Determining Hay Quality and Managing Forages at Home

Presented by
Joe Monroe & Hannah Bollinger
Cargill Animal Nutrition

Sponsored by:
Nutrena® Nutrition for a lifetime.
Nutrena & Progressive Nutrition have combined forces to improve the future of equine nutrition!
Today’s Agenda

1. Managing your hay and feeding program
2. Understanding how forage can affect the horse digestive system
3. Determining forage quality
   1. Relative Feed Value in Forage
   2. NSC’s in Forages and Cereal Grains
4. Different horse feeds available
Feeding for Performance
Humans → Horses
Three Equal Factors in Performance: Owners Have Control Over Two of Them

Maximum Results To Take You to Your ‘Optimal Goal’

Nutrition

Genetics

Training
History

- Horses digestive systems are designed for:
  - Roaming long distances, up to 25 miles a day
  - Continuous, selective grazers
  - Eating many small meals throughout the day, as they graze up to 18 hours per day
  - Flight, not fight—small stomach and streamlined digestive system
How have we changed the lifestyle of the horse?

- Stall confinement
- Long trailer rides
- Fed twice a day
- Increased performance demands
Digestive System

Starch digestion occurs in the stomach and small intestines
(Stomach: 15 min. Small intestine: 30-90 min.)

Amino acids and fat digested and absorbed in small intestine

Vitamins/minerals absorbed in small intestine

Fiber digestion occurs in the cecum/colon (48-72 hours)

Nutrena®
FEEDING FORAGES:

1. Horses are herbivores by design and foragers by nature

2. Forages are consumed as:
   a. **Fresh**, as pasture (70-80% Water)
   b. **Dried**, as baled or cubed hay (10-12% Water)
   c. **Preserved**, in plastic bags (40-50% Water)
Importance of Forage in the Horse Diet

1. Continuous grazers
   a) Horses will graze up to 18 hours per day
   b) Maintain normal gut function
   c) Reduce intestinal twists/torsions from occurring
   d) Saliva is produced while chewing
      1. Contains enzymes and lubricates the whole digestive system
      2. The best buffer to stabilize intestinal pH
         a) Helps to keep ulcers in check
   2. Reduces boredom and vices
      a) Especially in stressful situations like: confinement, competition
Importance of Forage in the Horse Diet

Feeding forages free choice, will:

1. Decrease the incidence of colic
2. Improve the metal state of the horse
3. Increase nutrient absorption
4. Maximize feed efficiency
Importance of Forage in the Horse Diet

Good forage can supply the majority of the necessary nutrients needed

a) Horse feed or balancers should provide the difference between what nutrients are in your forage and what your horse needs

b) Some horse feeds contain higher calories, select them when needed

c) Hay is what will keep your horse warm in the winter (fermentation by-product = heat)

d) Choose highest quality hay (softest) when possible for performance horses

1. Hay Belly (When RFV < 86, = <Grade 4 Hay)
Importance of Forage in the Horse’s Diet

1. As horses mature, they become continuous grazers.

2. Ad-lib forage is necessary to maintain a healthy digestive system (cecum and large intestine).

3. While chewing, saliva is produced:
   a. Horses can produce 25 to 30 gallons per day, per 1,000 lbs of body weight.
   b. Saliva is the best buffer to stabilize intestinal pH.

4. Free choice hay also reduces boredom and vices:
   a. Especially in stressed horses.
Forage – The Foundation of the Horses Diet

- Forage: Hay/Pasture should provide between 50% to 90% of the mature horses total diet.

- The average mature horse should be fed a minimum of 2% of their body weight in hay/day.
  - So how many flakes of hay is that?

- Grass hay example @ 3#/flake fed at 2% bwt
  - 500# pony: 10# hay = 3.3 Flakes/day
  - 1000# horse: 20# hay = 6.6 Flakes/day
Free choice forage
4lbs nutrition
DETERMINING FORAGE QUALITY
Maturity of the plant when harvested

- Horses will eat the ‘softest’ forage first
- Immature grasses have a lower NDF than legumes, but higher when mature
  - Therefore, immature grasses are more palatable in the pasture, and less palatable as mature hay than legumes (Alfalfa, Clover, etc.)
Relative Feed Value

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 (controlled by it’s rate of passage)
Maturity of the plant at harvest will effect:

- **Digestibility** of the Fibers:
  1. ADF and NDF

- **Availability** of the Nutrients:
  1. Protein
  2. Calories
  3. Major minerals
  4. Trace minerals
  5. Vitamins
Relative Feed Value (RFV)

The higher the RFV score in forages, the more palatable and digestible it is.

The table below lists:
a) the Forage Grades
b) the nutrient ranges of ADF and NDF percentages
c) their resulting Relative Feed Value
e) Hay Intake per day, as a % of their Body Weight

Forage Grade: If the ADF is: If the NDF is: Then the RFV is: Hay Intake is:

<table>
<thead>
<tr>
<th>Prime</th>
<th>ADF Range</th>
<th>NDF Range</th>
<th>RFV Range</th>
<th>Intake</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</td>
<td>31-35</td>
<td>41-46</td>
<td>150-125</td>
<td>3.0-2.6%</td>
</tr>
<tr>
<td>2</td>
<td>36-40</td>
<td>47-53</td>
<td>124-103</td>
<td>2.5-2.3%</td>
</tr>
<tr>
<td>3</td>
<td>41-42</td>
<td>54-60</td>
<td>102-87</td>
<td>2.2-2.0%</td>
</tr>
<tr>
<td>4</td>
<td>43-45</td>
<td>61-65</td>
<td>86-75</td>
<td>1.9-1.8%</td>
</tr>
<tr>
<td>5 (Reject)</td>
<td>Over 46</td>
<td>Over 66</td>
<td>Under 74</td>
<td>&lt;1.8%</td>
</tr>
</tbody>
</table>

Don Kapper, PAS, author and Stephen Reed, DVM, editor
The time for forages to go from ‘Prime’ to ‘5’

Ambient temperature effects maturity rate

- Cool seasons (Spring and Autumn)
  - 4 to 5 weeks
- Hot summer months
  - less than 3 weeks
Using the ‘Relative Feed Value’ as a management tool

<table>
<thead>
<tr>
<th>Nutrient Need</th>
<th>Best RFV to Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Highest Need</td>
<td>Over 125 (Prime - Grade 1)</td>
</tr>
<tr>
<td>- High Performance, Lactating</td>
<td></td>
</tr>
<tr>
<td>- Sucklings, Weanlings</td>
<td></td>
</tr>
<tr>
<td>2) Medium Need</td>
<td>103 to 124 (&gt;Grade 2)</td>
</tr>
<tr>
<td>- Eng. &amp; West. Pleasure</td>
<td></td>
</tr>
<tr>
<td>- Low Level Dressage, Yearlings</td>
<td></td>
</tr>
<tr>
<td>3) Lowest Need</td>
<td>75 to 102 (Grade 3 or 4)</td>
</tr>
<tr>
<td>- Mature Idle, Lay-ups</td>
<td></td>
</tr>
<tr>
<td>- ‘Special Needs’ horses, etc.</td>
<td></td>
</tr>
</tbody>
</table>

Avoid feeding hay with a RFV below 74 (Grade 5), because there is a high incidence of ‘impaction colic’ due to the amount of ‘over-mature and indigestible’ fiber.
Good grass year, bad hay year!

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>1) Grass Pasture 2014 (Grade 1) 130</th>
<th>2) Grass Hay Ave. (Grade 2) 110</th>
<th>3) Grass Hay - 2014 (Grade 4) 80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Feed Value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>14.0%</td>
<td>11.0%</td>
<td>5.5%</td>
</tr>
<tr>
<td>NSC (starch + sugar)</td>
<td>15.0%</td>
<td>12.0%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Digestible Energy</td>
<td>1,100 kcal/lb</td>
<td>950 kcal/lb</td>
<td>770 kcal/lb</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.38%</td>
<td>0.34%</td>
<td>0.22%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.28%</td>
<td>0.22%</td>
<td>0.16%</td>
</tr>
</tbody>
</table>
Managing horses with ‘Special Needs’
Carbohydrate Sensitive Conditions

A group of conditions that all have the same nutritional goal

- Insulin Resistance
- Cushings
- Equine Metabolic Syndrome
- Laminitis
- PSSM

1. Reduce daily carbohydrate intake
   a) Sources and forms of carbohydrate
Non Structural Carbohydrates (NSC) in cereal grain & forages

Starch, sugar and fructan = NSC

- **Sugars**—simple sugars or sugar chains
- **Starch**—Glucose chain that is digested in the small intestine via enzymes. *(ESC + Starch)*
- **Fructan**—Water-soluble chains of fructose found within the cell contents of plants. *(WSC + Starch)*
  - Broken down in the cecum and colon via microbial fermentation
  - Not digested in the small intestine
What do we do if you have a horse with one of these problems?

- Limit glycemic response
  - Anything that raises blood glucose
  - Starches & sugars from cereal grains and forages
- Many sources and management factors
  - Eliminate cereal grains from the diet
  - Analyze your hay for: RFV, Starch + WSC, Starch + ESC
  - Soaking hay for 20 minutes in cold water will reduce the NSC by >30%
  - Keep horses off of the spring and fall pastures
NSC in forage

Plant Growth Basics:

- **Photosynthesis**—creates sugars all day
  - Sun and Temperature Dependent
  - Stops at Night

- **Respiration**—uses sugar up all night (growth)
  - Temperature Dependent
  - Slows as Temp declines (<45 degrees)
  - Stops at Freezing (32 Degrees)
    - if sugar is not utilized by the plant at night, during respiration, it is accumulated in the plant's lower stem (2 to 3 inches)
# Average NSC content in Forages

<table>
<thead>
<tr>
<th>Forage</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>11.3%</td>
<td>9-14%</td>
</tr>
<tr>
<td>Straw</td>
<td>11.7%</td>
<td>5-18%</td>
</tr>
<tr>
<td>Beet Pulp</td>
<td>12.2%</td>
<td>7-17%</td>
</tr>
<tr>
<td>Ave. Grass Hay</td>
<td>13.8%</td>
<td>9-18%</td>
</tr>
<tr>
<td>Oat Hay</td>
<td>22.0%</td>
<td>15-29%</td>
</tr>
</tbody>
</table>

*Source: EquiAnalytical [http://www.dairyone.com/Forage/FeedComp/disclaimer.asp](http://www.dairyone.com/Forage/FeedComp/disclaimer.asp)*
Stress factors that will increase the forage NSC’s

Cool Season Grass

1. Over grazing
2. Drought during growth
3. Poor fertilization
4. Intense sunlight during growth or curing
5. Frost or less than 45 degrees at night
6. Cut or eaten in the late afternoon
Managing NSC in the diet

- Cereal grain still biggest impact on diet
- Look at forage after all factors are addressed
- Evidence that soaking hay can lower NSC
  - Over 30% reduction after soaking in cold water for 15 to 20 minutes
  - Negative effect on remainder of nutrition in the plant if is soaked over 6 hours
- Graze between 5 and 9 AM only and use a grazing muzzle if necessary
Impact of Cereal Grain is the Most Critical Factor

- Cereal grains (oat, corn, barley, wheat, rice) can be over-fed and cause an increase in glycemic response and/or acid gut syndrome
# Ave. NSC in Cereal & Protein Grains

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>NSC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>73%</td>
</tr>
<tr>
<td>Molasses (Liquid)</td>
<td>70%</td>
</tr>
<tr>
<td>Wheat</td>
<td>66%</td>
</tr>
<tr>
<td>Barley</td>
<td>61%</td>
</tr>
<tr>
<td>Oats</td>
<td>54%</td>
</tr>
<tr>
<td>Wheat Midds</td>
<td>32%</td>
</tr>
<tr>
<td>Rice bran</td>
<td>21%</td>
</tr>
<tr>
<td>Hi Pro Soybean Meal</td>
<td>16%</td>
</tr>
<tr>
<td>Extruded Soybean</td>
<td>14%</td>
</tr>
<tr>
<td>Beet Pulp</td>
<td>12%</td>
</tr>
<tr>
<td>Alfalfa Meal</td>
<td>9%</td>
</tr>
<tr>
<td>Soybean Hulls</td>
<td>7%</td>
</tr>
</tbody>
</table>
How much to feed your horse per day?

*First- look at the feeding directions*

1. Found either on the back of the bag or feed tag
2. Feed according to the manufacturer's directions
3. If less pounds are fed per day than recommended, **it is a deficient diet!!**
4. You have two choices if your horse is too fat:
   a) Select a different feed with less calories per pound
   b) Top dress with a ‘balancer’ to make up the difference and meet their nutrient needs
Common problems found today
From:

- Not feeding according to the manufacturers feeding directions
- Diets: too many calories fed, deficient in amino acids, vitamins & minerals (fat, under nourished horses)
- Too much body weight does NOT always mean ‘adequate nutrition’
Performance vs. visual changes

- Performance loss (growth, reproducing, performing) will occur **before** you see any visual changes in your horse.

- Visual changes will show you **why** performance is being negatively affected.

- **Nutrition is the ‘Science of Prevention’,** so don’t wait until you have a problem!
  - Be proactive and set up a feeding program today.
‘Purpose Statement’ on each feed tag

This feed is to be fed to:

1) Horses of all ages, eating grass or mixed forage

2) Growing, reproducing, performing as well as idle horses

3) For mature, idle horses

4) For performance horses

Read the feeding directions to see if the pounds they recommend are within reason for your horse to maintain their desired body weight.
Different horse feeds available

The SafeChoice Line

For all horses who need to be fed more calories to maintain or need to gain additional body weight

<table>
<thead>
<tr>
<th>NAME</th>
<th>PURPOSE STATEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mare &amp; Foal</td>
<td>for growing and reproducing horses</td>
</tr>
<tr>
<td>2. Perform</td>
<td>for performance horses at all levels</td>
</tr>
<tr>
<td>3. Original</td>
<td>for the pleasure horse of all ages</td>
</tr>
<tr>
<td>4. Senior</td>
<td>for older horses</td>
</tr>
</tbody>
</table>
**Diet and calorie balancer feeds**

**Empower - Balance**
- For mature horses who do not need to be fed more calories
- To help balance the diet when less than ‘recommended’ amounts of a horse feed is fed per day

**Empower – Boost**
- A high calorie supplement containing 22% Fat
- To help ‘hard keepers’ gain or maintain desired body weight
- 1 lb will do the same job as 3 lbs of oats
In conclusion

- Must look at all components of the diet
- Hay analysis important so you know how good it really is
- Know the nutritional needs of your horse
- Select a feed or balancer that will make up the difference between the nutrients in your forage, and what your horse needs
- Nutrition alternation can be powerful tool