Ruminant Animals: An Introduction

ANSC 324

What are Ruminants?
- *Ruminare* = Latin ‘to chew over’
- Websters
  - Mammals that have evolved a highly specialized mode of digestion that enables them to ingest/digest/utilize fibrous feeds more than herbivores
  - A cud-chewing, even toed, hooved animal

Why ruminants?
- Ruminants obtain nourishment from forage and byproducts which people cannot directly consume
- Ruminants provide food, byproducts and services.

Ruminant Food Products
- Contain valuable nutrients
- Provide an adequate supply of essential amino acids
- Small quantities can prevent protein deficiency

Value of Ruminant Products
- Clothing, shoes
- Medicinals
- Fuel
- Employment
- Fertilizer
- Conservation (open plains)
- Cultural and religious significance

Ruminant Types
(based on feeding patterns)
Land use: United States

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Land Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
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<tr>
<td>80%</td>
<td>Cropland</td>
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<tr>
<td>60%</td>
<td>Grassland</td>
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<tr>
<td>40%</td>
<td>Forest</td>
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<tr>
<td>20%</td>
<td>Special use: highways, parks, wildlife</td>
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<tr>
<td>0%</td>
<td>Urban</td>
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Energy recovered per energy expended

<table>
<thead>
<tr>
<th>kcal out/kcal input</th>
<th>Vegetables</th>
<th>other major crops</th>
<th>Fruits and nuts</th>
<th>Food grains</th>
<th>Oil crops</th>
<th>Feed grains</th>
<th>Hay and silage</th>
<th>grazing land</th>
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Feed Efficiency

<table>
<thead>
<tr>
<th>Protein conversion and protein equivalents</th>
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</thead>
<tbody>
<tr>
<td>1 Ton of corn = 178 lbs of protein</td>
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<tr>
<td>1 Ton of corn fed to beef cattle yields 128 lbs of protein</td>
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<tr>
<td>But on a protein value basis</td>
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<tr>
<td>178 x .53 = 94.3 lbs of metabolizable protein vs.</td>
</tr>
<tr>
<td>128 x .73 = 93.4 lbs of metabolizable protein</td>
</tr>
</tbody>
</table>

Structures of the rumen

- Esophagus
- Cardia
Contractions of the reticulum sieve out large feed particles for remastication

Structures of the rumen

Linings of the Rumen, Omasum and Abomasum

- Reticulum
- Omasum
- Abomasum

Structures of the omasum
Structures of the omasum

- Leaves = laminae
- Spaces between leaves = intralaminar recesses
- Omasal groove
  - continuous with the ROO and the opening to the abomasum
  - is an extension of the esophageal groove (ventricular groove)
- Vestibule(s) – spaces between the edge of the laminae and the omasal groove.

Omasum

- Presence of many leaves (manyplies)
- Functions to absorb water from the digesta
  - Decreases bicarbonate levels
  - Increase DM content
- Acts as a 2-stage pump
  - 1) pulls digesta in and 2 pushes it out (to the abomasum)
- Absorb peptides and amino acids

Abomasum

- Glandular gastric mucosa
- HCl secretion - stimulated by VFA and contractions of the abomasum

Intestinal Layers

- Mucosa
- Submucosa
- Serosa
- Muscle
- Lumen

Intestinal Sections

- Small Intestine

1/3 Duodenum + 1/3 Jejunum + 1/3 Ileum??

NO!!
Intestinal Sections (cont.)

- duodenum
- jejunum
- ileum
- pylorus
- Small intestine
- Large intestine

Intestinal Length

- Length relative to body length
- High forage diet = longer (80:20)
- Low forage diet = shorter (70:30)

Large Intestine Structure

- Cecum – larger in concentrate selectors
- Colon – longer in concentrate selectors
- Same layers as small intestine
- Epithelium has crypts and goblet cells, no villi

Are ruminants the same as non-ruminants from the intestines on?

NO!