Challenges of Horse Nutrition

- Digestive physiology
- Feeding of components
- Size and breed differences
Digestive System

- Non-ruminant herbivore
- Foregut
  - Enzymatic digestion
- Hindgut
  - Fermentative digestion
Digestive System

- **Stomach**
  - Small!
  - One-way passage

- **Small intestine**
  - Majority of nutrient digestion and absorption
  - Soluble carbohydrates, protein, fat

- **Large intestine**
  - Digest structural carbohydrates via bacterial fermentation
    - VFA produced
  - B vitamins and vitamin K produced
Feeding This System

- Digestive system suited for small quality forage-type meals
- System works well with continuous feeding
  - Large CHO meals may lead to colic, founder
- Forage should be main diet component
- Concentrate feed considered supplemental
A Horse’s Diet

- Dietary components
  - Forage
    - Pasture, hay
  - Concentrates
    - Energy
    - Protein
    - Additives
  - Water
  - Supplements??
Forages

• Foundation of a successful feeding program
  - Daily nutrient needs
  - Maintains digestive tract
  - Minimizes vices

• Selection is critical
  - Visual appraisal vs. chemical analysis

• Include in diet at minimum of 1% BW daily!
Concentrates - Energy

- Consider supplemental to quality forage
  - Increases energy input
- Grains used to provide energy
  - Oats, Corn, Barley, Sorghum
- Fat also added for energy
- Grains often processed to increase digestion in small intestine
## Relationship of Crude Fiber to Expected DE in Conventional and Fat Supplemented Concentrates

<table>
<thead>
<tr>
<th>CF% on Feed Tag</th>
<th>Approximate DE (Mcal/lb)</th>
<th>DE (Mcal/lb) With 4-5% Added Fat (Tag Reads 7-8% fat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.62</td>
<td>1.72</td>
</tr>
<tr>
<td>4</td>
<td>1.55</td>
<td>1.65</td>
</tr>
<tr>
<td>6</td>
<td>1.45</td>
<td>1.55</td>
</tr>
<tr>
<td>8</td>
<td>1.35</td>
<td>1.45</td>
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<tr>
<td>10</td>
<td>1.25</td>
<td>1.35</td>
</tr>
<tr>
<td>12</td>
<td>1.15</td>
<td>1.25</td>
</tr>
</tbody>
</table>
Concentrates - Protein

- Protein quality is key, especially for growth
  - Soybean meal best source of amino acids
  - Other sources can be used, but not alone
- Lysine is first limiting amino acid
- Urea can be tolerated
<table>
<thead>
<tr>
<th>Classification</th>
<th>CP%</th>
</tr>
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<tbody>
<tr>
<td>Mature, Idle</td>
<td>8-10</td>
</tr>
<tr>
<td>Performance</td>
<td>10-14</td>
</tr>
<tr>
<td>Lactation</td>
<td>14-16</td>
</tr>
<tr>
<td>Foals, Weanlings</td>
<td>16</td>
</tr>
<tr>
<td>Yearlings</td>
<td>14</td>
</tr>
<tr>
<td>2-yr olds</td>
<td>12-14</td>
</tr>
</tbody>
</table>
Minerals

• Calcium and phosphorus required
  ◦ 2:1 ratio
  ◦ Most grains have inverted ratios
• Most other minerals adequate
  ◦ Cu, Zn, Mn important during growth
  ◦ Electrolytes (Na, Cl, K) for performance horses
Vitamins

- **Fat Soluble**
  - Vitamin A – usually added
  - Vitamin D – added at 10% of A
  - Vitamin K – hindgut fermentation

- **Water Soluble**
  - B complex vitamins – hindgut fermentation
  - Vitamin C – from glucose
Mare and Foal Nutrition
Broodmare

• Ideal body condition score of 6
• Types of broodmares
  ✷ Open
  ✷ Pregnant
  ✷ Lactating
Broodmare - Gestation

• Feed to meet maintenance requirements in first two trimesters
• Gradually increase concentrate portion of ration when approaching third trimester
Broodmare - Lactation

- Early lactation requires increase in energy, protein, and calcium.
- At foaling, increase concentrate portion of ration slowly.
Milk Production in Mares

![Graph showing milk production in mares over time after foaling. The graph indicates a peak in milk production at approximately 2 months after foaling and a decline thereafter.]
Foals and Weanlings

• Creep feed recommended
  - Late lactation does not support all nutrient needs
  - Nutrient requirements of foal differ from mare

• Creep rations
  - Assume low forage intake
  - Palatable
  - High quality

• Weanlings have low forage consumption
Growth Curve for Young Horses

Body Weight (lb) vs. Age (months)

- Rapid
- Moderate

Age (months): 0, 4, 8, 12, 16, 20, 24, 28, 32, 34

Body Weight (lb): 385, 485, 585, 685, 785, 885, 985, 1085, 1185

Image: A young horse standing by a body of water.
Working Horses
Working Horses

• Amount of energy needed is proportional to work
  ✷ Light
  ✷ Moderate
  ✷ Intense
Light Work

- Pleasure riding or training of show horses in non-demanding events
- Requires 25% increase in energy
  - Maintain CP to DE ratio

<table>
<thead>
<tr>
<th>Workload</th>
<th>DE (Mcal/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>15</td>
</tr>
<tr>
<td>Light</td>
<td>35</td>
</tr>
</tbody>
</table>
Moderate Work

- Work frequently performed by performance horses
- Requires 50% increase in energy
  - Maintain CP to DE ratio

![Graph showing DE (Mcal/d) for different workloads: Main, Light, Moderate]
Intense Work

- Frequently performed by racehorses and polo horses
- Requires 100% increase in energy
  - Maintain CP to DE ratio

![Graph showing DE (Mcal/d) for different workloads: Main, Light, Moderate, Intense. The Intense workload has the highest DE requirement.](image)
General Feeding Tips

• Most horses consume 2-2.5% BW daily
  • Minimum 1% forage
• Fresh water always available
• Access to trace mineralized salt block
• Feed by weight not volume
• Avoid “cutting” balanced rations
• Store grain out of reach
Individual Feeding

- Avoid feeding on the ground
  - Losses
  - Contact with parasites, etc.
  - Ingestion of soil
- Keep troughs clean and free of mold
- Attempt to slow aggressive eaters
Group Feeding

- Adequate space if single trough
- Better to provide individual feeders
  - 50 ft apart
  - Feed dominant horses first
Feeding Time and Frequency

- Feed regularly at same time each day
- Offer feed in multiple meals when grain intake exceeds 0.5% BW
  - Even time intervals
- Limit grain intake to 0.5 lb feed/100 lb BW per feeding
Changing Rations

• Change type of feed or amount offered gradually
  - Over 1 week
  - Avoids digestive upsets

• 3 weeks to adapt to any dietary changes
  - Supplements
The purpose of having a foal...