

Therapeutic horses

Feed Choices
Feeding Older Horses

OLD AGE?

- <http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2842>



**Signs: Loss of muscle mass; esp. back
– could cause some “swayback
appearance; greying of hair, dental
problems**



1 year



5 years



10 years



21 years

Changes in the older horse

- Sarcopenia (exercise, eating, PPID, lower muscle protein synthesis)
- Thermoregulation
- Immunosenescence

OLD?

- Some investigators have used ~20 yr of age
- **No set age**
- The world's oldest horse may be: 53 years old (if still alive) the equivalent of 150 human years - and living in Cornwall.
http://www.bbc.co.uk/cornwall/content/articles/2009/08/24/nature_oldpony_feature.shtml
- USDA found 7.5% of horse population was over 20 years of age (NAHMS, 1998)
- Much variation: Need to use chronological age with physical signs of aging to determine **effects** of aging

What could be a problem for an older horse?

Likely problems:

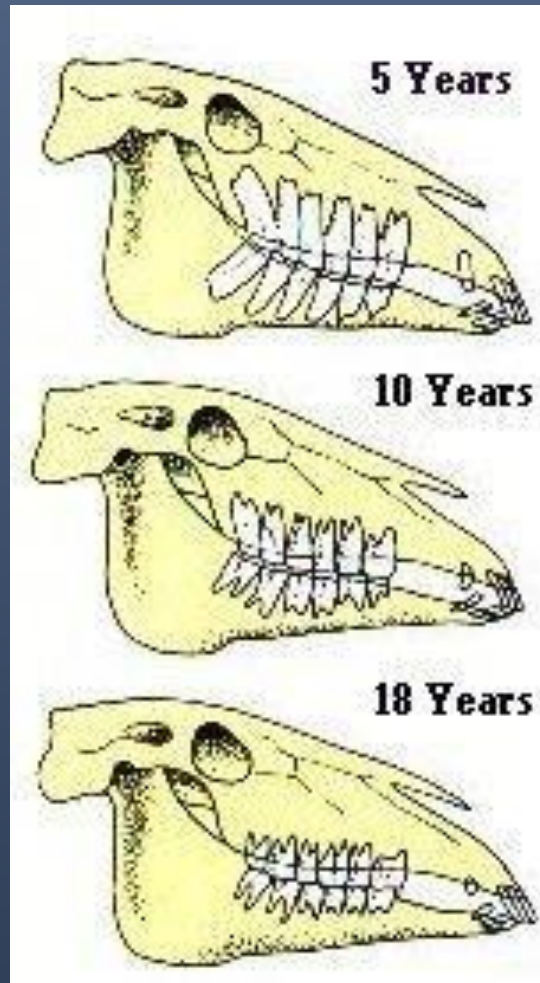
- **Decreased ambulation – CAUSE?**
- **Decreased ability to compete for food**
- **Decreased ability to chew food**
- **More cold stress ? WHY?**

Less likely:

- **Digestion could be reduced- fiber, parasite damage (data is limited and this could occur in any age horse)**

Food boluses – “quidding”





Bottom Line:

- **No good estimates of exact caloric increase over maintenance**
 - Factors ranging from 20 to 100% have been employed
 - You will notice that Lewis (last published in 1996) on page 192 makes recommendations – but that was based on the 1989 NRC
- **Latest NRC (2007) makes no specific recommendations for older horse feeding regarding additional nutrients needed**

How would you feed a horse that had some problems here?

- Decreased ambulation?
- Dental problems?
- Decreased ability to deal with cold stress?

- What is Old?

- Chronological

- ≥ 20 years

- Demographic

- 20% > 15yrs in U.S

- Physical signs of aging

- ↓ muscle mass (topline)
- ↓ BCS
- Dental disease
- Graying hair coat
- Hollowing above eye



Old Horses



- “Inflamm-aging” – Chronic unsoundness
- Decreased insulin sensitivity - obesity issues
- ↑ age, ↑ disease, ↓ function
 - Osteoarthritis, degenerative arthritis
 - Insulin resistance
 - Laminitis
 - Recurrent airway obstruction (RAO)
 - Ophthalmic lesions
 - Neoplasia
 - ↓ fertility, ↓ conception rates, ↑ pregnancy loss in the mare

3 Groups of Old horses

- 1). Healthy Seniors
- 2). Geriatric & “Hard-keepers”
- 3). Geriatric & Obese

1). Healthy Seniors

- Feed to requirements and activity level
- Similar to mature horses



2). Geriatric & “Hard-Keepers”

- Define Geriatric...
- How’s the Body Condition?
- Rule out PPID!



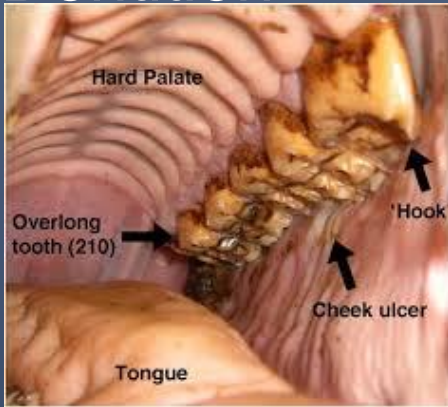
2). Geriatric & “Hard-Keepers”

- Picky eaters...slow to eat...
 - Feed several small meals no more than 0.5%BW each
 - 1,000lb x 0.5%=5lb; 2%BW – feed 4x/day
- Do old horses have the same nutrient absorption as mature horses?
- Study by Elzinga, et al. 2014. Compare Nutrient Digestibility in Mature and Senior Horses. J of Equine Vet. Science



Continued...

- Dentition



- alternative feeds?

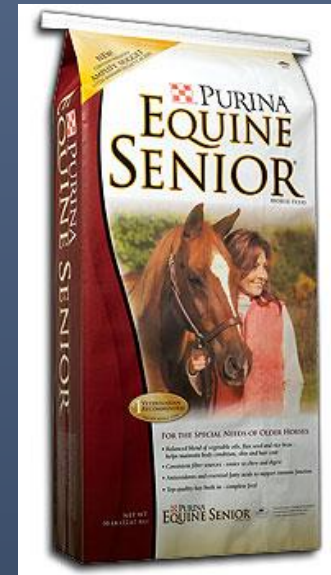


- 12-14%CP, no straight alfalfa, no daily bran mash...



Hard Keepers

- Complete feed designed for seniors- best
 - Greater density of energy
 - 12-14% protein
 - Added Yeast cultures for increased digestibility
 - Can have
 - Grain heat processing
 - More fat – rice bran, high omega-3, flax
- How do I feed in the winter time?



Low appetite



3). Geriatric and obesity

- IR: ↑ production of insulin is required to maintain blood glucose levels within normal limits
- ↑ weight in old horses, ↑ fat tissue, ↑ inflammatory cytokine production (Adams et. al., 2008)



Equine Metabolic Syndrome

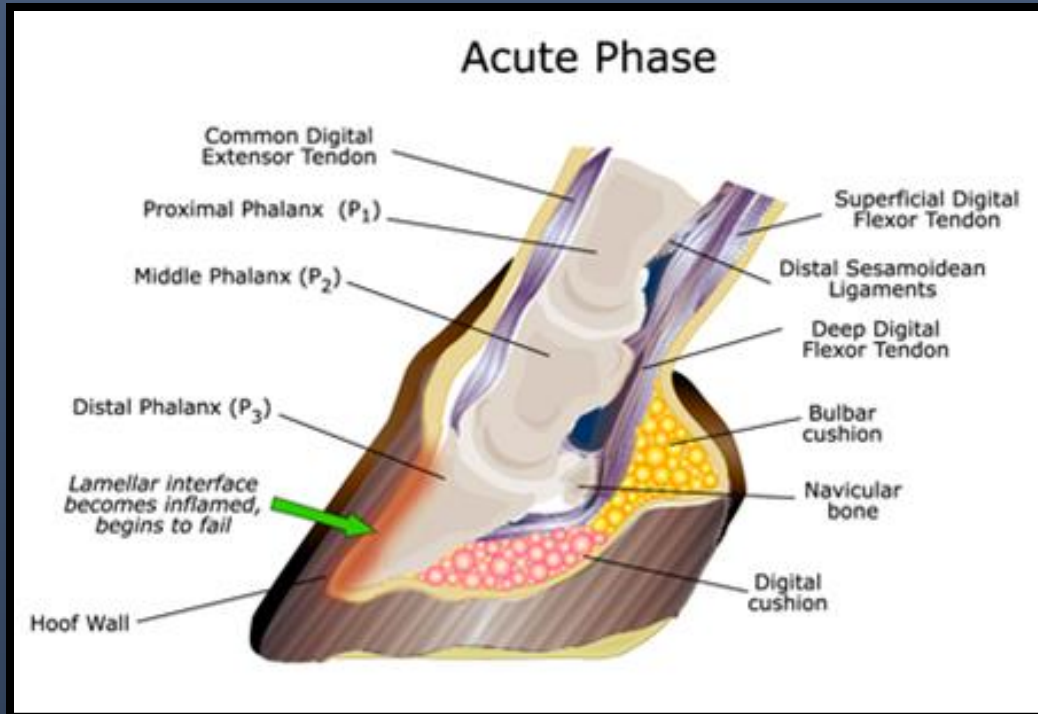
IR



Laminitis

Laminitis-prone ponies and TNF- α
(Treiber, et al., 2006)

Painful signs



Separation of laminae and hoof wall



What do we feed an obese horse?



- Horse's Natural Diet
- Forage (hay/pasture)
 - Low in fat
 - High in ALA
 - Up to 3 times more n-3 than n-6
- Opposite the typical human western diet



Continued...

- Wide variety of brands carry specialized grain
- Aim for a Low Glycemic index
 - NSC \leq 12%
 - Increased fiber
- Increased Omega-3 Fatty Acids
 - (Otabachian-Smith, et al. 2012)Platinum Performance
 - Flax seed meal
 - Marina supplements



To Determine Maintenance Requirements

- Need to know the horse's weight



WEIGHT



BEST way – livestock scale

WEIGHT

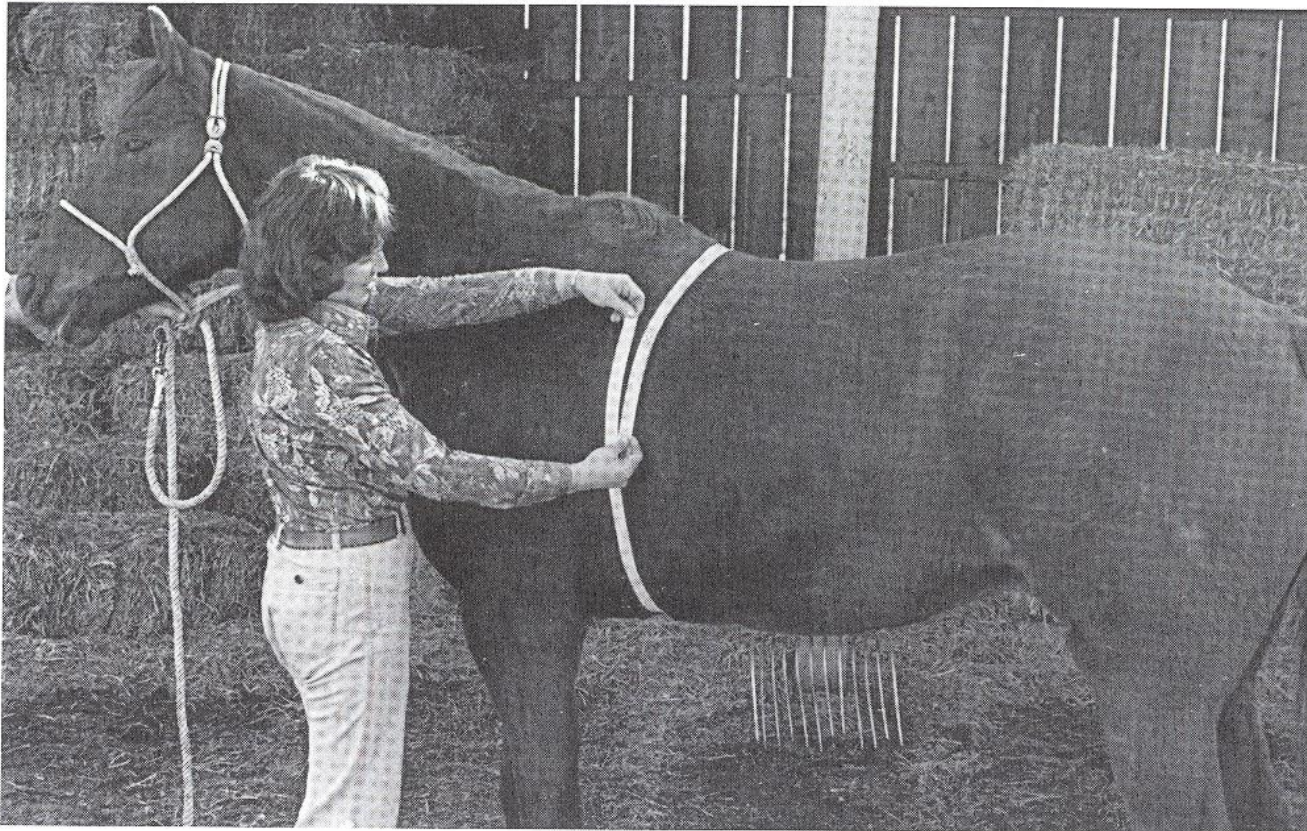


Fig. 6-6. Estimating the horse's weight from measurement of the girth. A weight tape marked in pounds of body weight (which for the average horse correlates well) is available from some feed stores and tack shops. A tape measure and the information given in Table 6-1 may be used instead.

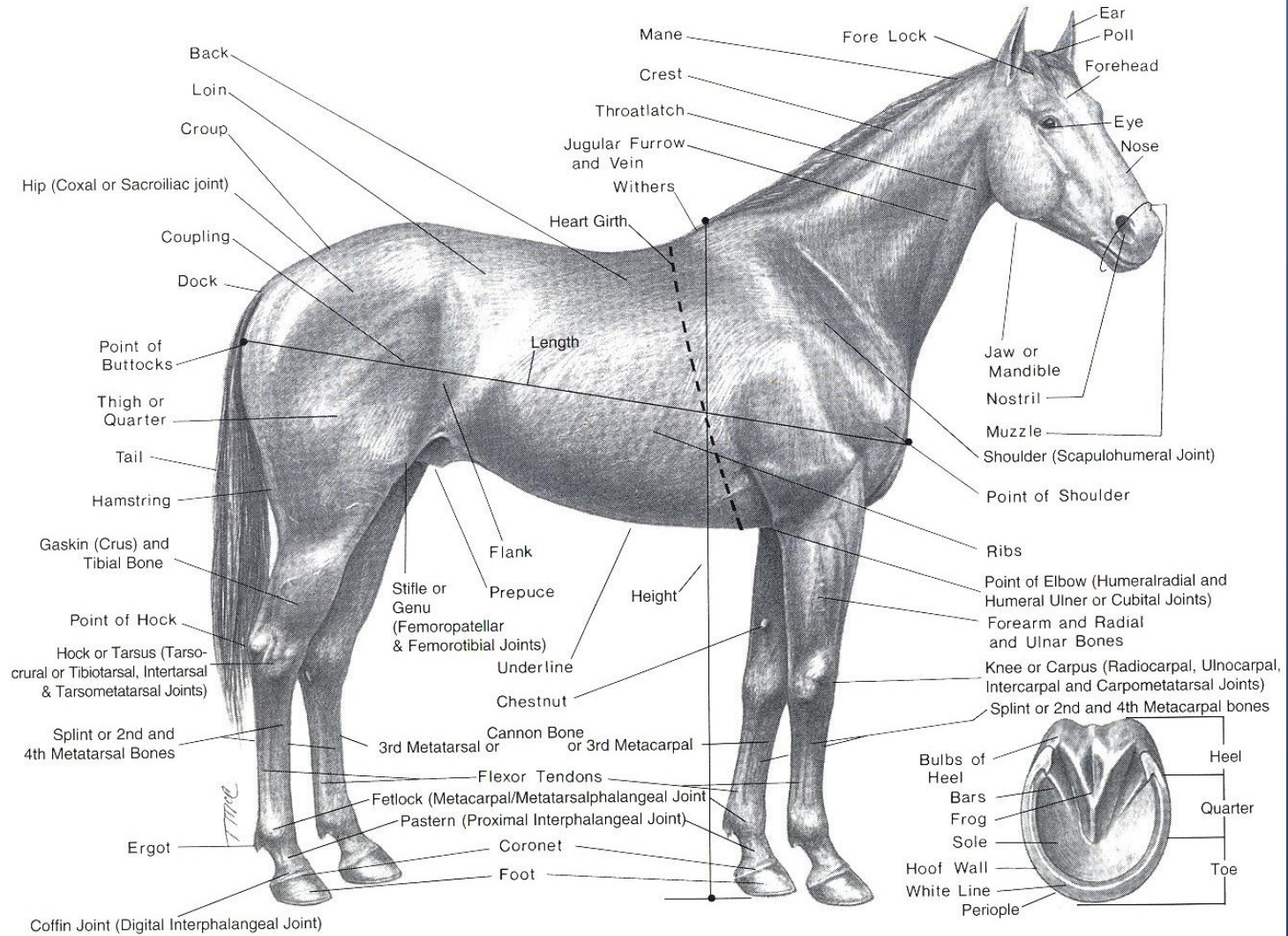


Fig. 6-5. Major external anatomic structures of the horse.

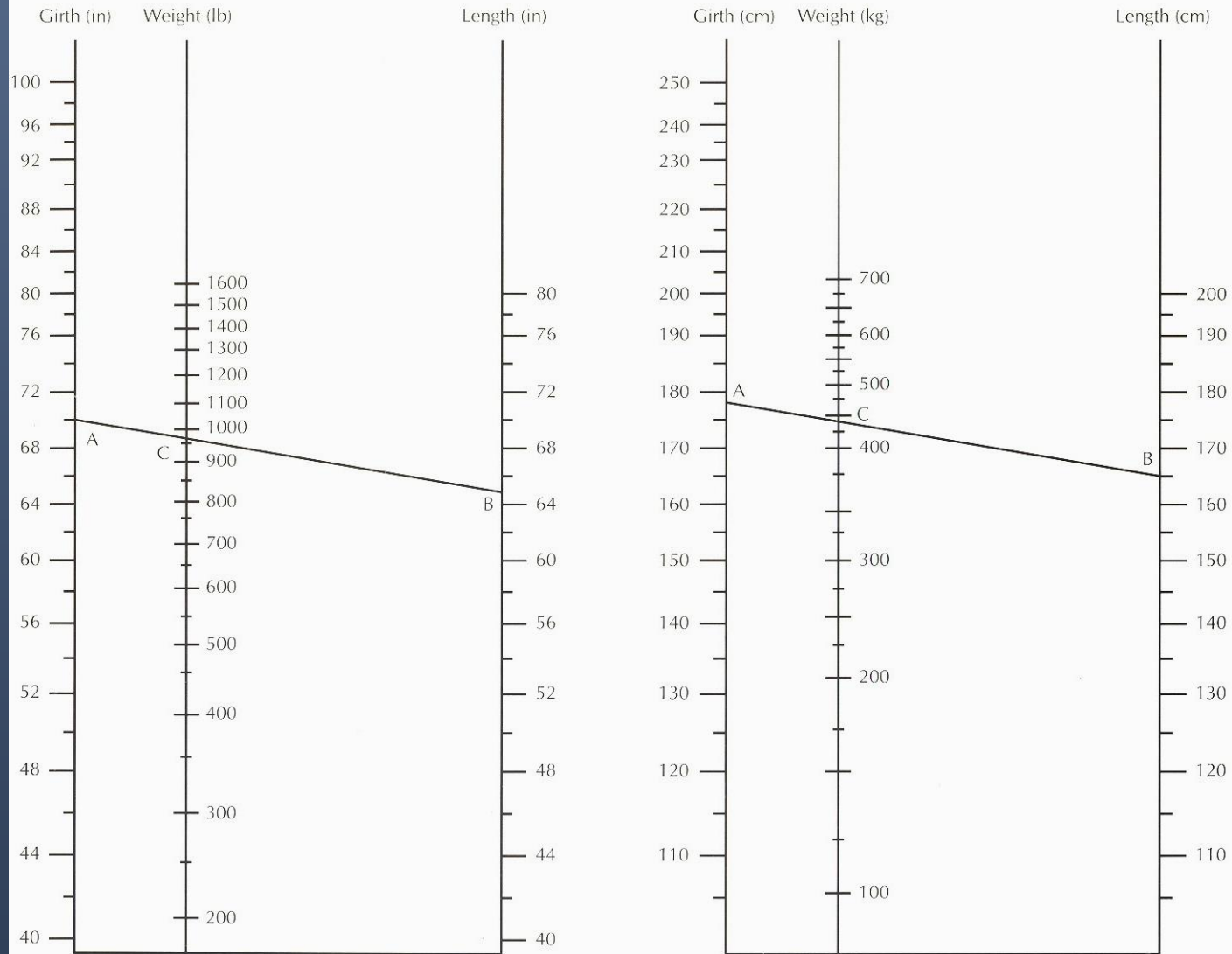
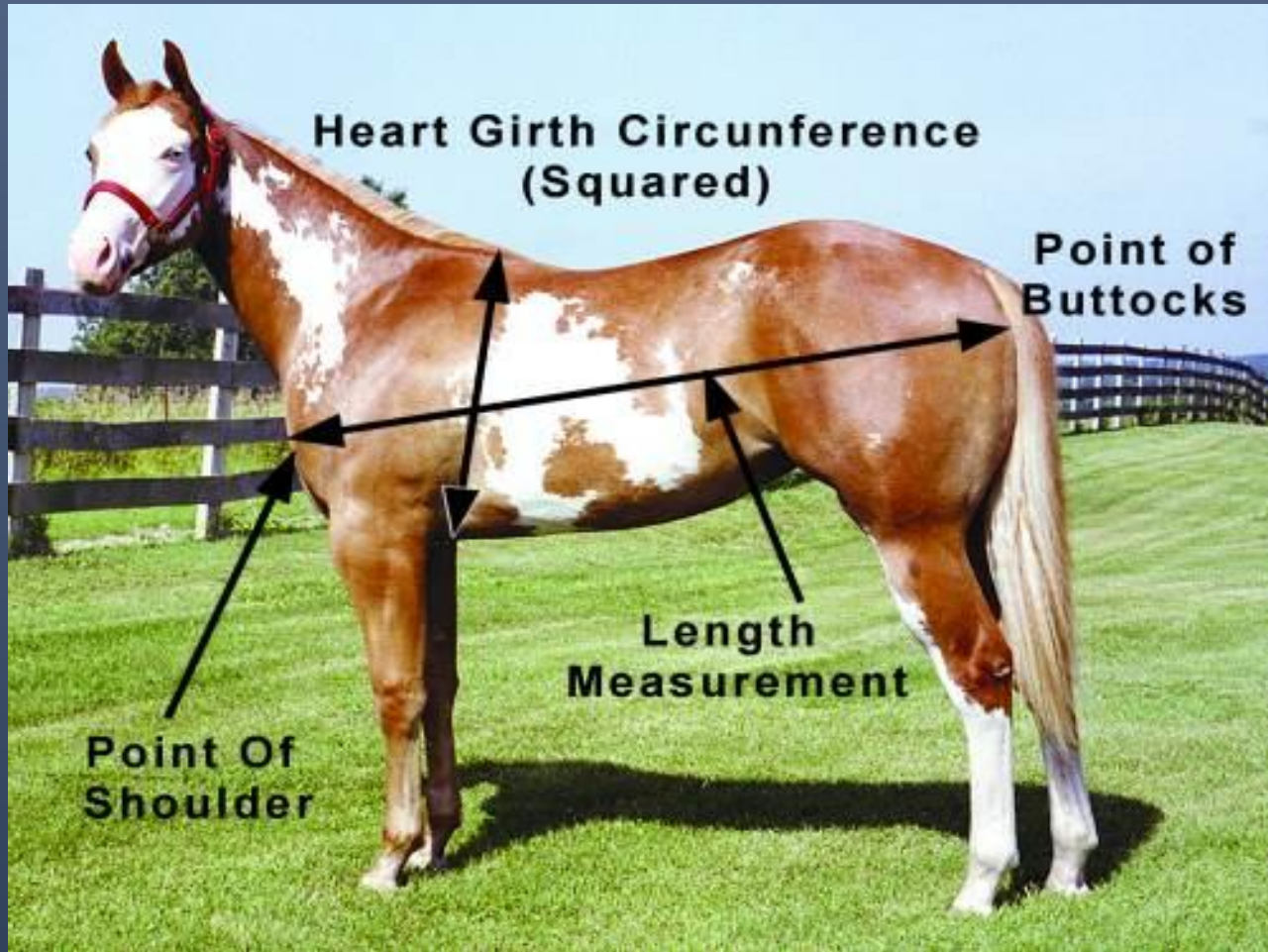


Fig. 6-4. Nomograms for estimating a horse's weight from girth and length measurements. Girth is measured just behind the withers and elbows following respiratory expiration, and length is measured from the anterior point of the shoulders to the posterior point of the buttocks (tuber ischii) (illustrated in Fig. 6-5). Example: A horse's girth is measured as 178 cm (70 in), which is plotted on the girth scale above as point A, and length is measured as 165 cm (65 in), which is plotted on the length scale as point B. Where a straight line drawn from point A to point B crosses the weight scale, indicated above as point C, is the horse's weight, which in this example is 440 kg (968 lb).

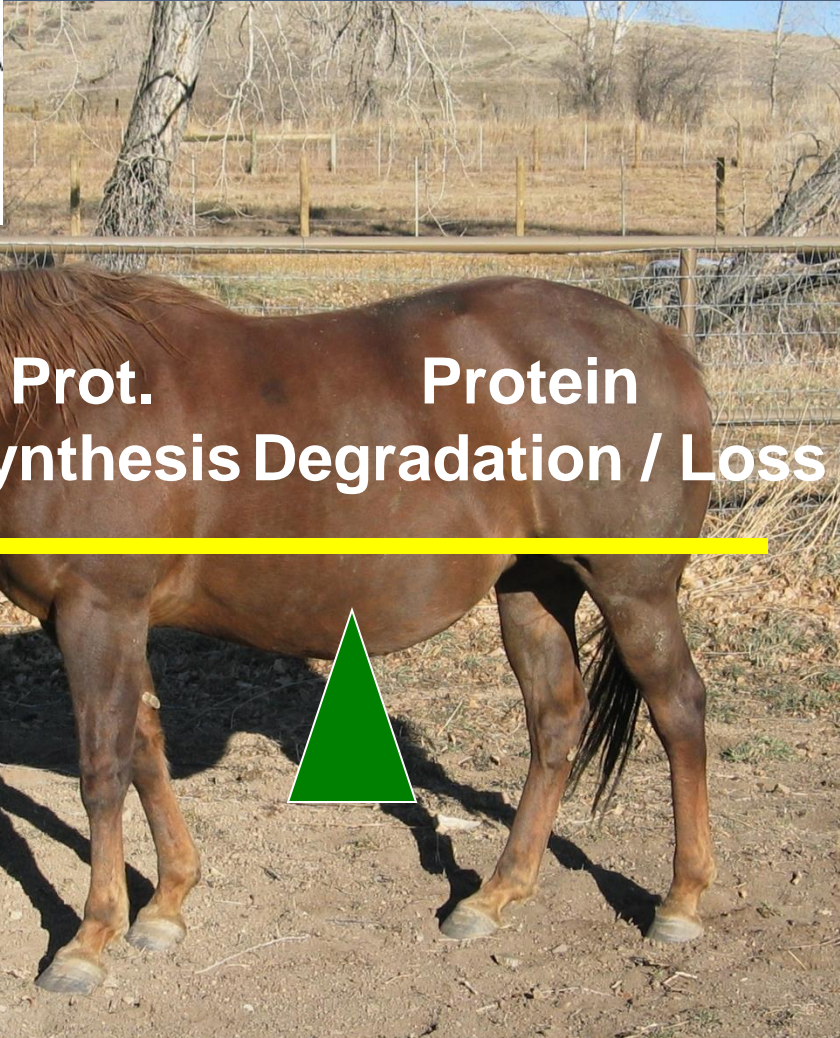
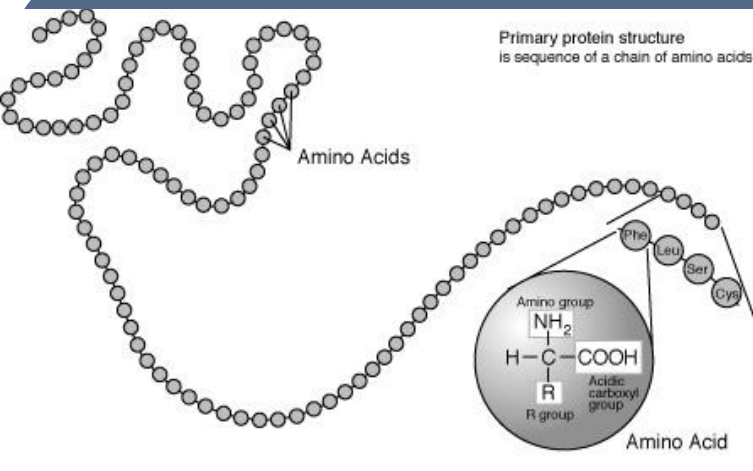


Body Weight= Heart Girth² X Body Length

330

<http://www.youtube.com/user/NutrenaFeed#p/u>

Protein Metabolism



Prot. Synthesis Protein Degradation / Loss



Balance Studies indicate that at Maintenance:

- Minimum: $BW \times 1.08 \text{ g CP/kg BW/d}$
- Average: $BW \times 1.26 \text{ g CP/kg BW/d}$
- Elevated: $BW \times 1.44 \text{ g CP/kg BW/d}$

500 kg horse? 540, 630, 720 g/day

Lysine Requirement for Maintenance

- Lysine (g/d) = CP requirement X 4.3 %

- Average 500 kg horse = (630 g) X .043 = 27 g

Mineral Requirements

- Calcium _____20_____ g/d 500 kg horse
- Phosphorus ___14_____ g/d 500 kg horse
- Magnesium 7.5 g/d
- Potassium 25 g/d
- Sodium 10 g/d
- Chloride 40 g/d = TOTAL 25g SALT/d
 - (some chloride in feeds)

Maintenance Vitamin Requirements

- Vitamin A 15,000 IU
- Vitamin D 3300 IU
- Vitamin E 500 IU
- Thiamin 30 mg
- Riboflavin 20 mg

TABLE 10-1
 Idle, Worked, and Aged Mature Horses' Major Nutrient Needs in Diet Dry Matter as Compared with That in Feeds^a

	Digestible Energy Mcal/lb (kg)	Protein (%)	Calcium (%)	Phosphorus (%)
Needed for:				
Maintenance	0.9 (2.0)	8	0.25	0.20
Work & breeding stallion	1.15–1.3 (2.5–2.9)	10–11	0.3	0.25
Aged horse	1.0 (2.2)	10	0.25	0.25
Composition of:^a				
Legumes (e.g., alfalfa)	1.0–1.1 (2.2–2.4)	15–20	0.8–2	0.15–0.3
Grasses, mature	0.7–1.0 (15–22)	6–10	0.3–0.5	0.15–0.3
Cereal grains	1.5–1.7 (3.3–3.7)	9–12	0.02–0.1	0.25–0.35

^a For more exact values, see Appendix Table 6 for the specific type of grain or forage being fed; for the most accurate values, have the feed analyzed as described in Chapter 6.

Feeding the Maintenance Horse

- The easiest class of horse to feed
- Generally can meet needs with moderate to high quality forage fed at 1.5 – 2.0 % of body weight daily
- Must supplement salt; most people will supplement trace-mineralized salt
- Example:
 - Horse weight = 1100
 - $1100 \times (1.88/100)\% = 20.7 \text{ lbs as fed}$
 - $20.7 \text{ lb} \times (90/100) \% \text{ (Dry matter)} = 18.6 \text{ lb}$
 - Grass hay energy = .9 Mcal/lb
 - $18.6 \text{ lb fed} \times .9 \text{ Mcal/lb} = 16.7 \text{ Mcal fed}$
 - Average energy req = 16.7 Mcal/day
 - Met!



Working horses



Workloads

Exercise category	Mean HR	Description	Type of Event
Light	80 bpm	1-3 hs wk 40% walk, 50% trot, 10%canter	Recreational riding Beginning of training, occasion show
Moderate	90 bpm	3-5 hs wk 30% walk, 55% trot, 10% canter, 5% show jumping, cutting, skill work	School horses, recreational, beginning training, frequent show horses, polo, ranch work

Workloads

Exercise category	Mean HR	Description	Type of Event
Heavy	110 bpm	4-5 hs wk 20% walk, 50% trot, 15%canter, 15% gallop, jumping, other skill work	Ranch work, polo, show horses (frequent strenuous events), low- medium eventing, race training (middle stages
Very Heavy	110-150 bpm	Various;1 hr wk speed work, 6-12 hs wk slow work	Racing (flat+ endurance) Elite 3 day event

DE Requirements for exercising horses

- Heavy

$$\text{DE (Mcal/d)} = (0.0333 \times \text{BW}) \times 1.6$$

- Very heavy

$$\text{DE (Mcal/d)} = (0.0363 \times \text{BW}) \times 1.9$$

DE Requirements for exercising horses

- Light work

$$DE(\text{Mcal/d})=(0.0333 \times BW) \times 1.20$$

- Moderate work

$$DE(\text{Mcal/d})=(0.0333 \times BW) \times 1.40$$

Exercising Horses — Protein

- More protein than idle
(Working horses: 10-12% total)
- Too much CP = more urea, more excretion, more heat, more acid produced, increased water need



Exercising Horses — Protein

- Protein can be used as energy
- But expensive
- 3-6x more HEAT produced from utilization for energy
- Water requirement increased → excess N from aa catabolism excreted as urea or ammonia
- ↑ electrolyte loss associated with ↑ water excretion
- ↑ urinary ammonia may compromise respiratory function if ventilation not adequate

Exercising Horses — Protein

- Additional protein: why?
- Light, moderate, heavy, very heavy
- 500 kg horse: 699, 768, 862, 1004 g/d

Appropriate feed?

- Feed selection
- Ration formulation
- Management

Feed selection

- DE enough for work level
 - Compatible with intake maximum
- CP
 - Avoid excess
- Ca P
- Electrolytes
- Vitamin E
- Cu, Zn, Se

Feed Selection

- Forage
 - At least 1.5% BW
 - Digestible fiber :energy, heat
 - Hindgut motility, function, pH
 - Water reservoir?
- Grass, alfalfa, mix?
- Mix of grass alfalfa providing 1 Mcal/lb DM
- Protein

Feed Selection

- Forage
 - Bulky increases bowel ballast
 - Source of water
 - Less efficient— losses as heat
 - Heat stress
 - May have excess protein

Feed Selection

- Beet pulp
 - Limit 0.8-1% of BW AF
 - Choke
 - Good source of K
 - Energy and glycemic response

Feed selection

- Grain mix concentrates
 - Energy: 1.6 to 1.7 Mcal, can be higher
 - Fat 3-10%
 - Fiber 6-10%
 - CP ~10-12%
 - Salt 0.1-1%
 - Vit E 160 IU/kg/DM

Feed Selection

- Energy sources
 - Starch:
 - Used for aerobic or anaerobic exercise
 - 50-70% of grain's DM
 - Starch for glycogen storage
 - Starch digestion → blood glucose ↑ → ↑insulin– glycogen synthesis
 - Blood glucose body fat
 - Blood glucose CNS

Feed Selection

- Starch
 - Broken into glucose units in SI and absorbed
 - If absorption in SI—feed small grain meals
 - Starch overflow into LI—fermentation—LA-- ↓pH— death of bacteria and protozoa
 - Multiplication of Gram + bacteria —LA, toxins
 - LPS released— endotoxins; exotoxins—damage to mucosa toxins enter blood—(endo)toxic shock, laminitis, colic...
 - Limit concentrate

Feed Selection

- Fat
 - Safe energy dense source
 - 2.25 times more energy than starch
 - Important substrate low intensity exercise
 - Reduced heat production
 - Sparing of muscle glycogen
 - More fat use, less glycogen use



Feeding Fat

- Provides essential fatty acids
- ↑ Absorption of fat-soluble vitamins
- Calming effect
- Type of fat to feed?
- *Not too much!!*



Feed Selection

- Fat
 - Example:
 - Requirements: 32.8 Mcal
 - Fat supplies 3.28-4.92 Mcal/d
 - Veg oil 4.08 Mcal/lb = feed about 1 lb or less
 - Rice bran 1.3 Mcal/lb = 2.5-3.75lb

How to feed older horses?



<https://practicalhorsemanmag.com/health-archive/head-to-hoof-senior-horse-health-concerns>

Aged, healthy, ideal weight

- 2% BW DM daily on grass or good quality hay, 2.5% if in work
- Energy seldom required
- Salt
- Weight tape weekly

Aged, healthy, overweight

- Restrict 1.5% DMI (1.25%), hay, haylage or replacers, divide into 3 feeds
- Techniques to prolong time spent grazing
- No energy required
- Can use high fiber pellets to prevent boredom
- Salt lick, good balancer when forage restricted
- Weight tape weekly and BCS to monitor weight loss

Aged, healthy, underweight

- 2.5% DMI, good quality hay, alfalfa or alfalfa pellets to increase palatability
- If forage only does not improve weight, add 0.5 to 1% bw DMI concentrate -senior product, vegetable oil 4-7% of diet
- Salt
- Good quality balancer, depends on grain contents, ginger may encourage appetite
- Vitamin E
- Weight tape- if no increases over a month, increase conc.; rice bran

PPID/laminitis prone but underweight

- 2-2.5 BW DMI good quality hay or replacers, restrict access to grass
- Restrict sugar and starch levels. Alfalfa based low sugar products to supplement protein
- Salt lick, good quality balancer, vitamin C, vit E especially if oil is provided
- Add calories safely with forage based pellets, unmolassed beet pulp

Failing dentition

- Continue to offer good quality hay or forage replacers, unless choke, colic. Chewing is beneficial– reduces acidity in stomach, allow to graze; bulk of forage (1.5-2.5% BW DMI as forage based pellets
- Restrict starch and sugar, 0.5-1% BW DMI, senior feeds
- Salt lick, good quality balancer vitamins and minerals
- Increase forage based pellets as ability to consume long fiber decreases
- Soak in water not below 10°C, divide in several meals