

## Module 13

# Diet, Feeding and Animal Welfare



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.

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# This module will teach you

**How different feeding regimens may affect animal welfare**

**How food relates to different aspects of animal welfare that you may encounter in veterinary practice**

**How to maximise welfare when feeding animals**

# Hunger and feeding 1

## Hunger

- **Appetite centre**
- **Variability in availability of food in the wild**  
Anticipation of finding food is pleasurable  
(Kyriazakis & Tolkamp, 2011)

## Normal pattern of behaviour = bouts of feeding (Kyriazakis & Tolkamp, 2011)

- **Amount ingested per feeding bout may vary with genetics and environment**
- **Feeding patterns are independent of quality of food or genetic traits**

# Hunger and feeding 2

## Feeding behaviour

- ⌘ Appetitive
- ⌘ Consummatory

## Traditional focus on consummatory component because this satisfies hunger?

- ⌘ If appetitive component is not satisfied this can cause frustration ⇒ behavioural and physical abnormalities, e.g. stereotypies, gastric ulceration



# Hunger and feeding 3

## Human factors (Kasanen et al., 2010)

**Number of animals to be fed**

**Time available**

**Costs and benefits**

- ⌘ Labour, feed, financial and non-financial value of the animals, owner's income and profit margins



# Feeding regimens 1

(Kasanen et al., 2010; Kyriazakis & Tolkamp, 2011)

## Ad libitum food delivery

**Can result in excess adipose tissue (obesity)**

Depending on, e.g., energy density, palatability, genetics, environmental complexity and opportunity to perform other behaviours

**Can lead to obesity ⇒ diabetes mellitus, musculoskeletal disorders, reduced longevity**

## Dietary restriction to limit calorie intake

**Quantitative vs. qualitative**

# Feeding regimens 2

(Kasanen et al., 2010; Kyriazakis & Tolkamp, 2011)

## Quantitative restriction of high-quality food

- Restrict amount fed: sows and boars, fed ~75 per cent; broiler breeders, ~35 per cent; rodents, 60-80 per cent of **ad libitum** intake
- Restrict time during which food is available
- Make access to food more difficult

## Quantitative restriction promotes physical functioning but can adversely affect feelings/mental state and performance of important behaviours

- Feelings of hunger
- Inability to learn – broiler breeders (Buckley et al., 2011)
- Inability to perform social behaviour
- Feelings of frustration

# Breeding stock of pigs and broilers

## Broiler hens

Egg limits space in abdomen

Full gut ⇒ vent prolapse and vent-pecking

**Fed every other day or reduced amount**

**Stereotypies as food arrives and after eating**

## Sows

Obesity – reduced fertility, joint pain, increased risk of crushing piglets



# Feeding regimens 3

(Kyriazakis & Tolkamp, 2011)

## Qualitative restriction

- ✦ *Ad libitum* access to low-quality food
- ✦ Effective in ruminants – fed more forage than concentrates – minimises behavioural signs of distress
- ✦ Other species? For example, high-fibre diets for dogs and cats

# Feeding regimens 4

(Kyriazakis & Tolkamp, 2011)

## Is qualitative restriction more humane than quantitative?

Both result in prolonged oral activity –  
stereotypic vs. ingestive, i.e. animal feeling  
hungry in both cases

Alternatively: internal mechanisms allow animals  
to adapt feed intake to quantity and quality of available food

- ⌘ Natural for animals to eat more of low-quality food,  
to meet needs. *Ad libitum* access allows them to regulate  
intake according to internal cues
- ⌘ Natural to eat more of high-quality food? Frustrating not  
to have enough of it?

Quantitative restriction creates anticipation which  
is pleasurable – positive welfare

# Other feeding regimens 1

## Forced moulting in laying hens

- ✦ Quantitative restriction at end of laying season

## High-producing dairy cows (Webster, 2010)

- ✦ Genetic selection for high production – inherent welfare problem
- ✦ Holstein (~18,000 litres per lactation; 50 l/day)
- ✦ On grass ⇒ can only produce 25 l/day
- ✦ Needs extra, energy-dense feed
- ✦ Keep inside to ensure animal eats enough
- ✦ Hunger vs. full gut vs. need to lie down  
⇒ cannot consume enough to meet energy needs

# Other feeding regimens 2

## Under-feeding

### Ignorance

- ❖ Lack of veterinary services (Minnaar & Krecek, 2001)
- ❖ Working equids: thinner animals are more likely to have other welfare problems, eg lameness (Burn et al., 2010)

### Animal hoarding (Patronek, 1999)

### Wilful cruelty (Christie et al., 2005; Whiting et al., 2005; Benetato et al., 2011)

# Other causes of hunger

**Parasites**

**Maldigestion**

**Malabsorption**

**Malutilisation**

# Water and animal welfare

## Insufficient water

**Broilers**

**Pigs**

**Veal calves** (Gottardo et al., 2002; Bähler et al., 2010)

- ❖ Water reduces stereotypic oral behaviours and fundic ulcers

**Working equids**

- ❖ 40–50 per cent of 4,903 animals were dehydrated on skin pinch test (Pritchard et al., 2005)



# Other causes of thirst

## Disease / loss of body water

Stomatitis

Metabolic disease

GI disease

Sweating / hot weather

## Pathological thirst



# Food and physical comfort

**Body temperature**

**Cushioning body surface**

**Ease of movement**

Obesity

Broiler chickens

Osteoporosis in laying hens





# Food and pain, injury and disease 1

## Nutritional deficiency diseases, eg

### Fractures caused by

- ❖ Rickets
- ❖ (Osteoporosis in laying hens)

### Arterial thromboembolism in taurine-deficient cats

### Mineral deficiencies, eg

- ❖ Low magnesium in new grass ⇒ tetany
- ❖ Iron-deficiency anaemia in veal calves

# Food and pain, injury and disease 2

## Overfeeding companion animals

### Eg Cats:

- ❖ 8 – 16 feedings per day is natural but pet food is very palatable.
- ❖ Owners may not understand what is normal bodyweight and thus may overfeed (AAFP 2005; Cave et al., in press, 2012)
- ❖ Endocrinology and role of carbohydrates (Kil & Swanson 2010)



Credit: Colin Seddon

## Over-feeding farmed animals, eg

**Ducks, geese (EU, 1998)**

**Broilers, pigs**

# Food and pain, injury and disease 3

## Over-feeding

Fatty liver

Laminitis

Ruminal acidosis

## Under-feeding

Neonates



# Food and pain, injury and disease 4

## Gastric ulceration

### Veal calves

(Mattiello et al., 2002; Bähler et al., 2010)

### Horses

(Waters et al., 2002; Wickens & Heleski, 2010)



# Food, fear and distress

## Predation

Some captive predators may be unable to express full range of feeding behaviour adequately ⇒ always distressed

(Clubb & Mason, 2002)

## Competition at feeding

Trough space

Quantitative dietary restriction ⇒ aggression

# Food and behaviours that are important to the animal

## Early weaning

**Dairy calves: non-nutritive sucking (von Keyserlingk et al., 2009)**

**Piglets: tail-biting – a combination of predisposing factors, including**

- ❖ A lack of manipulable material (Moinard et al., 2003)
- ❖ Nutritional deficiency (Beattie et al., 2005)?

# Summary so far

**How different feeding regimens may affect animal welfare**

**Next: How to maximise welfare when feeding animals**

# Food and environmental enrichment (EE) (Young, 2003)

**What is EE?**

**How does the species feed in the wild?**

**Carnivores (eat to relieve hunger)**

**Herbivores (eat to prevent hunger)**

⌘ Browsers, eg goats

⌘ Grazers, eg cattle

**Others, eg omnivores, insectivores, etc.**



Credit: Helen Proctor



# Designing nutritional EE (1)

(Young, 2003)

## Carnivores and other animal-eaters

- ✦ **Duration, distance, frequency of hunt**
- ✦ **Number of dimensions that the prey moves in**
- ✦ **In a group or solitary**
- ✦ **Special physical adaptations for hunting**
- ✦ **Senses used to find prey**
- ✦ **How the prey is captured and killed**
- ✦ **Are all the above different for different prey?**

# Designing nutritional EE (2)

(Young, 2003)

## Herbivores and other non-meat eaters

- ✦ Distance between areas eaten during grazing/browsing
- ✦ Duration/frequency of foraging bouts
- ✦ Number of dimensions vegetation is found in
- ✦ In group or solitary
- ✦ Special physical adaptations
- ✦ Senses used to find food: sight? Smell?
- ✦ How food is taken up: tongue? Beak? Teeth? Feet?
- ✦ How food is digested, eg rumination vs. grinding in gizzard

# Examples of nutritional EE (Young, 2003)

**Puzzle-feeders**

**Feeding poles**

**Hiding food**

**Fresh food**

**Movement**

**Nipple-feeders**

**Variety, eg horses (Goodwin et al., 2002)**



Credit: Helen Proctor

# Summary

## How we feed animals can be a source of pleasure or negative feelings

- ❖ *Ad libitum* feeding assuages hunger but risks obesity and frustration if appetitive component is not satisfied
- ❖ Dietary restriction prevents obesity but may not adequately satisfy hunger
- ❖ The content and the delivery of the diet can also promote or reduce welfare in terms of physical comfort, disease, negative emotions and performance of important behaviours
- ❖ Veterinarians can help owners address behavioural aspects of animals' diets, as well as disease-related aspects

# Feedback:

## Please let us know what you think

- ❖ How have you used this module?
- ❖ What did you like about it?
- ❖ What did you not like?
- ❖ Do you have any tips to share?

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Your feedback will help other teachers like you

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