The American Hanoverian Society
Keepers of the Hanoverian and Rhineland Studbooks in America

Presents:

“Feeding the Broodmare”

Helping You Make The Best Management and Nutrition Decisions

Presented by:
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Member: USSHBA
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Broodmare Management and Nutrition
Equine Internal Medicine, 2nd edition

Written out presentation can be found in the Veterinary Textbook: Equine Internal Medicine, 2nd Edition, ‘Applied Nutrition’ chapter, pp 1543-1605

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Today’s Menu

Balancing your horses ‘Total Diet’ comes from:

1. Knowing all the daily nutrient needs of your horses
2. Knowing 14 different nutrients in your forage (hay and pasture)
3. Then you can select the best ‘Horse Feed’ or ‘Balancer’ to provide the difference between what nutrients are in your forage and what your horse needs to meet their nutrient needs

This is true for the pregnant and nursing mare, as well as: weanling, yearling, and performance horses
Three Equal Factors, when Breeding Horses: You Have Control Over Two of Them

Optimal Results To Achieve Your ‘Ultimate Goal’

Genetics
Management

Nutrition
All Feeding Programs

Should be based on:

1. Your Forage ‘Type’ (Grass vs. Legume) (6/14/18)
2. and Forage ‘Quality’ (Relative Feed Value)
3. and your Horses ‘Physiological Status’:
   a. Age (young or mature or geriatric)
   b. Size (current body weight, BCS & MDS)
      ▪ Growing
      ▪ Reproducing
      ▪ Performing (what level)
FEEDING FORAGES

- Horses are herbivores by design and foragers by nature.
- They will graze up to 18 hours per day when fed ad-lib forage (pasture or hay).
- Forages are consumed:
  1. **Fresh**, as pasture
  2. **Dried**, as baled, cubed or pelleted hay
  3. **Preserved**, as ‘haylage’ in silos or ‘baleage’ in plastic bags
FEEDING FORAGES

Feeding Forages ad-lib, will:

1. Decrease the incidence of colic
2. Improve the horses’ mental state
3. Improve nutrient absorption
4. Maximize feed efficiency
Why is Forage so Important?

As horses grow and mature, they become ‘continuous grazers’

- ‘Ad-lib’ forage is necessary to maintain a healthy digestive system, especially in the hind gut (cecum, large intestine, colon)

- While chewing, saliva is produced:
  - Saliva is the best buffer to stabilize intestinal pH
  - Mature Horses weighing 1,000 lbs, can produce 25 to 30 gallons of saliva per day (D. Cuddleford, Scotland, published 1992)

- Free choice hay also reduces boredom and vices
  - Especially in stressed horses
The ‘Type’ of Forage will Affect Nutrient Profile

The ‘**Optimal Ranges**’ of Nutrients in **Three Different ‘Types’** of Forage, when the RFV is **above** 103, i.e. Grade’s 1 & 2

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>1) Grass Forage Analysis</th>
<th>2) Mixed Forage Analysis</th>
<th>3) Legume Forage Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter</td>
<td>87.0 - 92.0 %</td>
<td>87.0 - 92.0 %</td>
<td>87.0 - 92.0 %</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>9.0 - 15.0 %</td>
<td>12.0 - 18.0 %</td>
<td>18.0 - 24.0 %</td>
</tr>
<tr>
<td>Lysine (amino acids)</td>
<td>.30 - .51 %</td>
<td>.51 - .76 %</td>
<td>.91 - 1.22 %</td>
</tr>
<tr>
<td>Crude Fat</td>
<td>2.0 - 2.4 %</td>
<td>2.3 - 2.7 %</td>
<td>2.6 - 3.0 %</td>
</tr>
<tr>
<td>ADF</td>
<td>40.0 - 31.0 %</td>
<td>40.0 - 31.0 %</td>
<td>40.0 - 31.0 %</td>
</tr>
<tr>
<td>NDF</td>
<td>60.0 - 45.0 %</td>
<td>56.0 - 43.0 %</td>
<td>53.0 - 41.0 %</td>
</tr>
<tr>
<td>Mcal/lb of Dig. Energy</td>
<td>.86 - .95</td>
<td>.93 - 1.10</td>
<td>1.00 - 1.17</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.25-0.80 %</td>
<td>0.80-1.20 %</td>
<td>1.20-1.80 %</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.20-0.30 %</td>
<td>0.25-0.35 %</td>
<td>0.25-0.35 %</td>
</tr>
<tr>
<td>Potassium</td>
<td>0.80-1.50 %</td>
<td>1.50-3.00 %</td>
<td>2.00-3.50 %</td>
</tr>
<tr>
<td>Manganese</td>
<td>40-70 ppm</td>
<td>40-60 ppm</td>
<td>40-50 ppm</td>
</tr>
<tr>
<td>Iron</td>
<td>60-200 ppm</td>
<td>60-200 ppm</td>
<td>60-200 ppm</td>
</tr>
<tr>
<td>Copper</td>
<td>2-10 ppm</td>
<td>4-10 ppm</td>
<td>4-10 ppm</td>
</tr>
<tr>
<td>Zinc</td>
<td>12-26 ppm</td>
<td>14-26 ppm</td>
<td>14-28 ppm</td>
</tr>
</tbody>
</table>
Maturity of the Plant Before Cutting will Affect:

- **Digestibility/Fermentability** of the:
  1. Fibers (Relative Feed Value)

- **Amount/Availability** of the:
  1. Protein (Amino Acids)
  2. Calories (Digestible Energy)
  3. Major minerals
  4. Trace minerals
  5. Vitamins
Relative Feed Value of Hay

Endorsed by The Marketing Task Force of the American Forage & Grassland Council:

1. The Acid Detergent Fibers (ADF) determines ‘palatability of the forage’ (hay and pasture)

2. The Neutral Detergent Fibers (NDF) determines ‘how much can be eaten’ per day (it’s rate of passage is determined by how fast the fibers are broken down by fermentation)
The higher the RFV score in forages, the more Palatable and Digestible it is.

The table below lists:
- the **Forage Grades**
- the nutrient ranges of **ADF %** and **NDF %**
- their **Relative Feed Value is**
- **Hay Intake per day**, as a % of their Body Weight (how much can they eat per day?)

<table>
<thead>
<tr>
<th>Forage Grade:</th>
<th>If the ADF is:</th>
<th>If the NDF is:</th>
<th>Then the RFV is:</th>
<th>Forage Intake is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime</td>
<td>Under 30</td>
<td>Under 40</td>
<td>Over 151</td>
<td>&gt;3.0%</td>
</tr>
<tr>
<td>1 (Premium)</td>
<td>31-35</td>
<td>41-46</td>
<td>150-125</td>
<td>3.0-2.6%</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>36-40</td>
<td>47-53</td>
<td>124-103</td>
<td>2.5-2.3%</td>
</tr>
<tr>
<td>3 (Utility)</td>
<td>41-42</td>
<td>54-60</td>
<td>102-87</td>
<td>2.2-2.0%</td>
</tr>
<tr>
<td>4 (Utility)</td>
<td>43-45</td>
<td>61-65</td>
<td>86-75</td>
<td>1.9-1.8%</td>
</tr>
<tr>
<td>5 (Avoid)</td>
<td>Over 46</td>
<td>Over 66</td>
<td>Under 74</td>
<td>&lt;1.8%</td>
</tr>
</tbody>
</table>

Therefore, the Maturity of the Plant, When Cut, Will Affect its RFV

- Palatability (ADF)
- Digestibility/Fiber Fermentability (NDF)
  1) Availability of its nutrients (RFV)
  2) RFV will determine the true value of ‘all’ forages
  3) Using RFV in your hay selection, can help lower your feeding cost per day
’Cool Season’ Grass Hay – Example:

Cell Contents:
Non-Structured Carbohydrates (NSC)

Cell Wall Contents:
Structured Carbohydrates (SC)

Plant Carbohydrates

Cell Contents

Cell Wall

Organic Acids
Mono- & Disaccharides
Oligosaccharides
Fructans
Starch
Pectic Substances
Hemicelluloses
Cellulose

ESC

WSC

ADF

NDF
Using the ‘Relative Feed Value’ as a ‘Tool’ on Breeding Farms

**Nutrient Needs: Forage Grade Best RFV to Feed**

1) Highest Need ..........1.................. Over 125
   - **Best for:** Lactating, Sucklings, Weanlings

2) Medium Need ..........2............... 103 to 124
   - **Best for:** Pregnant, Yearlings, Stallions

3) Lowest Need ..........3 to 4..............75 to 102
   - **Best for:** ‘Easy keeping’ Open and Pregnant mares

4) Avoid feeding ..........5............... Below 74
   - Because there is a high incidence of ‘impaction colic’ due to the amount of ‘over-mature and unfermentable’ fiber
Example: Same Field of Grass Hay Harvested at Different Maturity’s on my Farm (2+ weeks apart in August)

<table>
<thead>
<tr>
<th>Nutrients, DM Basis</th>
<th>Grade 2</th>
<th>Grade 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relative Feed Value</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude Protein</td>
<td>12.0%</td>
<td>6.0% (50% loss)</td>
</tr>
<tr>
<td>NSC (starch + ESC)</td>
<td>15.0%</td>
<td>9.0% (40% loss)</td>
</tr>
<tr>
<td>Digestible Energy</td>
<td>1,000 kcal/lb</td>
<td>700 kcal/lb (30% loss)</td>
</tr>
<tr>
<td>Calcium, %</td>
<td>0.38%</td>
<td>0.22% (40% loss)</td>
</tr>
<tr>
<td>Phosphorus, %</td>
<td>0.28%</td>
<td>0.16% (40% loss)</td>
</tr>
</tbody>
</table>
Basics of Amino Acids

1. **Amino Acids**
   a. Are the Building Blocks of Protein
   b. After 2 days of age, Horses must break down the Crude Protein into its individual amino acids for absorption
   c. Therefore, horses have Amino Acid requirements, not a Crude Protein requirement

2. **Essential vs. Non-Essential Amino Acids**
   a. Essential have to be provided in the diet everyday
   b. Non-Essential can be created or formed inside the body
Crude Protein is Made Up of 22 Amino Acids

- Amino Acids are Stored in the Muscle
  - Needed to: Grow, Reproduce and Perform
  - All Feeding Programs are Only as Good as their ‘First Limiting’ Amino Acid

- Ten **Essential** Amino Acids
  - Lysine, Methionine, Threonine and Tryptophan
  - Cystine, Histidine, Arginine
  - Leucine, IsoLeucine and Valine (the BCAA’s)

- **Good Quality Amino Acid Sources**
  - Milk/Whey & Legumes (Alfalfa & Soybean)

- **Lower Quality Amino Acid Sources**
  - Cereal Grains (Oat, Corn, etc) and Grasses (Cool & Warm Season)
Basics of the ‘Essential’ Amino Acids

- PHYNLALANINE
- TRYPTOPHAN
- HISTIDINE
- ARGININE
- Isoleucine
- Leucine
- Valine
- Methionine
- Threonine
- Lysine

Growth
Hoof & Hair Quality
Tissue Repair

3 Branch Chain AA’s ‘Suckling & Weanling’ Development

Tissue Repair
The ‘First Limiting’ Amino Acid Depicts the Affect it has on the Rate of Protein Synthesis that can be Sustained*

Basics of Amino Acids

The First Limiting ‘Essential’ Amino Acids will be Determined by the ‘Type’ of Forage Fed *:

A. On a ‘Grass’ hay diet:
   1. Lysine
   2. Threonine
   3. Methionine

B. On a ‘Alfalfa’ hay diet:
   1. Either - Threonine or Tryptophan

*Dr. L.E. Chase, Dept of Animal Science, Cornell University
The first ‘limiting’ amino acid will determine the availability of ‘all’ the amino acids in the diet.

### For Example:

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>% of Req. in Diet</th>
<th>% Synthesized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysine</td>
<td>150%</td>
<td>80%</td>
</tr>
<tr>
<td>Methionine</td>
<td>110%</td>
<td>80%</td>
</tr>
<tr>
<td>Threonine</td>
<td>100%</td>
<td>80%</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>80%</td>
<td></td>
</tr>
</tbody>
</table>
Developmental Orthopedic Disease (DOD)

A Multifactorial Problem with three different component’s:

1) Genetics
2) Management
3) Nutrition

Appearing in different forms, further defined as:

1) Physitis
2) Bone Cysts
3) Acquired Contracted Flexor Tendons
4) Osteocondrosis
5) Osteocondrosis Dissecans
6) Wobblers
7) Juvenile Arthritis
DOD Prevention ‘Begins at Conception’

EM Komtess V, aka, Rivita (Riverman/Carolus)

100% of EM Rivita’s, filly offspring are Elite or Hanoverian Premium Mares.
Prenatal Nutrition

Research quote from: Univ. of Kentucky, Cornell and Illinois Depart of Veterinary Science, as well as the 2007 NRC for Horses:

“The prenatal nutrients received in the middle trimester of pregnancy is just as important as the last trimester.”

This change in management and nutrition has helped many breeding farms improve:

1) the health and reproductive status of their mares, and

2) reduce the incidence of early developmental problems in their resulting foals
Prenatal Nutrition

1. Managers and owners have looked at the Body Weight of pregnant mares on pasture and elected not to provide any additional ‘food/supplement’ because they are fat and shiny.

2. **Remember:** No forage alone today will meet the ‘Recommended Allowance’ of all the major mineral and trace mineral needs of a pregnant mare.

3. **Balancers** can ‘easily’ fill these gaps and meet all of the pregnant mare’s daily nutrient needs, on a low calorie diet.
Prenatal Nutrition

Prevention is the key to reduce the incidence of ‘Nutrition Related, DOD’ in young, growing horses

Recommended Management:

1) Prenatal Nutrition: meet the mares needs the ‘entire’ pregnancy
   a) Maintaining the mares BCS between 5.5 and 6.5

2) Lactation Nutrition: provide the ‘Recommended Allowance’ of nutrients to assure the ‘nutrient density in mares milk’ AND ‘the embryo for next years foal’, while:
   a) Maintaining the mares BCS (body fat) between 5.0 and 6.0
   b) Maintaining the mares (MDS (muscle mass) at an A or B+ Score
1) If the mare is not provided adequate prenatal nutrients (amino acids, major & trace minerals) during pregnancy, she has the ability to pull those nutrients from her body reserves to supply her fetus.

2) Only when her bodies “nutrient reserves” are used up, will her foals be born with ‘nutrition related’ deficiencies. (Contracted Tendons, OC’s, Angular Limb Deformities, etc.)
1. Over the past 40 years of being involved in DOD Research and Prevention, when over 25% of the foals on a farm are affected, we were able to reduce the incidence of skeletal and growth related anomalies by an average of 80%.

2. How? By concentrating on a) prenatal nutrition and b) monitoring the foals growth rates and feeding them according to their age and size. i.e. individual growth rate.

3. Pregnancy is the ideal time to feed ‘Balancers’ or ‘Supplements’ to meet prenatal needs.

   ‘Balancer’: A nutrient dense pellet containing concentrated amounts of Amino Acids (Protein), Minerals and Vitamins, but NO Cereal Grains (low calorie)
Nutrient ‘Optimal Range’ is in-between their Recommended Allowance & Upper Safe Limit.

- Deficient Level
- Optimal Range
- Toxic Level

Low     Increasing Levels of each Nutrient     High

Deficient Level: NRC
Optimal Range: RA
Toxic Level: USL

Nutrient ‘Optimal Range’ is in-between their Recommended Allowance & Upper Safe Limit.
Compare the Mare’s ‘Recommended Allowance’ while: Open, Pregnant and Lactating, on a Dry Matter Basis, to the Analysis of Your Forage

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Open</th>
<th>Pregnant (1-3 Months)</th>
<th>Lactation (4-6 Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter intake, % body wt*</td>
<td>1.5-2.0</td>
<td>1.5-2.0</td>
<td>2.5-3.5</td>
</tr>
<tr>
<td>Crude Protein, %</td>
<td>8.50</td>
<td>11.50</td>
<td>15.00</td>
</tr>
<tr>
<td>Calcium, %</td>
<td>0.30</td>
<td>0.53</td>
<td>0.70</td>
</tr>
<tr>
<td>Phosphorus, %</td>
<td>0.21</td>
<td>0.35</td>
<td>0.40</td>
</tr>
<tr>
<td>Potassium, %</td>
<td>0.40</td>
<td>0.50</td>
<td>0.80</td>
</tr>
<tr>
<td>Magnesium, %</td>
<td>0.10</td>
<td>0.12</td>
<td>0.15</td>
</tr>
<tr>
<td>Sodium, %**</td>
<td>0.14</td>
<td>0.14</td>
<td>0.20</td>
</tr>
<tr>
<td>Copper, mg/kg</td>
<td>15</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Iron, mg/kg</td>
<td>40</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Manganese, mg/kg</td>
<td>40</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Zinc, mg/kg</td>
<td>40</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Cobalt, mg/kg</td>
<td>0.20</td>
<td>0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>Iodine, mg/kg</td>
<td>0.25</td>
<td>0.25</td>
<td>0.50</td>
</tr>
<tr>
<td>Selenium, mg/kg</td>
<td>0.15</td>
<td>0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>Vitamin A, IU/kg</td>
<td>2,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Vitamin E, IU/kg</td>
<td>50</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Thiamine, mg/kg</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Riboflavin, mg/kg</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

These ‘Recommended Allowances’ were first published by The Ohio State University, Dept. of Vet. Sciences, in 1986.

*Feed intake is determined by: Body capacity, RFV of forage, physiological status, activity level and environment.

**Under average conditions .35% to .50% Salt (NaCl) is recommended in the total diet.

Needed Digestible Energy, Mcal/day is determined by: Body size, metabolic rate, reproductive status, dry matter consumption and Body Condition Score.
Beatrice VDL
with the newborn Rousseau colt, Helios

Paard Hill Farms, Ron and Dee Osborne
Helios – 1 day old
by Rousseau out of Beatrice VDL, Paard Hill Farms, Ron and Dee Osborne
The Lactating Mare

Milk production is influenced by:

1. Maiden vs. > 2\textsuperscript{nd} lactation
2. The month of lactation
   (will peak between 4-6 weeks)
3. Genetic potential (quality & quantity)
4. Nutrient input vs. nutrient output per day
5. Individual foals’ intake per day
The Lactating Mare

Watch your nursing mare’s nutrient input – output relationship:

1. If **calories** are in short supply, her fat stores will be used up and she will lose body weight.

2. If **amino acids (protein)** are in short supply, her muscles will be sacrificed and she will lose the muscle mass. Easiest place to see this, is on her topline.

3. If **major & trace minerals** are in short supply, her bone and liver stores will be compromised (you cannot see this until the foal is born, or becomes compromised).
# Mare’s Milk Composition, by Week

## Dry Matter & As Fed Basis

<table>
<thead>
<tr>
<th>Week</th>
<th>% Solids</th>
<th>Energy kcal/100mg</th>
<th>Protein %</th>
<th>Fat %</th>
<th>Lactose %</th>
<th>Ash (b) %</th>
<th>Calcium %</th>
<th>Phosphorus %</th>
<th>Magnesium %</th>
<th>Potassium %</th>
<th>Sodium %</th>
<th>mg/kg Copper</th>
<th>mg/kg Zinc</th>
<th>mg/kg Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>---------</td>
<td>536</td>
<td>75.79</td>
<td>2.75</td>
<td>18.25</td>
<td>2.86</td>
<td>0.34</td>
<td>0.16</td>
<td>0.19</td>
<td>0.45</td>
<td>0.21</td>
<td>3.93</td>
<td>25.40</td>
<td>5.2</td>
</tr>
<tr>
<td>12 hrs.</td>
<td>---------</td>
<td>557</td>
<td>33.04</td>
<td>20.87</td>
<td>41.74</td>
<td>4.35</td>
<td>0.68</td>
<td>0.35</td>
<td>0.12</td>
<td>0.84</td>
<td>0.32</td>
<td>7.22</td>
<td>24.40</td>
<td>8.26</td>
</tr>
<tr>
<td>24 hrs.</td>
<td>---------</td>
<td>544</td>
<td>28.95</td>
<td>21.93</td>
<td>45.61</td>
<td>4.65</td>
<td>0.85</td>
<td>0.39</td>
<td>0.1</td>
<td>0.74</td>
<td>0.30</td>
<td>6.4</td>
<td>31.60</td>
<td>9.21</td>
</tr>
<tr>
<td>1-4 w.k.</td>
<td>---------</td>
<td>542</td>
<td>25.23</td>
<td>16.82</td>
<td>57.94</td>
<td>4.91</td>
<td>1.12</td>
<td>0.68</td>
<td>0.08</td>
<td>0.65</td>
<td>0.21</td>
<td>4.21</td>
<td>23.36</td>
<td>7.99</td>
</tr>
<tr>
<td>5-8 w.k.</td>
<td>---------</td>
<td>505</td>
<td>20.95</td>
<td>16.19</td>
<td>60.95</td>
<td>3.81</td>
<td>0.95</td>
<td>0.57</td>
<td>0.06</td>
<td>0.48</td>
<td>0.18</td>
<td>2.48</td>
<td>19.05</td>
<td>6.29</td>
</tr>
<tr>
<td>9-12 w.k.</td>
<td>---------</td>
<td>500</td>
<td>18.00</td>
<td>14.00</td>
<td>65.00</td>
<td>3.00</td>
<td>0.80</td>
<td>0.5</td>
<td>0.05</td>
<td>0.4</td>
<td>0.15</td>
<td>2.00</td>
<td>18.00</td>
<td>4.9</td>
</tr>
</tbody>
</table>

## As Fed Basis

<table>
<thead>
<tr>
<th>Week</th>
<th>% Solids</th>
<th>Energy kcal/100mg</th>
<th>Protein %</th>
<th>Fat %</th>
<th>Lactose %</th>
<th>Ash (b) %</th>
<th>Calcium %</th>
<th>Phosphorus %</th>
<th>Magnesium %</th>
<th>Potassium %</th>
<th>Sodium %</th>
<th>mg/kg Copper</th>
<th>mg/kg Zinc</th>
<th>mg/kg Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>25.2</td>
<td>535</td>
<td>19.1</td>
<td>0.7</td>
<td>4.6</td>
<td>0.72</td>
<td>0.085</td>
<td>0.039</td>
<td>0.0473</td>
<td>0.11</td>
<td>0.052</td>
<td>0.99</td>
<td>6.4</td>
<td>1.31</td>
</tr>
<tr>
<td>12 hrs.</td>
<td>11.5</td>
<td>64</td>
<td>3.8</td>
<td>2.4</td>
<td>4.8</td>
<td>0.50</td>
<td>0.078</td>
<td>0.040</td>
<td>0.0138</td>
<td>0.10</td>
<td>0.036</td>
<td>0.83</td>
<td>2.8</td>
<td>0.095</td>
</tr>
<tr>
<td>24 hrs.</td>
<td>11.4</td>
<td>62</td>
<td>3.3</td>
<td>2.5</td>
<td>5.2</td>
<td>0.53</td>
<td>0.097</td>
<td>0.044</td>
<td>0.0110</td>
<td>0.08</td>
<td>0.034</td>
<td>0.73</td>
<td>3.6</td>
<td>1.05</td>
</tr>
<tr>
<td>1-4 w.k.</td>
<td>10.7</td>
<td>58</td>
<td>2.7</td>
<td>1.8</td>
<td>6.2</td>
<td>0.53</td>
<td>0.120</td>
<td>0.073</td>
<td>0.0090</td>
<td>0.07</td>
<td>0.023</td>
<td>0.45</td>
<td>2.5</td>
<td>0.86</td>
</tr>
<tr>
<td>5-8 w.k.</td>
<td>10.5</td>
<td>53</td>
<td>2.2</td>
<td>1.7</td>
<td>6.4</td>
<td>0.40</td>
<td>0.100</td>
<td>0.060</td>
<td>0.0060</td>
<td>0.05</td>
<td>0.019</td>
<td>0.26</td>
<td>2.0</td>
<td>0.66</td>
</tr>
<tr>
<td>9-12 w.k.</td>
<td>10.0</td>
<td>50</td>
<td>1.8</td>
<td>1.4</td>
<td>6.5</td>
<td>0.30</td>
<td>0.080</td>
<td>0.050</td>
<td>0.0045</td>
<td>0.04</td>
<td>0.015</td>
<td>0.20</td>
<td>1.8</td>
<td>0.49</td>
</tr>
</tbody>
</table>

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*a NRC 2007, Nutrient Requirements of Horses

*b Ullrey, DE., Struthers, R.D., Hendricks, D.G., and Brent, B.E., 1996 Composition of Mare’s Milk, Jan-Sci.25:217

IF PHYSITIS, ANGULAR or FLEXURE DEFORMITIES OCCUR:

1. Analyze the diets of the pregnant and nursing mares for nutrient adequacy or imbalances
2. Analyze the mares milk for nutrient density, every month (5, 30 and 60 days)
3. Administer a liquid or paste Foal Supplement to the foal at the appropriate amount, based on: 1) the milk analysis and 2) the foals current age and body wt.
4. Wean the foal, if over 4 months of age

DO NOT STARVE THE MARE OR FOAL

Photo credit: Dr. Sarah Ralston, Rutgers
DOD? It’s NOT the Protein!

Several research projects have been completed in recent years to prove that adequate or above the NRC Requirements for protein do not cause DOD *

* Sarah Ralston, PhD, DVM, retired Professor, Rutgers

MS Brimming (Banter /Androit/Akzent I) with her 4 month old foal by Rousseau, Roanoke OBX, at his AHS Foal Inspection

Brimming gave birth to 13 foals (10 filly’s) 9 of her daughters are EM / HPM’s, and one is Elite Eligible
Protein Component of D.O.D.

Dr. Ed Ott, from the University of Florida, has researched and published that feeding protein levels BELOW the NRC for Horses requirement, will:

1. Decrease bone density
2. Have a negative impact on tendon and ligament strength
Protein Component of D.O.D.

He also published:

1. As long as the protein was fed below NRC requirements for growth, adding additional minerals into their diet had ‘no effect’ on their skeletal anomalies

2. However, increasing the amount of protein, while maintaining the same amount of minerals:
   a) Increased the weanlings bone density
   b) Increased their tendon strength
Other Nutrients Implicated in Developmental Orthopedic Disease

1. The **only link** between feeding recommended levels of protein in the diet and DOD was when one or more of the minerals (calcium, phosphorus, copper or zinc) were fed **below NRC levels**.

2. **Conclusion**: Feeding an ‘amino acid (protein) deficient’ diet is **just as detrimental** as feeding a ‘mineral deficient’ diet. The results will be the same.
DOD Problem Solving Procedures

Weigh and Record the pounds, or ounces, of everything fed per day:

1. hay, grain, any supplements, along with each of their analysis.
2. enter into an Equine Ration Balancing Program and check for deficiencies and/or mineral interferences.
Each Feed Tag has a ‘Purpose Statement’

Make sure you SELECT a FEED whose label states:

1) **To be Fed to:** “Weanlings, Yearlings and Lactating Mares”

2) **And** the recommended pounds to feed per day are within reasonable amounts to maintain your horses desired body weight
Today’s Take Home Message

Feeding less amino acids (protein) then needed:

1. Can easily be seen in the horses muscle mass (Topline Evaluation Score)

Conclusion:

1. Young, growing horses with concave back and loin muscles, caused from inadequate amino acids (protein) in their diet, may be predisposed to:
   a) weak skeletal structures (fractures)
   b) weak tendons and ligaments (suspensory)
   c) soft tissue injuries
EM Rising Star MF
(Rotspon/Ramiro’s Son II/Pik Koenig)
Showing at DaD, 14 years old, Nursing her 10th foal and Pregnant with #11

Star’s offspring include:
• 2 Approved Stallions
• 1 Dressage at Devon ‘Champion’
• EM/HPM daughters
• Many ‘Top Foals of the Day’