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## NUTRITION OF SMALL HERBIVORES

### Small Mammal Nutrition

- Understanding the care of small animals begins with understanding the anatomy and physiology of small animals.
- Behavior of animal is different from what we know from dogs and cats.
- This predation-based model must be conveyed to domestic pet owners in everyday management practices. Changes in feeding and routine can alert and distress animals as they are creatures of habit.

### Pain recognition

In prey species the 'conservation-withdrawal' reaction is the dominant behavioral pattern over the 'fight or flight' reaction of predators.

- Herbivores
  - Animals designed to eat and digest plant material which carnivores can't digest.
- The common pet herbivores all have a similar digestive system:
  - Rabbit (large cecum holds about 60% of ingesta)
  - Guinea pig (holds about 45% of ingesta)
  - Chinchilla (smaller cecum holds about 25% of ingesta)

### General Physiology

- A well developed cardiac sphincter which prohibits vomiting

A look into the stomach via ultrasound

### General Physiology

- Disruption of the pH and digestive bacteria of the cecum can result in diarrhea and soft stools.

### Anatomy

- Beneficial bacteria function best:
  - Stabilized environment
  - Consistent daily diet
- When changes are frequent...
  - Populations change
  - Beneficial gut flora die
  - Gas, bloat occurs
  - *Clostridium Enterotoxaemia*

### General Physiology

- Peristalsis:
  - The movement of food through the digestive system via muscle contractions.
- General:
  - Both forward and reverse are important
  - The "scratch factor" of hay aids this necessary continual movement of bulk masses through the system.
- GI Stasis (gastro-intestinal "stop")
  - Upset occurs when peristalsis slows down or stops. This can be fatal if immediate action is not taken.
  - Food intake decreases (hay, pellets, grass)

A look into the cecum via ultrasound

### Gastrointestinal Stasis

- Peristalsis slows down or stops
- Food stays in GI system longer
- Moisture is pulled from ingesta
- Changes in fecal production

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## EXOTICS

- Slow recovery time (4-6 wks)
- Can be fatal
- Also known as “hairball” or “wool block”

### Gastrointestinal Stasis

#### Cecal vs. Fecal Pellets

- Small herbivores excrete two types of droppings.
- Cecals or cecotrophes are normally passed a few hours after eating.
- They are softer, stickier, more irregular in shape.
- They have a different smell than the regular fecal pellets that occur during the day.
- These cecotrophes are re-consumed directly upon excretion by rabbits, guinea pigs, chinchillas, degus, hamsters, and prairie dogs.
- Cecals are a wonderful source of Vitamin B and Vitamin K. The mucous covering protects beneficial bacteria from the high acidity of the stomach. Cecotropy is an example of the efficiency of the digestive system.

#### Cecal vs. Fecal Pellets

- The second type of Fecal Pellets.
- These are mainly comprised of undigested fiber and are produced all throughout the day.

#### Low Fiber Diet

- If your pet eats a pile of hay less than the size of his head, he MAY be on a low fiber diet.

#### Encourage Fiber Intake

- Optimize hay consumption
- High fiber pellets
- Increase fiber intake
- Reduce carbohydrates
- Reduce simple sugars
- Discourage too many treats

#### Psychological Benefit of Hay

#### Physical Benefits of Hay

- Stimulates peristalsis
- Provides lattice structure
- Aids in proper dental motion
- Provides mental enrichment

#### Chemical Benefits of Hay

- Soluble & insoluble fiber
- VFA (volatile fatty acids)
- Maintains pH balance
- Discourages *Clostridium sp.* proliferation

#### High Fiber Diet

- Prevents obesity
- Helps prevent GI stasis
- Helps prevent diarrhea
- Keeps teeth trimmed
- Can reduce the incidence of hairballs or wool block.

#### Alfalfa Hay

- Young, growing animals:
  - Great for < 6 months
- Adult animals:
  - Expectant mothers
  - Limited treat, appetite stimulant
- Elderly animals:
  - Supplement diet to stimulate

#### Grass Hays for maintenance

- Grass hays have less protein, calcium, and typically less energy.

#### High Fiber Diet

- Reduces Digestive Problems:

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- Fiber helps prevent digestive problems related to diarrhea and soft stools. During heavy shedding periods, feeding hay can reduce the incidence of hairballs or wool block.
- Reduces Dental Disease:
- Dental disease can also be reduced by feeding high fiber hays. The chewing action that is associated with eating hay helps to wear down the animal's teeth.

### Hay Feeding Guidelines

- Rabbits
- Rabbits should eat at least half their body size every day. Large piles of hay stimulate the senses and encourage consumption.
- Guinea Pigs & Chinchillas:
- May eat twice their body-sized amount of hay daily. Always leave ample hay available at all times.

### Herbivore Nutrition

- Adult herbivores have lower daily caloric requirements than growing animals and those that are in the reproductive stage of life. Feeding high quality, high fiber hays ensure proper digestion and limit obesity problems.
- A large population of beneficial microbes, mainly *bacteroides sp.*, live in the cecum and maintain a stable healthy population with a consistent diet of hay.
- When changes are frequent or drastic, beneficial gut flora die, and animals quickly become susceptible to gas, bloat and *Clostridium Enterotoxaemia*.

### Greens & Vegetables

- Greens are a wonderful supplement to the diet of rabbits, guinea pigs and other small herbivores when fed appropriately.
- Leaf lettuce and other green leafy vegetables are a good source of water and serve as mental enrichment providing a taste and texture variety.
- Avoid over feeding as greens contain 90-95% water and little fiber. Hay intake can suffer for animals that eat large quantities of greens and salads. Limit to a pile of greens twice the animal's head twice a day.
- Greens can be beneficial to the diet, but are not essential.

### Diet: Treats

- Treats Should Be Minimal
- A treat is something for the pet that is fun to eat and encourages interaction between the animal and their caregiver.
- Over feeding foods such as, fruits, nuts, and seeds can result in illness or death. Remember to feed in proportion to the size of the animal.
- One whole carrot to a rabbit would be comparable to us eating 10 carrots in one sitting.

### Pellets vs. Mixes

- Mixes Contain...
  - Seeds
  - Puffed colored foods
  - Dried fruits & vegetables
  - Nuts
- Attractive to owners because it looks fun and healthy, but looks can be deceiving!

### Pellets vs. Mixes

- Selective feeding behavior
- Eat sweet fatty pieces first
- Leave "boring" vit/min pellet
- Owners replenish dish
- Imbalanced nutrition

- Intake of phosphorus can be
- 4-5 times higher than calcium

### Pellets vs. Mixes

#### Pellets

- Hay-based fortified feed
- High in fiber, low in protein
- Discourages selective feeding
- Proper balanced nutrition
- Guarantees micronutrient intake
- Veterinarian Recommended

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## EXOTICS

### Palatability of Pellets

- Hay Based Pellets
  - Perfect for pet herbivores
  - Fresh ingredients
  - Aromatic smell
  - Encourages intake
- Hay based pellets will have more variability in color and smell. Hay may smell different crop to crop.

### Treats: Yogurt Drops

- Implied benefit is healthy
- Restores the balance of bacteria
- Beneficial bacteria
  - *Lactobacillus acidophilus*
- Contain sugar and whey
- Supports clostridium growth
- Defeats the purpose

### Treats: Yogurt Drops

- The implied benefit is that yogurt drops are healthy. The “purpose” is to help restore the beneficial balance of into the digestive system, specifically *Lactobacillus acidophilus*.
- However, yogurt drops also contains sugar and whey, which supports clostridium growth and this defeats the “purpose”.
- It has not been proven that the probiotics found in the yogurt drops can actually survive the high acidity of the stomach and reach the cecum.
- Calcium to Phosphorus Ratio:
- Positive ratio
- Vegetative parts of plants
  - Leaves & stems
  - All hays
  - Greens (leaf lettuces)

- Carrot tops
- Herbs

### Calcium to Phosphorus Ratio:

- Negative Ratio
- Reproductive parts of plants
  - Seeds & Roots
  - Carrots & Sweet Potato
  - Apples & Bananas
  - Sunflower Seeds

### Health Concerns

- Rabbit Concerns
  - GI Stasis
  - Dental disease (hay wears teeth properly)
  - Obesity
  - Diarrhea or soft stools
  - Excess cecal pellets
- Guinea Pig Concerns
  - Cavies cannot produce their own vitamin C, so it must be supplemented in the diet
  - Prone to bladder stones
  - Dental Problems

### Health Concerns

- GI Stasis
- Enteritis
- Dental Disease
- Obesity
- Diarrhea or soft stools
- Excess cecal pellets
- Bladder sludge (uroliths)

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## EXOTICS

### Rat Nutrition

- We know a lot about human nutrition from studies first done on rats. There are strong parallels between human and rat nutrition.
- We both eat when bored. We will eat what tastes good, not necessarily what is good for us.
- Due to our genetic makeup some of us are prone to eating more food.
- We both have a satiation biofeedback internally that is triggered to tell us when we are full and stop us from eating.
- Studies have proven that a high fiber, low protein, low calorie diet promotes health and longevity in pet rats.

### Hamsters & Hay

- Welcome addition to their cages
- Make nests, hide and burrow
- Wonderful enrichment
- Not an essential part of diet
- Tasty seed heads
- Healthy treat

### Hamsters & Hay

- Hamsters and other small rodents welcome the addition to hay in their cages.
- Grass and other plant material are part of their natural habitat. Hamsters will make nests, hide and burrow in piles that are offered to them. Hay is a wonderful enrichment for hamsters and gerbils and other small rodents.
- Although hay is not an essential part of a hamsters daily diet the tasty seed heads of oat hay and timothy make a healthy treat.

### Herbivorous Reptiles

- Desert tortoises
- Leopard tortoises
- Sulcatus or Spur Thighs
- Spiny tailed lizards (Uromastyx)

- Their digestive system has the capacity for hind gut fermentation, and fiber is essential for gut motility and production of volatile fatty acids.

### Herbivorous Reptiles

- Hind gut fermenters
- Long transit time
- Volatile fatty acids
- Fiber is essential
- Hay will improve stool
  - Quality
  - Consistency

### Small Pet Nutrition

#### Greens & Vegetables

- Wonderful supplement
- Source of water and enrichment
- Taste and texture variety
- 90-95% water and little fiber
- 2x animals head, twice a day
- Consistency is key

- *Greens can be beneficial to the diet,*
- *but are not essential*