Clinical Nutritional Management in Rabbits and Rodents

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How to feed the rabbits?

Question:
The owners and vets are really sure to feed the proper foods for rabbits?. Vegetable, commercial pellet, fresh or hay grass is correct? and how much of its per meal?.

1
How to feed the rabbits?

- The owners were interviewed, more than 80% mistook about the foods for their rabbits.
- What do you think?
- How to feed their rabbits?
Nutritional Disorders

• The common diseases due to improper management of nutrition.
  – Gastrointestinal hypomotility and stasis
  – Dysbiosis
  – Malocclusion

Nutrition Management

• The previous educated told us that the dietary fibers should not more than 17% and lower than 10%.
  – They believed that the rabbits displayed diarrhea, if the fiber was lower than 10%
  – The rabbits showed low quality of muscular mass or retard growth, if take them the higher fiber than 17%
  – Appropriate dietary fiber = 15-17% ?
Nutrition Management (2)

- The current education found appropriate fiber should be performed 22-25% and must produced by grass hays
- Gastrointestinal movement will be decreased when the rabbits were given by the low dietary fiber (lower than 20%)

Nutrition Management (3)

- Low dietary fiber induced GI hypomotility and dysbiosis
- And also low grass feeding induced malocclusion
- How to manage the nutrition
  - Veterinarians must know well on the role of fibers
  - Fibers are the heart of gut and intestinal health
  - The quality of stools are observed and described by the type of fibers
Focus on Fibers

• What are types of fibers in plants?
• What’s types of fibers or plants do you give to your sick rabbits?
• You know?
  – we know = the rabbits recover

Types of fibers

• Pectin, Hemicellulose, Lignin, Cellulose and other carbohydrates.
• Digestible fibers and Indigestible fibers.

Why are rabbits produce different size of stools?
Which stool is best?
How vets detect the diseases from the quality and quantity of stool?
How do fibers work?

- **FIBRE**
  - FERMENTABLE (DIGESTIBLE) FIBRE: Small particles <0.3mm are moved into the CAECUM.
  - INDIGESTIBLE FIBRE: Large particles >0.5mm are moved into the COLON.

- **CAECUM**
  - Small particles are broken down and fermented by caecal microorganisms. Ease of degradation or 'digestibility' varies according to structure of molecule, e.g. cellulose is less digestible than hemicellulose.

- **PECTINS**
  - HEMICELLULOSE
  - CELLULOSE
  - LIGNINS

- **COLON**
  - Large fibre particles are expelled in hard faecal pellets.

Hemicellulose, cellulose and lignin are bound together to form large particles. Digestibility can be increased by physically reducing the particle size by grinding.
Role of indigestible fibers

• Stimulate gastrointestinal motility that moves digesta and fluid into the caecum for fermentation
• Prevent boredom and behavioral problems such as fur and foreign bodies chewing
• Indigestible fibers such as lignin, cellulose and also silica, high in old plants provide dental exercise and normal dental occlusion
• Stimulate appetite and ingestion of caecotrophs

Role of indigestible fibers (2)

• Provide the substrates for caecal microflora
• Provide optimal caecal pH and volatile fatty acid production
• Prevent proliferation of pathogenic bacteria in the caecum
• Increase fiber content of cecotrophs, so they are of firm consistency
Role of digestible fibers

- Digestible fibers are pectin and hemicelluloses, high in young plants.
- Most digestible fibers take place by the microbial flora within the caecum
- Digestibility within the caecum depends on the nature of the plant material

Role of digestible fibers (2)

- Hemicelluloses and pectin are broken down more easily than cellulose, by cellulolytic bacteria
- Degradation of cellulose takes longer than hemicellulose, less fermentable than hemicellulose
- Digestibility of fiber within the caecum affects the rabbit’s appetite and growth rate
Role of digestible fibers (3)

- Buffering capacity that is dependent on the concentration of carboxyl, amino and hydroxyl groups
- The type of fiber has an effect on caecal pH which, in turn, can affect dysbiosis
  - Straw tends to increase caecal pH
  - Alfalfa do not modify caecal pH

Role of digestible fibers (4)

- Particle size within the caecum affects retention time for microbial fermentation
- Grinding down lignin to small particles allows it to be retained in the caecum where it cannot be digested
- Pectins and gums, are hydrophilic and tend to form gels in solution, moved into the caecum where they absorb water and increase retention time
Coprology in Rabbits?

- Chief complaint and history taking on the diet is most important
- Quality of food will display quality and quantity of stool
### Appropriate Diets

**Commercial Pellet foods**

<table>
<thead>
<tr>
<th>Species</th>
<th>Protein (%)</th>
<th>Fat (%)</th>
<th>Fiber (%)</th>
<th>Calcium</th>
<th>Phosphorus</th>
<th>Vit C (mg/kg)</th>
<th>Vit AD3E (IU/kg)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbit</td>
<td>Min 15</td>
<td>Min 2.5</td>
<td>22-25</td>
<td>0.5-1.0</td>
<td>0.25</td>
<td>-</td>
<td>Min 19000 IU/kg.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>Min 15</td>
<td>Min 2</td>
<td>0.35-0.85</td>
<td>0.25</td>
<td>Min 800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cavy</td>
<td>Min 15</td>
<td>Min 2.5</td>
<td>25-29</td>
<td>0.6-1.1</td>
<td>0.25</td>
<td>Min 400</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>Min 15</td>
<td>Min 2</td>
<td>0.35-0.85</td>
<td>0.25</td>
<td>Min 800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinchilla</td>
<td>Min 18</td>
<td>Min 2.5</td>
<td>18-23</td>
<td>0.6-1.1</td>
<td>0.25</td>
<td>Min 400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** Alfalfa and Timothy are the main ingredients of Rabbit, Cavy and Chinchilla foods, and also in Hamster.
*** Supplement with Yeast, provide feed intake in hindgut fermentation animals.
*** Copper is supplement 25-30 ppm
*** Lack selenium, copper and AD3E induced head tilt.

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### Appropriate Diets (2)

**Commercial Pellet foods**

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<th>Vit C (mg/kg)</th>
<th>Vit AD3E (IU/kg)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamster and Gerbil</td>
<td>Min 17</td>
<td>Min 4.5</td>
<td>11-15</td>
<td>0.6-1.0</td>
<td>0.45</td>
<td>-</td>
<td>Min 19000 IU/kg.</td>
<td></td>
</tr>
<tr>
<td>Rat</td>
<td>Min 15</td>
<td>Min 8</td>
<td>7</td>
<td>0.8-1.1</td>
<td>0.25</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** Alfalfa and Timothy are the main ingredients of Rabbit, Cavy and Chinchilla foods, and also in Hamster.

Soy and fish meal provided protein for Rat, but must provide grass for health.
Feeding Guideline

Rabbit is a strict herbivore

Avoid treat!

Hay is an important component of captive rabbits, but can vary dramatically in nutritional quality. So, high quality grass hay should be available at all time

Vegetables and treats ≤ 5

Commercial pellet foods (appropriate fiber diet) ≥20%

1/8-3/4 cup

Grass Hays or Appropriate Grass 75-80%

Most recommend rabbits be offered a wild variety of green foods and vegetables, but debate exists on the percentage green foods should make daily food intake.

Careful evaluation of each ingredients and ration of pellets, complete pelleted ration are available but there is evidence many may be inadequate.

Given with care!

Ideally

- Rabbits should be given with hays at all time
- Provide only ideal pellet foods, is made primarily of grass hay with fortified vitamins and minerals but given with care (>20% fiber).
- General rule is to feed a maximum of 25g of per Kg bodyweight (2.2 lb.), sometime provide 15-100 g. of foods per body upon the performance of rabbits and quality of foods
Ideally (2)

- Green and vegetables should provide with care, cause large amount of pectin but low in indigestible fibers (about 1 cup. per 4 lb. bodyweight or less)
- Avoid treat and sweet!, however, some literature detailed to give small amount of fruit totally only 1-2 level Tbs. per 5 lb. body weight but non if dieting and avoid sugary fruit (exotic companion medicine handbook, 2008)

Although rabbits provided with really sure proper diet, veterinarians need to examine body condition score related to GI health

Who says love has to make sense?
Clinical Approach in Rabbit Gastrointestinal Syndromes

- Gastrointestinal disease in rabbits is common, related to inappropriate diet
- The most common disorders:
  - Gastrointestinal hypomotility
  - Dysbiosis
  - Malocclusion

Anatomy and Physiology of GIT

Note: Nominal values are those observed in the New Zealand White breed, aged 12 weeks, fed a complete balanced pelleted feed.
Diagnosis

- History taking
- Clinical signs
- Physical examination
  - Head and mandible palpation
  - Oral inspection
  - Abdominal palpation and percussion
  - Auscultation of GIT
  - Body condition score
Diagnosis (2)

• Radiography
  – Four patterns of GI gaseous (Ileus)
    • Stomach- Small INT- Caecum - Colon
  – An important divided to 4 patterns of megacolon
  – Severity
  – Treatments
Grade 1

Grade 1
Megacolon

Modified by Weerakhun (2010)
Hollow Shape

Sausage like shape
Colonic Impaction
Sticky gel like fecal

Mucoid Enteropathy

Colonic Impaction
Colonic Impaction
Update! Rabbit Gastrointestinal Syndrome

- Treatment: Gastrointestinal Hypomotility
- How start to stabilize your patients?
  - Pain management
    - Opioid
    - Meloxicam, Butorphanol, Buprenorphine, Carprofen
  - Fluid therapy
    - 100 mL/KgBW
Gastrointestinal Hypomotility

• Treatment (2)
  – Nutritional or energy support
    • Hand feeding is a critical component to therapy
    • Critical Care (Oxbow)
    • Always use Rabbit Care (RP) to rapid energy recovery and probiotics supplement
  – GI motility stimulants
    • Cisapride
    • Metoclopramide
    • Alternative – Ranitidine

Gastrointestinal Hypomotility

• Treatment (3)
  – Antibiotics
  – Encourage physical activity
  – Anti-ulcer therapy
  – Alternative – enema, lubricants, simethicone, etc
  – Dysbiosis should be aware of
    – Enzyme!
      • Pineapple for bromelin or Papaya for papain may help to break down the matrix holding the material together of trichobezoars?
      • Saccharomyces cerevisiae (Enzymatic product from yeast)
  – Probiotic or Prebiotic:
    • Bunny Enzyme
  – Recheck blood chemistry, if the patients did not respond therapy. The other causes need to be observed.
Obstructive Ileus

- The rabbit should be stabilized first with fluid therapy, warmth and analgesia
- The surgical technique is the same as the other animals, routine gastrotomy is performed
- Motility stimulants are contraindicated prior to surgery but are useful post-operative to stimulate GI motility
- Verapamil at 200 µg/kg per os every 8 hours for 9 doses prone to developing post-surgical adhesions

Dysautonomia

- Dysautonomia was reported in rabbits in 1996, causing impaction, anorexia, depression and death
- Mesenteric autonomic ganglia showed chromatolysis-like degenerative changes and neuronal vacuolation
- Response to supportive treatment is generally poor
Dysbiosis

- Immediately food change
- Pre-weaning or early weaning
- Stress
- ABOs
- High concentrate food
- Low fiber diet
  - GI Hypomotility
  - Vegetables and fruits
Diarrhea

- Stress and dietary factors are common
- Dysbiosis causing overgrowth of *Clostridium* spp. (*C. spiroforme*) and release of an iota-toxin leading to enterotoxaemia
- Bacterial enteritis due to enterotoxic *E. coli* and *Staphylococcus* spp. does occur in neonatal and young weaned rabbits
Diarrhea (2)

- *Clostridium piliforme* (Tyzzer’s disease), *Salmonella typhimurium, Pseudomonas aeruginosa* and *Campyrobacter*-like species in young rabbits
- Rotavirus and Coronavirus can cause enteritis in 3-10 week old rabbits and is generally an endemic colony problem

Diarrhea (3)

- Coccidiosis, *Eimeria* species can be an important cause enteritis
  - *E. steidiae* cause hepatic coccidiosis
- Epizootic rabbit enterocolitis (ERE) is a new and serious GI syndrome, the mortality rate is high and 30 to 80% of all cases die
How do vets treat rabbits with dysbiosis

• Treatment of Enteritis
  – Aggressive supportive care
  – Increase caecal and colonic motility
  – Discouraging the growth of pathogenic bacteria and the product of toxins
  – Supporting the growth of normal flora: Probiotics and Prebiotics

Treatment (2)

• Treatment of Enteritis
  Drugs used in dysbiosis:
  • Clostridium might be sensitive to chloramphenicol and sulfamethoxazole
  • Metronidazole 20 mg/kg q12h, help reduce mortality rate from endotoxemia
  • IV or IO fluid (sometime you need to give fluid by SC route ASAP)
  • Cisapride or Metoclopramide provide GI motility (Alternative: Ranitidine)
  • Diet high in fiber (prefer >20%)
  • Cholestyramine is ion exchange resin use for absorb enterotoxin
    – Dose = 2g. per 20 mL water q24h. by gavage.
  • Sulfa and toltrazuril (Baycox) use for Coccidiosis
Malocclusion

• Normal function of mastication  
  – How the rabbits masticate foods?
• Malocclusion is differentiated to 6 grades  
• Key point for treatment protocols
Grading of Malocclusion

Modified by Weerakhun (2010)
Summary

• Fibers is an important role in maintaining good health in rabbits
• Chewing and grinding food wears the teeth and helps to maintain normal dental occlusion
• Diet deficient in fibrous material has been implicated in cheek tooth overgrowth

Summary (2)

• Diets low in indigestible fibers predispose to gastrointestinal hypomotility and the retention of food and hair in the stomach (hairballs)
• Slow gut motility and increased food retention time in the hindgut can result in alterations in gut flora and the development of enterotoxaemia
Summary (3)

- Diet high in indigestible fiber to indoor rabbits reduces the ingestion of non-food items such as carpet fibers
- Diets high in indigestible fibers increase the rabbit’s appetite for caecotrophs

Thank you for your attention