and anxiety in humans. Two commonly used tests involve swimming, and a maze.

For ease of handling the animals are often housed in un-enriched cages. However, there is increasing evidence that this may affect the resulting data. For example:

If the rats and mice are raised in a barren environment, by mothers who were not handled much, this can affect their cognitive processes. It can also affect the development of their vision. This may in turn affect how they respond when they are used in the swimming and the maze tests.

Studies of standard handling vs. additional playful and gentle handling, suggest that these human-animal factors strongly affect rodents' ability to perform specific behavioural tests.

We shall now move on to consider how to provide effective EE for different species.

### Slide 12:

Broadly, there are two schools of thought about how to provide EE.

The first is the *naturalistic* approach, where the captive environment is like the one that the species has in the wild. This is common in zoos where there are only a few animals of any one species, and research indicates that members of the public believe that animals are happier in a naturalistic setting. This may be of particular consideration if the animals are being bred for eventual reintroduction into the wild.

The second approach to EE is the *behavioural* approach. Here, the captive environment may be very artificial but it allows the animal to satisfy his or her behavioural needs. This is common in farm animals because it is not economical to provide huge, naturalistic spaces on farms.

The general principles that underpin both approaches to EE are as listed on the slide, and discussed in more detail on this and the next slide.

The first general principle requires you to know the *primary behaviours* of the species under free-living or wild conditions. Consider all possible behaviours of the species, and how these are demonstrated, and then design EE accordingly. The list of behaviours will be long and may



include marking, social avoidance, social interaction, exploration, drinking, foraging, giving birth, etc. However, the species will prioritise these activities when living in the wild and this should be taken into consideration.

### Slide 13:

The second general principle is *space*. It is not clear exactly how much space each captive species needs. For example, large carnivorous mammals such as polar bears and other bears need such a large territory that it is impossible to satisfy this need in captivity, no matter how much EE we use.

Therefore it is probable that we should never keep these species in zoos or other confinement at all. In contrast, although stabled horses have very little space compared to when they are out at pasture, they may not show behavioural or other signs of stress so long as they have access to pasture for several hours every day, and access to forage as well.

Meanwhile, the minimum space required for different farm species varies from country to country, depending in part on the extent to which their scientists value behavioural evidence over physiological evidence. This variation in minimum standards, coupled with market forces, may mean that some farmers are unable to provide enough space for any EE.

The third principle of EE is *environmental control*. Control is one behavioural need which has been argued to be fundamental in any species environment. Animals have an innate need for control over their environment, which makes control a key aspect to most good enrichment. Animals cannot passively receive environmental events; they must be able to act on their environment and consequences must result from their actions. This must also be in line with the need to meet particular species-typical behaviours. The EE must be very well thought-out and based on a thorough knowledge of the species concerned. An example of this is in laboratory mice and rats. It is ideal to provide nesting material for rats and mice in captivity as this allows them to build burrows and nests which they would do in the wild, as they are both a typical prey species.

The fourth principle of effective EE is *safety*. Furniture and materials must be made of non-toxic material, clearly visible to the animals so they do not injure themselves by falling over them: animals must not be able to break furniture or, if they do break it, the pieces should not pose any danger. All EE must be easy to clean and disinfect and, if electronic, it must be earthed.

The fifth principle stipulates that effective EE must be *used* by the animals. Any EE device must therefore be tested for safety and to check that the animal uses it. In groups of animals, some EE such as foraging enrichment may cause aggression or the monopolisation of resources. To avoid this, there must be enough devices for the whole group. Another consideration is the abilities of the individuals in the group. If there are older animals with arthritis, they may be unable to manipulate a feeding device and this may cause distress and reduce their food intake. Therefore, testing and close observation of the animals is essential when an EE device is first developed.

It is also important that the EE satisfies animals' preferences. This requires research, to see what animals prefer when they are given a choice. However, the preferences that animals show in research do not tell us if animals suffer through not having their preferences satisfied. Nevertheless, providing animals with what research tells us they want uses the best available knowledge. As that develops, we can always change our approach as best we can.

Finally, it is important that the EE is *economical* and *practical*, particularly in commercial operations such as farming.

### Slide 14:

So how can we be sure that our EE is effective, in addition to whether the animal is using it or not?

The effectiveness of EE can be measured through the reduced occurrence of abnormal behaviours and the increased performance of positive behaviour and species-typical behaviours such as exploration and play, as well as maximising health and productivity. It is important to compare an increase in 'positive' behaviours with the activity time- budget of individuals of that species in the wild; for example, a dramatic increase in self-grooming in primates could be an indicator of stress and anxiety and may even result in physical harm if over-grooming occurs.

An increase in activity should never be used alone as an indicator of improved welfare, and the type of behaviour must be assessed fully. Increased activity in the form of pacing would not be a positive result but a general increase in activity might be, providing this consists of species-typical behaviours. It is also important to consider the impact of the enrichment throughout the whole day rather than simply during interactions with it. For example, a good enrichment device will have a lasting effect on the animal's behaviour beyond the time he or she spends interacting with the device.

### Slide 15:

The five main types of EE can be categorised, as shown on the slide. These categories overlap. For example, housing has sensory elements and includes occupational elements (the space to exercise, socialise, play and forage for food). The picture shows two dogs playing tug-of-war. The rope toy provides the dogs with occupational enrichment, social enrichment and sensory enrichment.

We shall look at general examples of some of these types of EE in the next few slides, and then move on to consider EE for the four main groups of confined animals – farm, companion, laboratory and zoo animals.

In some countries, companion animals are wild-caught exotics (either sold in pet shops which have imported the animals, or caught and kept locally). Depending on the species, trading in or keeping such animals may be illegal under national or international law. However, as a veterinarian, you may be faced with advising either the owner or the confiscating authority on the best environment for the animals. The principles we will cover next will provide you with some general starting points in such cases.

## Slide 16:

We start with housing design. We are interested in a structure and layout that either mimics the animal's natural environment or provides similar stimuli and opportunities. A good starting point is the type of medium that the animal lives in or on, e.g. water, land or air or a combination of these. Does it live in trees but not climb? Or does it live in trees and climb?

Flooring: does the animal change colour to blend with his or her surroundings? Here the species might need different flooring types at different times of year because, in the wild, that is what animals will encounter due to migration, rainy seasons, etc. The properties of the flooring used are more important than the material itself, e.g. thermal properties and ease of cleaning.

Note also that cleaning will remove the animals' scent markings and this may be very stressful. More research is needed to see if animals in long-stay facilities such as veterinary hospitals or shelters need to have their kennels disinfected every day: it is unlikely to help their physical state and may make their condition worse because it causes stress by removing their own scent.

Another consideration with flooring is that the material must be safe, e.g. chips of tree bark might carry *Aspergillus* or other moulds that could be dangerous to the animals' health. Also, in a dry climate certain types of floor might produce too much dust.

## Slide 17:

The space between floor and ceiling should permit all normal alertness and exploratory behaviours. For example:

- wild-caught animals in particular may not have enough room to stand upright or move about
- both farmed and domestic rabbits are often kept in cages that do not allow them to stand on their hind legs and take some hops
- many pet birds are often kept in narrow, tower-like cages where they cannot fly horizontally, in the way they would if free-living.

The housing should permit species-typical exercise patterns and encourage locomotion – by scattering food throughout the enclosure and providing several water outlets, the animals can move or climb (as appropriate) to get to them.

Also consider light patterns and noise levels from outside. Many animal facilities have a practice of playing the radio constantly in the housing area. Note that there has been little research on the benefit of playing the radio to captive animals, and it may be stressful. Some frequencies of sound can be stressful or even damaging to some species. Consequently, EE experts recommend that you do not play the radio, especially to undomesticated species, unless there is scientific evidence that it is beneficial.

## Slide 18:

The furniture and any toys or novel objects must be chosen with knowledge of the species concerned and the individuals too.

Note that toys are objects that animals play with, and that simply interacting with an object is not play. For example, it is unlikely that the bells placed within play balls for cats stimulate play behaviour – it is much more likely to be the movement of the ball.

This means toys should be designed to stimulate specific behaviour patterns. Those patterns may be social (e.g. tug-of-war between two dogs) or solitary (e.g. a cat chasing a ping-pong ball). In either case, the animal also gains environmental control.

Note also that not all animals will enjoy all toys – there may be individual differences and breed differences. It is important to get to know the preferences of each individual to ensure he or she is provided with toys that are stimulating. Also, play is typically a juvenile behaviour in many species, although it may be retained into adulthood, especially when daily living is not taken up with meeting basic needs such as eating and sleeping.

For example, when captive polar bears are given large balls, they shake them up and down in the water. It is likely that such play behaviours in these carnivores help with the development of the motor skills needed to catch or kill prey.

Toys may help reduce fear of novelty in animals who have not been used to a changing captive environment, and so have lost the expectation of change and the ability to adapt automatically to change. Many animals may therefore show avoidance or fear when a toy is first introduced, but they will then explore it, and remember its function.

They may also get so used to the toy that it does not stimulate their interest after a while, and so it is important to vary the toys. If the animal(s) tire of the enrichment device, the enrichment will become ineffective.

Do not provide the toys all together; occasionally, it may be appropriate to withhold toys for a day. It is best practice to vary the toys from day to day so that the animal only encounters a particular one once every two weeks. Because it may be difficult to provide at least 14 toys that are different from each other, but relevant to the animal, novel objects can be supplied on some days instead.

*Novel objects* are objects that are new to the animal and provoke some exploratory behaviour, but do not stimulate play behaviour (e.g. a paper bag for cats, cardboard box for puppies).

These approaches all help the animal to remain interested in toys and to benefit from them.

Furniture and toys can both promote exercise, e.g. bars for animals to climb on, interactive play with chasing.

## Slide 19:

Even if space is limited, the furniture in it can still provide ample enrichment if you design it with specific behaviours in mind. For example, a nest or box for sleeping in (e.g. hamsters); scratching posts (e.g. brushes in cow stalls). Consider all possible behaviours of a species, and how the behaviour is demonstrated, and then design furniture accordingly. The behaviour list will be long and may include diverse range of activities such as social, feeding or resting behaviours.

For wild-caught species kept as pets, there may be little knowledge of the important behaviours, but researching their natural history may help you with this.

It is very important for zoo animals, in particular, to have a place where individuals can retreat to and hide from the presence of zoo visitors and other group members. It is important that this place is big enough for all individuals, and that they can come and go as they please.

You may also need to prioritise the furniture needs in decreasing order of importance to animals in the wild. That is:

1. life-sustaining – feeding, drinking, sheltering
2. health-sustaining – exercise (e.g. climbing areas), avoidance of others (e.g. hiding boxes, visual barriers), maintenance of territory (posts for scent-marking).
3. comfort-sustaining – toys, novel objects, scratching posts.

Furniture should be safe and easy to clean. It should also be moveable and, where possible, its structure should be varied from time to time. Also, consider every aspect of the behaviour that the furniture is designed for, to ensure that it is maximally beneficial from the animal's point of view. For example, primates in the wild climb on trees that have (a) branches of different thickness, and (b) leaves to provide cover. If we simply provide captive primates with a metal climbing frame that has uniformly thick bars and no cover, the EE is not adequate.

We noted earlier that environments that are too predictable are not good for animal welfare because they do not provide enough stimulation. In addition, such environments mean that furniture and toys when first introduced may stress the animals because they are novel. However, by introducing complexity and variety, you allow the animals to experience some environmental control and adaptability, which may then help them to adapt to bigger changes, such as transport to another facility.

## Slide 20:

Next we move to the category of nutritional EE, which relates to how food is provided to captive animals. Traditionally, food is given to captive animals as a complete meal (e.g. pelleted food) and presentation may not allow for the animal's natural food-seeking behaviour.

When we consider both wild and domesticated species, animals acquire their food in a wide range of ways.

First, carnivores generally do not hunt and kill until they start to feel hunger – they eat to remove feelings of hunger. The way in which they catch their prey may vary. Also, note that some animals eat fish or insects rather than land-living vertebrates.

In contrast, herbivores can digest plant matter, which has relatively low energetic value, so they eat for large portions of the day, in order to prevent hunger arising rather in response to it.

As with carnivores, nutritional EE for herbivores must include consideration of how animals feed in the wild.

In all cases, variety may be more important than has been previously realised, i.e. allowing individuals to select from a variety of forages or feeds, as they are naturally adapted to best meet their individual needs for macronutrients, rather than having a complete feed with only one balance of nutrients. For example, research on growing steers and calves suggests that they may grow more cost-effectively when they have access to a choice of forages, rather than when they are given a complete diet based on concentrates and one type of forage.

Another point to consider is how often captive animals are presented with food. For example, all species of primate in the wild spend a large proportion of the day foraging, and it is important to promote this behaviour in captive species. Some zoos have incorporated scatter feeds, which encourage individuals to forage.

In the wild a large proportion of the time animals spend eating involves the processing and manipulation of food. They are often deprived of this in captivity, as food is provided in pellet form or chopped up and already processed. Research has shown this to cause frustration and boredom in captive animals, and so food should be provided in its whole form wherever possible, e.g. fruit with the skin on and not chopped, nuts with shells on and meat with fur on. This allows animals to spend more time on processing their food, as they would in the wild. There must be consideration for the abilities of the individuals in the group to ensure that they can all feed without difficulty.

## Slide 21:

We now move to social enrichment. Again, you need to know the natural social tendencies of the species concerned to provide effective EE. As humans we may make mistakes here as we are naturally social and may assume that other animals are too when they are not.

**Asocial species:** many zoos house *asocial* species in groups (for examples, bears or large feline species like tigers or leopards), partly because it looks better to the public to see animals in groups. However, this may in fact be very stressful for animals that are an asocial species designed for solitary living. More research is needed.

**Social species:** social species should never be housed individually because they often suffer chronic stress, e.g. separation anxiety in dogs kept on their own. Mirrors may help in some social species housed alone (e.g. horses), but more research is needed on the usefulness of this. Alternatively, there may be visual or auditory contact with the individuals in the adjacent pens. However, because animals are not allowed to choose which animals are on each side of them, this may be stressful too: the barriers prevent resolution of social problems, and the

animals can never really get away from each other. An extreme example of this is sows who are tethered in gestation stalls.

Where social domestic animals are housed individually, or left without social contact for much of the day (e.g. pet dogs), daily training and handling based on positive rewards provides predictable and rewarding social contact.

For captive animals in zoos, for instance, multi-species environments have proven to be successful.

When group-housing, it is necessary to take great care with the structure of social groups. For example, in the wild, pigs live in groups and juveniles live with adult sows and their new litters. However, on farms it has been common to house juvenile pigs without any older pigs, and this can make the group unstable and cause high levels of aggression.

Group sizes should not be too large, as this too may result in aggression: the individual animals cannot remember all the others in the group and so constantly meet 'strangers'. This problem occurs in laying hens who are kept in barns.

It is especially important to keep young with their mothers for the appropriate period so that they learn acceptable social behaviour; if they are weaned too early they are more likely to have difficulty interacting with other conspecifics. This may be particularly important in zoo animals.

**Opportunities to get away from the others:** it is important to provide hiding areas to enable individuals to escape from others and from human exposure.

The absence of escape areas in group-housed pigs may contribute to problems with aggression, as it allows individuals to be picked on repeatedly.

In the case of exposure to humans, zoo species may find human visitors distressing, especially if the visitors are intrusive, e.g. shouting or throwing things at the animals or the enclosure, and the animals cannot escape.

## Slide 22:

In the wild, animals are exposed to a great variety of constantly changing external stimuli. Sensory EE does not have to replicate all of these, and some research is being carried out on the benefits to captive animals of natural and artificial stimuli, particularly auditory, olfactory and visual stimuli. Results are not clear-cut, as other factors such as species, sex, age and housing affect efficacy.

However, the general principle of sensory EE is that it should target the dominant sense for the species concerned, using stimuli that do not cause negative stress. Again, some of these may not occur in the wild at all, e.g. certain types of music.

Some forms of visual enrichment, for example a painting of the species' natural environment at the back of the enclosure, is generally not enriching, and is only there to please the visitors.

### Slide 23:

We shall now move on to particular types of EE for different animal management systems.

We will start with captive wildlife. EE for long-term captive wildlife needs to differ from that for short-term captive wildlife. That is, wild animals who are only held for a short time should not be allowed to become dependent on a captive environment. Instead, the captive environment should be as close as possible to their natural wild environment.

Animals who are held captive for a long time should have salient naturalistic and behavioural enrichment following the principles we have just outlined. The focus is on providing positive salient features that animals are adapted to in the wild, while reducing features found by the animal in the wild that would cause poor welfare. An obvious example of the latter would be ensuring that prey species are not at risk of predation while in captivity.

### Slide 24:

Moving on to the use of EE for farm animals, we start with laying hens. Extensive research indicates that they have strong motivations to roost at night, to dust-bathe (groom), and to nest when they lay eggs. The traditional barren 'battery' cage has neither the space nor the furniture to permit any of these highly motivated behaviours. Housing hens in large groups in barns, with perches, allows them to roost.

However, if the birds are not familiar with perches from a young age, they are unable to land properly when they fly up onto the bars and many of them fracture their keel bone, partly because their high egg production predisposes them to osteomalacia. This problem may be prevented by ensuring that hens are exposed to perches when they are young chickens.

An alternative to a barren cage is an enriched cage which provides a dust bath, a nest area and a perch. The nest area slopes so the eggs that are laid roll out into a channel at the front and are easy to collect. The enriched cage still holds four or five birds, but the quality of the confined space is much higher than in a battery cage. Nevertheless, they do not have the freedom of movement that hens kept outside do (see photo on the left).

Of course, the ideal system for laying hens is the free-range, organic system, in which hens can roam indoors and outdoors freely. The indoor environment should include perches and nesting boxes and substrates for hens to dust-bathe in whilst the outdoor environment should have plenty of leaf cover and shrubbery to incentivise the hens to venture outdoors and utilise this space.

Module 11 reviews the welfare of laying hens in more detail.



## Slide 25:

Cattle like to scratch and rub their heads and bodies against rough surfaces. Anecdotal evidence and research indicate that when rubbing devices are provided – such as the heads of brooms, carefully secured – dairy cows will use them regularly.

An exercise yard is especially important for dairy cows who are kept in tie-stalls. The free-stall system allows the cows to move around, but tie-stalls do not. Cows who are kept in tie-stalls all winter, or during other periods when there is no pasture available, tend to develop muscle weakness and are more likely to slip. By giving the cows access to an exercise yard every day, this problem is avoided. Also, the yard will give the cows some opportunity for environmental control and social interaction, including grooming. However, the exercise yard must be kept clean so that it does not become slippery.

Feeding space is key, as herd animals, cattle tend to eat as a group. Therefore, their housing should permit all the cows to eat at the same time (for example, a circular forage feeder might cause aggression and distress if there are more cows than there are spaces at the feeder).

## Slide 26:

For pigs, rooting and exploring are important behaviours at all ages for the enjoyment of novelty and for seeking food. In many commercial systems, baby piglets are weaned at 21 days, much earlier than they would naturally be weaned. They are moved to sterile pens that lack suitable material for them to root in. This environment, coupled with the lack of an udder to suckle from, may predispose them to bite each other's tails as they grow up, leading to tail or spinal abscesses and sometimes paralysis.

Sows are not fed to appetite for reasons of health and economics. When they are housed in gestation crates they do not have the opportunity to satisfy the appetitive component of their motivation to eat, i.e. they cannot move around and root in a substrate, looking for food. This is likely to be the reason why some sows develop bar-biting behaviour (shown on the slide); as a substitute behaviour for rooting, manipulating or chewing.

Pigs also need social contact. The stalls shown in the picture limit social contact; neither do the animals have any choice about who they are next to. They have no opportunity to establish a social structure.

When sows are close to parturition, they are moved to farrowing crates. However, generally, they are not given the opportunity to build a nest. The drive to nest-build is a very strong response to the hormonal changes leading to parturition.

The three most common types of enriched housing for pigs are listed on this slide and discussed on the following slide.

## Slide 27:

Alternative enriched housing systems include outdoor free-range systems and indoor socially natural systems such as the family pen, illustrated in the picture.

These systems provide the most complex environment and maximise the performance of behaviours that are important to the pigs; therefore, it is assumed, they maximise positive emotions. Productivity is good, but these systems are the least practical and require relatively high labour and set-up costs.

Next is the straw-based system: here pigs may not be kept in socially natural groups, but housing is based on straw bedding, which enables rooting and manipulation.

These systems are relatively inexpensive and are associated with fewer negative welfare effects, such as fighting and disease, even if they do not maximise the opportunities for a wide range of species-typical behaviours.

The third system of enriched housing – point enrichment – may have typical barren pens, but with the addition of objects that capture and sustain the attention of pigs.

These additions may be a rack of straw (rather than uniform straw bedding), chains, car tyres, balls, etc. An important aspect is that pigs will tire of each object, so rotation is important. Also, competition may lead to fighting, and it is not yet clear what the appropriate ratio is of pigs to objects of each type. Also, if the object is transferred into the pigs' lying or dunging areas within the pen, the pigs may no longer use them.

Overall, therefore, straw-based systems seems to offer the most effective enrichment for pigs based on criteria of cost; however, in terms of animal welfare the best system for pigs is that of the free-range outdoor one, where they can go outside and farrow in huts on their range.

## Slide 28:

In the case of stabled horses EE could include:

- companionship – another horse/other animal in the stable, or a mirror
- visual contact with other horses +/- tactile contact
- access to a variety of forage
- access to pasture for at least six hours per day.

## Slide 29:

Next we will consider enrichment for psittacine birds. Their primary motivations are to forage, socialise with other birds, groom/self-preen and sleep/rest.

Foraging: in the wild, Costa Rican Amazon parrots spend ~6 hours a day foraging. In contrast, captive orange-winged Amazon parrots spend little time attempting to forage; this is likely to be true of captive parrots generally because, in captivity, they are often kept in isolation, with little EE. Some ways to increase their foraging opportunities are:

- place food in crumpled paper
- tie food and hang it within the cage
- put the food in opaque dishes with a paper cover
- use a puzzle toy food dispenser.

Grooming/preening: the environment of many captive pet psittacines only supports grooming/preening and sleeping. This may be, in part, why excessive preening – feather-pecking – is so commonly seen in captive psittacines. The picture on the left shows a cockatoo with extensive feather-pecking. This behaviour may be reduced by increasing environmental complexity, with foraging opportunities as described above, and more varied environmental complexity (branches, swings, etc.).

Exploratory behaviour: parrots climb a lot, more than they fly, and need access to branches and perches. The picture on the right shows an African grey parrot in a cage with some climbing toys. However, parrots need a more complex enrichment than that – leafy branches of untreated wood are much preferable.

Given the complexity of the behaviour of psittacine birds, including budgerigars, it may be that we simply cannot provide adequately for their welfare even with environmental enrichment. That was the conclusion of a review by Engbretson in 2006.

## Slide 30:

Next we consider rabbits. Pet rabbits are often kept in very sterile conditions, as are laboratory rabbits, but generally meat rabbits are kept in pairs. In all three instances, however, the rabbits may be largely or constantly confined to cages that have wire floors and lack sufficient space for animals to assume their alert position of standing upright on their hind legs, or for animals to take a couple of paces within their cage.

The pictures show EE for rabbits in a rescue shelter. In the left-hand picture, note the following elements of EE.

Social EE: there are two rabbits in this cage. Note that adult males may fight when kept with other males or, perhaps, females. Mixed-sex pairs should only be kept if one of the rabbits is neutered, to avoid unwanted young. Female rabbits usually do very well in same-sex pairs. Where males have to be kept alone because of problems with fighting, the cage should be very enriched.

Toys/novelty: In the same image, see the rope with the bell and fake food on the right of the cage. Some rabbits make a game of hitting the object, but novel objects are usually moved within the cage from one location to another over time in order to change the environment for the rabbits. Straw whisk brooms may be mounted to the sides of all the cages, and are chewed (sticks of untreated wood would also do). Balls are another toy which can be moved around the cage for stimulation.

Shelf: the cage pictured on the left is quite small. The shelf allows the rabbits to jump up, and have more floor space; underneath and to the left is a sleeping area. The cage is just big enough to allow rabbits to stand on their back legs to explore. In some cages there is a wooden 'house' the rabbits can retreat into, depending on their temperament.

Exercise: all rabbits need to get out of their cages every day, to exercise in a larger penned off area (pictured on the right) or more freely on the floor of the room where they are housed.

Litter tray: rabbits can be litter-trained. Many respond well to being allowed out of their cage to roam freely in the house; they use the litter tray as they need to.

Movement: the general rule about the size of a rabbit's cage is that there should be enough room for the rabbit to stand and take one hop forward. The cage on the left and the pen on the right are both tall enough to allow the rabbits to stand up. The cage on the right is also big enough to enable the rabbits to hop forward.

Research on the welfare of meat rabbits is especially concerned with issues of cost, labour, practicality and effects on production and reproduction.

However, research in Hungary has shown that, at both lower and higher stocking densities, the meat rabbits studied preferred cages that contained a mirror on one side. Rabbits housed alone also preferred the mirrored end. The authors concluded that the mirror might enhance welfare of both fattening meat rabbits and rabbits housed singly.

Larger pens would probably also benefit meat rabbits, but may not be feasible in most commercial farms. In the case of pet rabbits UK researchers compared the behavioural repertoire of rabbits when in the standard pen size (0.88 m<sup>2</sup>) and when in pens that provided two and four times that floor area (1.68 m<sup>2</sup>, and 3.35 m<sup>2</sup>). The researchers concluded that "Smaller pens lead to less activity and environmental interaction, and on moving to a larger pen there is an increase in activity of rabbits. [...] it appears that small pet rabbit enclosures, including many that are commercially available, would not provide enough space for rabbits, of all sizes, to adequately express a number of activities and may consequently threaten pet rabbit welfare." (Dixon et al., 2010)

## Slide 31:

Hamsters and gerbils are often kept as companion animals, as well as being used for laboratory research. It is the latter use that has given rise to research on enrichment. Important points from those analyses include those listed below.

### Hamsters

- Hamsters are solitary: they only contact other hamsters when they intend to mate, and are otherwise aggressive to each other. In the wild, they live 60 cm underground, at the end of tunnels 100–150 cm long, and digging and maintaining a tunnel seems to be important for captive hamsters.
- Their food should be given in open dishes, in different parts of the cage, or it can be scattered in the bedding after the cage has been cleaned. In this way, the hamster can find it and then take it to their den to eat.
- Research on laboratory hamsters suggests that they can live in groups, but only if there is enough EE. That is, social contact adds complexity to their environment when all their basic needs are fully met. So before housing hamsters in groups, they would first need to be provided with plenty of food and shelter so that they do not compete over these resources. For example if they are provided with plenty of sticks to chew on, shelves to rest on, cardboard shelters to hide in, and food scattered through the bedding this can reduce the risk of aggression if group housed, and therefore enable them to benefit from social contact rather than having to be kept in isolation. However, it is probably not wise to advise pet owners to try housing hamsters in groups unless they have a lot of experience of looking after hamsters.
- Chewing the cage bars: hamsters who chew the bars of their cage are probably very frustrated. Although some veterinary textbooks say this is normal behaviour, it is in fact a stereotypic behaviour and may be related to attempts to explore an otherwise barren environment. To reduce or prevent bar-chewing, the cage should contain a variety of tunnels (e.g. using the tubes from kitchen rolls), sloping up and down (but never so the animal can fall out of the top), and the direction of some of the tunnels can be changed periodically to provide novelty.
- Running wheel/ball: many hamsters like to run on a running wheel and, in research studies, they will work hard to gain access to a wheel. Wheel-running may be a stereotypy or simply self-rewarding; it is less likely if there is a lot of other EE, as described above.
- Many pet shops sell clear plastic balls into which hamsters can be placed, and shut in. The ball is then placed on the floor of the room and the hamster can move around the room within the ball. It is likely that these balls cause distress, because the hamster is fully exposed and unable to run away and hide. Hamsters are a prey species and do not naturally live in the open. Also, when the ball bangs into furniture this is probably stressful too. A large, well-enriched cage is almost certainly a much better way to meet their need to explore and exercise.

## Gerbils

- These are social animals who live in stable family groups. It is not clear if they are nocturnal or diurnal. They live in burrows which may have many entrances. Therefore, they should be housed in pairs (but not if the gerbils concerned have not been raised together, as they will fight and could kill each other).
- Gerbils are diggers, and like to do so in sand, so part of the cage should have a sandy area that is at least 5 cm deep. They will also use wood shavings or compacted peat. Digging is often stereotypic and very persistent and seems to be related to a strong motivation to build a burrow. If possible, they should be allowed to do so. Otherwise, their cage should have a darkened tunnel leading to a nest area or, better still, several tunnels. For example, use opaque plastic tubing, 5 cm wide, with a right-angled bend in it; one end should lead into a plastic nest box. The right-angled bend ensures that light cannot reach the box.
- Issues of wheel-running, bar-chewing and feeding are the same as for hamsters.

## Slide 32:

Rats and mice are widely used in laboratory research and are often kept as companion animals. Their use in research has given rise to studies on enrichment, notably preference testing whereby animals are allowed to choose between different aspects of an enrichment technique, so that we can better understand what is most important for the animals.

For example:

- in the case of rats, studies have examined which group size they will work hardest to gain access to, and whether they prefer an opaque tunnel leading to a shelter or a transparent tunnel
- in the case of mice, researchers have examined whether mice prefer a ready-made nesting box to nesting material whereby the mice can create their own nests.

There are still many subtle aspects of enrichment that we need to study more in order to understand what the best housing environment for these species is. A criticism of many of the standards and manuals that are published about EE for laboratory animals in different countries is that they have been too vague. For example, for laboratory rats:

- the minimum legal space allowance per animal is much smaller than the animals prefer, e.g. in US, the recommended space per rat is 60 sq cm, but they prefer at least 540 sq cm
- those minimum sizes appear sometimes to be recommended without adequate consideration of species-typical behaviours. For example: rats are nocturnal and avoid brightly lit areas, so a larger but brightly lit cage is generally aversive (notwithstanding the species' strong motivation to explore).

Keeping all these factors in mind, here are some recommendations for EE for rats and mice. It is not an exhaustive list and, as with other species, be aware that emerging research may give rise to different recommendations as you go through your professional lives.

1. The first point is that rats and mice are social animals and should not be housed alone, unless that is how they were reared – which is itself a welfare concern.
  - The ideal group size for caged rats is 6, and a range of 3 to 6 animals is recommended along with the associated larger cages. Generally, male rats can live together.
  - However, male mice fight when housed together unless they are litter mates who have been raised in the absence of females.
  - (If housed with females, one or other sex must be neutered otherwise the females will reproduce every 5 weeks (mice) or 10 weeks (rats))
2. The second point concerns environmental complexity: although there are many enrichment devices available commercially, especially for pet owners, not all have been thoroughly researched as to whether they provide key features for the species concerned.
  - Mice like to dig and to make their own nests. The nests in turn provide shelter and enhance thermoregulation. Nesting material is an essential resource and is more important than a ready-made nesting box.
  - At this time, nesting material also seems more important to caged mice than other EE such as climbing structures, or tunnels. This means mice should have a cage with a solid floor, containing manipulable nesting material such as cotton wool, paper tissue or wood shavings. The amount provided should be at least 2 grams per mouse (more with wood shavings), and the materials should be replaced every week for reasons of hygiene.
  - In the case of rats, an environment that stimulates exploration is very important and nesting material alone is not sufficient enrichment.
    - Rats dislike bright light and research indicates that they will use tunnels, but much prefer opaque ones to transparent ones.
    - Soft bedding of wood chips, with recycled paper as the nesting material work well. Cotton wool is probably too fine a material for nesting, and is not recommended.
    - Climbing is also important as part of rats' exploratory behaviour. You can adapt pigeon cages or other high cages for climbing, by using the lids of traditional cages as platforms at different levels, connected by ladders.
  - Note that many pet shops typically provide running wheels in the cages of pet rodents. Research over the last 100 years indicates that every species that is given a running wheel will run on it, often for considerable periods. This includes hens, horses, humans, rodents etc. It is still not entirely clear why animals do this. The behaviour may be a reflection of a generally barren caged environment and/or it may be self-reinforcing owing to release of endorphins, as is typical after sustained exercise.
  - While running can help to prevent obesity which is a problem with caged rodents, it is important that pet owners do not see a wheel on its own as adequate EE and that any additional EE is appropriate to the species in more subtle aspects as illustrated above.

### Slide 33:

We now move on to EE for dogs and cats. There is growing research on the welfare of companion dogs and cats, both in the home and during time spent in shelters and veterinary hospitals. Briefly, some main points are below.

- The majority of pet cats tend to be solitary. The tendency to be 'friendly' to humans depends on many factors including genetics: boldness seems to be inherited from the male, and if kittens are socialised to people at between two and twelve weeks of age, they generally grow up to be friendly and sociable.
- However, many cats appear not to be bred from friendly sires, or they may not have been properly socialised as kittens. These 'unfriendly' cats may find human contact or the company of other cats stressful unless they have areas to which they can escape without intrusion. These cats are best kept alone and their owners should not try to pet them too much as this may produce 'petting aggression', when the cat suddenly bites or growls at the owner, runs away, and then stops and grooms rapidly for a few seconds. The syndrome is normal behaviour – not a seizure – and it helps the cat to reduce his or her level of arousal to the point where he or she is no longer stressed.
- Perching area: cats also value height and three-dimensional space. They need to perform exploratory behaviours and find secure places from which to monitor their environment without anxiety. This is also important for helping them manage their stress when caged in shelters or at the veterinary hospital.
- Scratching areas: scratching against hard surfaces removes loose keratinised material from their front claws. Scratching is a species-typical behaviour and it appears to be strongly motivated. EE for this may be a scratching post – either a vertical or horizontal one – provided from kittenhood, so that they learn to use it, and not chairs!
- Litter trays are necessary if cats are not allowed outside. The tray should be in a quiet part of the house, and needs to be sufficiently large and deep to give the cat lots of room and to enable the animal to bury stools. The general rule is one tray per cat, plus one more. Anecdotal evidence suggests that the traditional shallow, small pans are inadequate for many cats and may predispose cats to house-soiling, and that many cats may need litter trays that are double that size and twice as deep.

### Slide 34:

Kennelled cats may be group-housed, if they are disease-free, so long as there are areas where individuals can avoid each other. This allows cats to choose how much social contact they have.

In Canada, the British Columbia Society for the Protection of Animals (SPCA) has developed a 'hide, perch and go' box which doubles as a cat carrier (pictured here). When the cat is adopted, the owner can take the cat away in the carrier, which the cat is already familiar with. The box is made of plasticised cardboard; it has a shallow tray on top so cats can sit up there and see out of their cage; the box also has entrances at the side and at the front. The



box would also be useful for an owned cat when being taken to a cattery or to the vet. In the picture, note that the feeding and water bowls are at the top of the box (see arrows) so the cat can remain 'perched' and eat from a place where they feel safe. Note also that the cages do not need any other bedding and are therefore easier to manage, and the litter tray has relatively high sides.

### Slide 35:

Laboratory dogs, shelter dogs and working dogs are typically kennelled for much of the time. However, these animals need play, exercise and social contact. When kennelled dogs are housed in pairs or groups, they generally explore the kennel more and can show social behaviours. Having kennel staff groom the dog each day and spend even another five minutes with the dog can help enormously.

Note that if dogs are not socialised to people when they are puppies, human contact may cause a lot of distress. This is seen in laboratory dogs who are bred in 'puppy mills'. These dogs often stay at the back of their cages, and freeze if a human touches or approaches them. Animals of any species who 'freeze' at human touch are typically extremely frightened. This is because freezing is a natural response to predators – it is harder for a predator to see a stationary animal than a moving one.

The dog in this picture is very fearful of people. The dog's front feet are gripping the floor, the tail is tucked under, he or she is in a frozen position and is looking away, yet the ears are cocked towards the person.

For improved EE in kennel situations, toys can play an important role, especially to young puppies. Examples are cardboard to chew, and rawhide or hard plastic bones. However, note that dogs kept individually in kennels may not play much with toys because their strongest motivation (need) is for social contact.

Training: this teaches dogs a vocabulary and allows them some environmental control – by responding correctly to a stimulus (command) they can gain a reward. One of the main reasons why owners give their dogs to shelters or abandon them is that the owners do not like their dogs' behaviour and cannot control it. Proper training that is based on the principles of classical and operant learning can overcome this.

Sleep: this is important to all dogs, especially hospitalised animals. These dogs are often unwell and are very stressed by being in a new environment. If there is a lot of barking, they may not sleep properly and then suffer from exhaustion. Research continues into the clinical importance of sleep for animals.

## Slide 36:

Many owners of pet dogs neglect their dogs' need for exercise, company and play.

Exercise: a general guideline is 20 minutes' exercise (not including letting the dog out in a garden) twice a day, regardless of the size of the dog. Some breeds of dog need much more than 20 minutes of exercise twice a day, including herding breeds such as collies and German shepherds.

Going for a walk gives the dog a change of scene and new stimulation; it also helps prevent obesity. Some owners do not like to walk their dog because the dog pulls on the lead or is aggressive. The owners may use choke chains or prong collars to try and control their dogs. Both these kinds of restraint work by causing discomfort or pain, until the dog stops pulling (negative reinforcement – the desired behaviour results in the removal of an unpleasant stimulus), or the owner uses the collar to provide a sudden short sharp pain, by pulling sharply on the collar (positive punishment). Prong or choke collars are generally bad for welfare because:

- it is hard to control the exact amount of pain caused: these collars either do not cause enough pain to make a difference, or they cause unpredictable amounts of pain
- it is difficult to use them correctly so, even when the dog stops pulling, the discomfort continues
- when dogs are excited, e.g. pulling towards another dog who is passing by, or chasing after a bird, they do not learn. So, even if the owner pulls hard on the choke/prong collar and causes enough pain to stop the dog from pulling, he or she will be too excited and then too surprised by the discomfort to learn to associate the pain with them pulling
- anecdotal evidence suggests that owners' misuse of prong collars and choke collars may cause subluxation of the cervical vertebrae, with associated regional pain.

In conclusion, veterinarians should not recommend prong collars or choke collars to any owners. Causing unnecessary pain to any animal is not acceptable. Using negative reinforcement techniques has been proven to be both ineffective and cause unnecessary distress to animals. Positive reinforcement techniques are much more effective for training, and comply with animal welfare.

Social contact: although some individual dogs can adapt to being left alone without social contact for eight to ten hours while their owners are at work, many cannot, and develop separation anxiety (demonstrated by chewing furniture, barking and soiling the house). Getting another dog is rarely a solution on its own, because the problem is that the first dog has become so attached to the owner. Many vets do not have training in clinical ethology and do not know how to treat separation anxiety. It is important to know that it is a serious welfare problem and drugs alone are not effective; behavioural therapy is the most important thing.

Although providing a single dog with a canine companion is often not sufficient to alleviate separation anxiety in dogs that are very bonded to their owners, the presence of a conspecific is nevertheless an important form of EE. Dogs are social animals and the presence of one or

more other dogs in the house provides opportunities for positive experiences such as play (illustrated in the picture on the left), and mutual grooming.

Training: effective training provides positive social interaction for dogs and owners, and is often part of the treatment regimen for separation anxiety.

Toys and play: There has not been substantive research published on the role of play and toys in improving the lives of companion dogs. However, many breeds of dog display neoteny, i.e. the retention of juvenile traits into adulthood. This is probably why, anecdotally, many adult dogs enjoy play.

The pictures on this slide show a puppy and an older dog playing together (left), and a dog interacting with an owner (right) – both dog and owner are enjoying the interaction. Toys must be chosen with knowledge of the individuals concerned and their context. For example:

- One study (Wells, 2004b) examined the response of dogs in a shelter to five toys (a squeaky ball, a non-squeaky ball, a nylon bone for chewing, a tug rope and a large hard plastic ball (“Boomer ball”). Each dog was housed singly and was exposed to each toy in turn for 6 days, in random order. In all cases, the dogs spent relatively little of the observation time using the toys, and they showed markedly reduced interest in each one (“habituation”) by the end of the first day in some cases, or within 5 days. The results suggest:
  1. In contrast to an owned dog whose owner may use a toy like tug rope or ball to play with a dog, and may give their dog attention when the animal plays, dogs in shelters may not want or value solitary play as much as social contact.
  2. Relatively frequent rotation of toys is likely to be important for solitary play. However, many owned dogs never seem to tire of some games like having their owner throw their ball for them.

## Slide 37:

In veterinary hospitals, sick cats and dogs may be kept as in-patients for one day or several days, and occasionally weeks for advanced therapies.

Hospitalisation is stressful as animals are suddenly in an unfamiliar environment that is unpredictable and often uncontrollable, especially as they are typically housed in small hospital cages. This may be made more stressful by the fact that dogs and cats have relatively poor sight, but highly acute hearing and smell – much more acute than our own. They can probably smell blood, fear-related pheromones and all the drugs and chemicals much more acutely than we can.

Applications of EE include:

- keeping cats away from dogs during handling and housing, including providing areas for cats to hide and perch, even if this is just a towel over half of the front of the cage
- feeding dogs with Kong toys (sold in petshops) or providing chew toys sprayed with flavouring to occupy animals who need to be starved

- playing gentle classical music, which has been shown to reduce behavioural indicators of stress in shelter dogs, compared to talk radio, pop music or silence, and it may help calm hospitalised dogs.

In some countries, pheromone preparations are marketed for stress reduction in hospitals and clinics may rely on these to manage the stress of their in-patients. However, as of 2012, a critical reading of the reported research indicates that there are as yet no robust data to support the use of pheromone preparations for reducing stress in in-patients. Given the complexity of the stressors involved, targeted EE and appropriate handling are likely to be more effective in reducing your in-patients' stress.

### Slide 38:

This concludes the overview of the role of EE in the welfare of confined or captive animals. You now know that EE offers benefits, but has limitations, and that more research is needed in many cases.

However, the material we have covered gives you a framework for advising on the design of appropriate EE for wild or domesticated species, and it highlights the limitations of EE in providing adequate welfare for the individuals concerned.

You also have some knowledge of particular examples of EE that may be used for a variety of the domesticated species that you may encounter in practice, as well as some wild species that you may find being kept as pets.

**A note on source material:** *Environmental enrichment for captive animals* (Young, 2003) was one of the main sources used in compiling this module. Many online resources refer to domestic animals in laboratory settings; the principles outlined for laboratory animals are applicable to when the same species are kept as pets or are farmed.