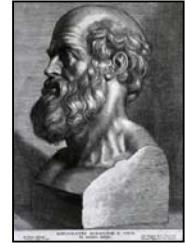


## Nutritional Management of Equine Medical Conditions

Mary Beth Gordon, Ph.D.  
Land O Lakes Purina Feed



"If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health."



"Let thy food be thy medicine and thy medicine be thy food"

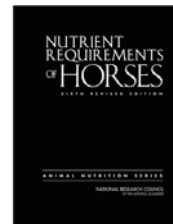
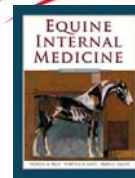
Hippocrates (460 – 377 B.C.)  
The Father of Medicine

## Outline

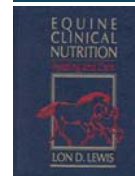
- DOD
- Gastrointestinal Disorders
- Obesity, EMS, Laminitis, and PPID
- Liver Disease
- Renal Disease
- Respiratory Disease
- Musculoskeletal Disorders
- Enteral diet research



## Useful Resources



Clinical Nutrition, April 2009



<http://nrc88.nas.edu/nrh/>



<http://www.equinevetnutrition.com>



*Research on feeding the sick horse is limited.*



## Developmental Orthopedic Disease

- Nutrition as a cause or solution for DOD is not well supported
- Recent "gene chip" research may establish specific nutrients with specific epi-genomic amplification related to chondrocyte proliferation and differentiation
  - RA receptor and retinoid inducible serine carboxypeptidase...functional proteins in the RA pathway (Bertone, 2010)



- **OBJECTIVE** - decrease caloric intake while supporting development with proper balance of protein, vitamins, and minerals
- **Ration balancer** – if quality grass forage is available
  - Follow bag recommendations according to BW and pair with grass hay (1 – 1.5% BW)
- **Complete feed** – if hay quality is an issue
  - Reduce bag recommendations for moderate growth by 75% if feeding as a complete feed
  - Feed up to 5 lbs hay/day for “chew factor”



## Gastric Ulcers

- **OBJECTIVE** – treat first, then alter management to reduce / prevent recurrence
- Maximize pasture access (Reese and Andrews 2009)
- Include alfalfa in diet at regular intervals (every 5 – 6 hours) (Nadeau et al. 2000)
- Higher fat/fiber, lower soluble carb concentrate
- Increase meal frequency (3 – 4/ day)
- Don't exercise on an empty stomach (hay is o.k.)



## Gastric Ulcers – Supplements?

- Antacids and coating agents
  - Aluminum Phosphate, Calcium Carbonate
  - Short duration (increase pH ~2hrs)
  - No studies proving / disproving efficacy
- Vegetable oils
  - Corn, rice bran oil?
  - Seabuckthorn berry extract? (Reese and Andrews 2009)
- Avoid hypertonic electrolyte preps (Holbrook et al. 2005)



## Malabsorption and Inflammatory BD

- **OBJECTIVE** – provide easily digestible feeds in small but frequent feedings
  - 2 – 4 lb meals
  - Absorption tests?
  - High fat and fiber concentrate feeds
  - Straight alfalfa or alfalfa-grass mix hays
  - Complete feeds in severe cases
  - Fat supplementation to induce weight gain




## Chronic Diarrhea and Colitis

- **OBJECTIVE** – reduce mechanical demand on the colon
  - Complete feed (Equine Senior)
  - High quality grass pasture and hay if well-tolerated
  - Limit alfalfa in severe cases of diarrhea (laxative effect?)

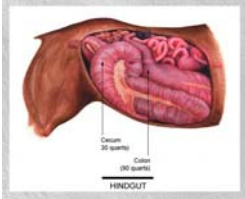


- Psyllium mucilloid
  - For sand accumulation, free choice grass hay just as effective at clearing sand from gut (Lieb and Weise 1999)
  - Potential to promote gut mucosal healing in colitis cases?
    - 5 Tbsp q 12 – 24 h (Jones 2010)


## Chronic Diarrhea/Colitis




- Probiotics
  - Evidence is lacking
  - Questionable quality of commercial products
    - Only 2 of 13 products tested met label claims (Weese 2002)
  - Administration to foals increased incidence of diarrhea and colic compared to placebo (Weese and Rousseau 2005)




## Chronic Colic




- Maximize pasture access
- Minimum of 1.5% BW in high quality forage daily
  - Pasture, alfalfa hay, grass-alfalfa mix hay, soaked alfalfa cubes, beet pulp
  - Avoid sudden changes in forage




## Chronic Colic (cont.)



- Small, frequent meals of concentrates higher in fiber and lower in soluble carbs
- Complete feeds may be necessary in severe cases
- Encourage water intake
  - Add 1 – 2 oz salt to feed daily




## Intestinal Resection



- Small intestine
  - **OBJECTIVE** – Emphasize fiber digestion in hind gut with high fiber, low bulk, low soluble carb feeds
  - >50% resection, vit/min supplementation may be necessary
  - >70% resection, utilize complete feed (Lewis 1995)
- Feed highly digestible fiber sources
  - Fresh grass
  - Quality alfalfa- pellets or mash in warm slurry
  - Complete feeds fed in a mash (not bran mashes)
- May need to add fat
- Small meals every 3-4 hours, 1-2.5 lbs each meal
- Gradual introduction of long stem forage after 3-4 days of soft diet feeding, if no complications

## Intestinal Resection (cont.)



- Colon resection
  - **OBJECTIVE** – Emphasize SI digestion
  - 1<sup>st</sup> 30 days – low fiber, lower bulk fiber, highly digestible
    - Grain-based growth formulas
    - Diarrhea and appetite problems are common
    - Alfalfa or alfalfa-mix hays or hay pellets
  - >90% colon resection, continue this plan
    - B-complex vitamin supplementation
  - Cecum or left colon resection, potential to return to a “normal” diet








## Obesity

- **OBJECTIVE** – Decrease calorie intake and increase exercise
- Obesity and lack of exercise are primary causes of IR in horses
- **Calorie restriction plan:**
  - Limit grazing
  - Reduce forage to 1.5% BW (1% in most severe cases)
  - No grain; utilize "ration balancer" or a "weight control" product

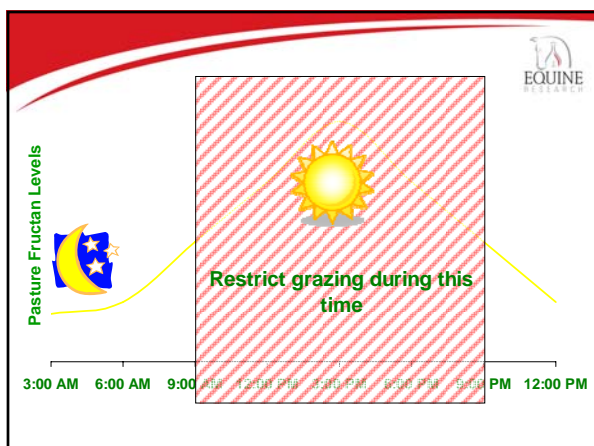


### Metabolic Syndrome, Laminitis, PPID

- **OBJECTIVE** – limit soluble starches and sugars in the ration
- Utilize concentrates with <12% NSC
  - Guaranteed starch and sugar on tag
  - Feed multiple small meals
- Excellent protein quality, and vitamin and mineral considerations are important



- Analyze hay, soak in cool water for 60 minutes to ↓ sugar/starch by 20 – 30%
- Cool season grasses contain fructans, which can be problematic for laminitic horses
  - Timothy, Orchardgrass, Fescue, Annual ryegrass
- Fructans highest in the spring, lowest during mid-growing season, moderate in fall, and higher following stress such as drought (Longland and Byrd 2006)



## Liver Disease

- **OBJECTIVES:**
  - Meet dietary energy needs
  - Supply high level of soluble carbs, gluconeogenesis impaired?
  - Limit fat and salt
  - Meet, but don't exceed, protein requirement
- In case of hepatoencephalopathy-
  - Higher branched chain amino acids (leucine, isoleucine, valine)
  - Lower in aromatic amino acids (phenylalanine, tyrosine, tryptophan)



### Liver Disease (cont.)



- Sources of Nutrients:
  - Cracked corn (both BCAA and starch)
  - Barley
  - Molasses
- Appropriate feeds:
  - Non fat-added grain mix sweet feeds
  - Low sugar/starch/fat concentrate if concurrent IR
  - Ration balancer (32% protein??) paired with small amount of cracked corn for easy keepers
- Horses may benefit from Vitamin C supplementation

### Renal Disease



- **OBJECTIVES:**
  - Maximize water intake
  - Meet, but not exceed, protein, Ca, and P requirements
- Low calcium diet due to increased risk of calcium “stones” and lethal increases in blood calcium
- Restricted protein and phosphorus
- Fat supplementation appropriate except in cases of hyperlipidemia or hypercholesterolemia
- Monitor for hypoproteinemia (Geor 2000)

### Renal Disease (cont.)



- AVOID legume forages, beet pulp, soybeans, wheat bran, and Ca/P supplements
- Grass hay paired with ration balancer (32%) or grain mix concentrate with moderate protein and Ca/P content

### Respiratory Disease



- **OBJECTIVE** – minimize exposure to triggering allergens
- Dust-free feeds
  - Soak hay before feeding
  - Feed soaked hay cubes
  - Feed complete feed to minimize hay in ration
- Pasture-associated RAO – reduce pasture exposure
- Vitamin C supplementation?
- Other “anti-inflammatory” supplements?

### RER/PSSM

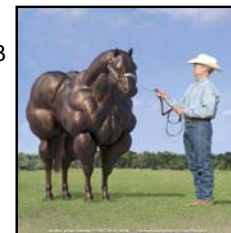


- **OBJECTIVE:**
  - Reduce soluble carbs in ration
  - Supply additional energy with fat
  - Ensure adequate Vit E intake
- Feed minimum 1.5% BW in hay ( $\leq$  12% starch and sugar)
- Concentrate should provide  $\leq$ 15% DE from soluble carbs and 10-20% of DE from fat (Valberg)


### HYPP



- **OBJECTIVE:**
  - Limit dietary K intake ( $\leq$  33 g K per meal) (Reynolds et al. 1998)
  - Promote uptake of K into cells via insulin action
  - Eliminate excess K from body via urine


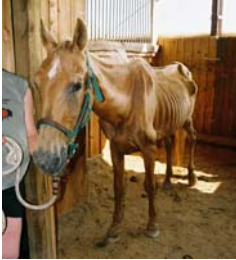


### HYPP (cont.)





- Forages can range from 1 – 3% total K
  - Pasture good option due to high water content
  - Choose mature grass hays – fescue, timothy, Coastal Bermuda grass (orchard grass?)
  - Soak hay for 30 – 60 min to ↓ K by 55%
  - Use complete feed if low K forage hard to find
- Utilize grain mix sweet feeds
  - Insulin potentiates K uptake into cells
- Avoid alfalfa, commercial electrolyte supplements

### Re-feeding the Starved and Neglected “Healthy” Horse





- Day 1-14...gradual introduction of small amounts of good quality grass hay (alfalfa)
- Day 15-45...introduction of high quality complete feed (1 pound / 2 day)
- Day 46-120...continue complete feed with gradual introduction to pasture





- Day 1-120...daily monitoring of health, fecal form and output
- Day 121+...gradual introduction of appropriate high quality concentrate and pasture / hay


### Enteral Diet Research



- Current enteral diet challenges
  - Bulky ingredients that are difficult to administer
  - Complications such as laminitis or diarrhea
    - Too high in soluble carbohydrates
  - High cost
  - Not formulated specifically for the horse
    - Or, formulated improperly...

- Objective:
  - Provide essential nutrients to facilitate healing and prevent loss of condition
  - Provide a high level of glutamine to support enterocyte health
  - Maintain a healthy hindgut environment
  - Easily administered through a NG tube

- **Experiment 1**
  - Assessed acceptability and nutrient utilization...4 horses (voluntary consumption) for 7 days...
  - Blood parameters monitored

*Results* – measurements remained within normal ranges
- **Experiment 2**
  - Assessed safety...8 horses (double dose, voluntary consumption) for 30 days...4 horses (enteral administration) for 5 days...
  - Acceptability, manure consistency, monitored for signs of gastrointestinal disturbance

*Results* - no reported incidences of colic, diarrhea, changes in manure consistency, or other gastric disturbance

• **Experiment 3**

- Assessed glycemic response to 1 lb administration
- 8 horses (enteral and voluntary)
- Glucose, insulin, triglycerides and non-esterified fatty acids (NEFA)

Results

- Lower glucose and insulin response upon voluntary consumption as opposed to enteral administration
- Glucose/insulin peaked slightly higher with enteral administration
- Overall, a low glycemic response for both routes of administration

• **Experiment 4**

- Field trial in >11 veterinary clinics
- >1100 lbs “Test Gel” was shipped
- Evaluated both enteral administration and voluntary consumption
- Clinicians were asked to complete a detailed survey (59 questions) for each patient to evaluate the product’s overall performance

• **Results:**

- Survey results received back for 27 horses
- Ages: 1 - >20 years
- Strangulating lipoma, cecal dysfunction, enterolith, colitis, sand impaction, dystocia, rectal tear, osteomyelitis, esophageal laceration, and more...
- Duration: 1 – 39 days (enteral) and 1 – 49 days (voluntary consumption)

Performance of the test diet in a clinical setting

	Poor	Fair	Acceptable	Good	Very Good
Mixture Consistency	0%	0%	44%	39%	17%
Ability to pump through tube	0%	0%	18%	46%	36%
Ease of use for handler	0%	0%	29%	29%	42%
Overall impression	0%	0%	6%	59%	35%

• **Results (continued):**

- No reports of adverse events following enteral administration or voluntary consumption
- One llama with heavy parasitism also was administered the test formula enterally with success
- 76% of clinicians indicated that the administration of the enteral diet had a positive or potentially positive effect on the patient’s health status, while 24% indicated no effect



CASE STUDY – “Amigo” January 2010

