Case study pre-reading: Equine nutrition - Practical aspects

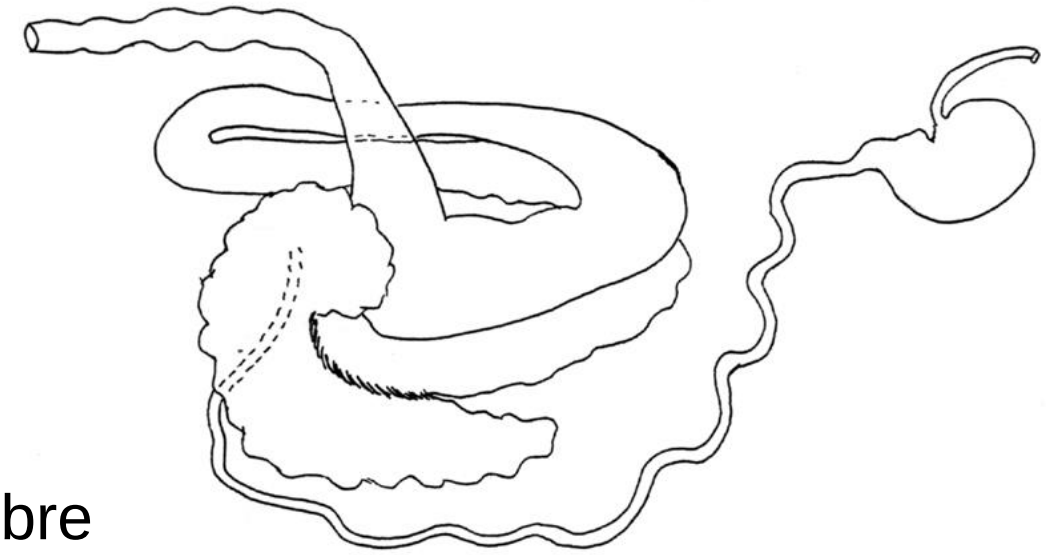
Simon Bailey

(with acknowledgements to Dr. Sally Church)

The horse – a monogastric hindgut fermenter

- Advantages:
  - Digestion and absorption of good quality feedstuffs

- Disadvantages:
  - Loss of bacterial proteins, vitamins etc
  - Not as efficient as ruminants at digesting fibre



Equine digestive tract: monogastric hindgut fermentation

Digestion and absorption in the equine GIT

Small intestine:

- Most non-structural carbohydrates – sugars and starches (α linkages)
- Protein
- Fats
- Large volume of secretions

Hindgut fermentation in the caecum and colon:

- Fermentation and digestion of structural carbohydrates and fructans (β linkages):
  - Cellulose (glucose polymer) and hemicellulose (xylose polymer)
  - Fructans (fructose polymer)

- Absorption of volatile fatty acids
- Absorption of water and electrolytes

Water requirement

- 50 ml/kg/day (25 L / 500 kg horse)

  Provided:
  - idle
  - cool weather conditions
  - eating dry feed (hay, chaff, grain)
  - not lactating

- Horses eating only fresh green pasture (80% water) will require no additional water, but will usually drink anyway
- Inadequate water availability significantly reduces the intake of dry feed

Dry matter

- For comparing between feeds, their **dry matter** content is used
  - (%DM or /kg DM)
  - (hay, chaff, grains ~90% DM; green pasture 25-30% DM)

Maximum dry matter intake

(% of body weight consumed)

Maintenance & Gestation:	1.8% DM	=2% Dry Feed
Moderate work / late lactation / growth (18-24mth):	2.25%DM	=2.5%Dry Feed
Heavy work / early lactation / growth (yearling):	2.7% DM	=3% Dry Feed
Growth (weanling) :	3.15%DM	=3.5%Dry Feed

Maximum dry matter intake

- How much will a MATURE, RESTING 500 KG Thoroughbred eat each day?
  - 500 kg x 1.8% = 9 kg DM

    OR
  - 500 kg x 2.0% = 10 kg hay

Maximum dry matter intake

- How much will a MATURE 500 KG LACTATING Thoroughbred mare eat each day in the first week after giving birth?
  - 500 kg x 2.7% = 13.5 kg Dry Matter

    OR
  - 500 kg x 3.0% = 15 kg hay (dry feed)

Maximum dry matter intake

- How much will a 300 KG WEANLING Thoroughbred eat each day?
  - 300 kg x 3.15% = 9.45 kg DM

    OR
  - 300 kg x 3.5% = 10.5 kg hay

- Notice a 300 kg growing weanling will eat as much or more than a 500 kg horse requires for maintenance

Fibre

- Fresh grass
- Grass hay; lucerne hay
- Chaff (oaten; lucerne)
- Haylage

Fibre requirements

- Generally, the MINIMUM requirement to maintain normal caecal & colonic fermentation:
  - 1 kg DM hay/chaff per 100 kg body weight MINIMUM (or pasture equivalent)

BUT REMEMBER

  - Grain should never form more than 50% of the diet

Energy requirements

- Maintenance energy requirements for an idle 500 kg horse is:

  68 MJ digestible energy/day

Energy requirements

- Affected by:
  - Exercise - light x 1.25; mod x 1.5; heavy x 2
  - Pregnancy - last 3 mth ONLY; x 1.1 or 1.2
  - Lactation - early x 2; late x 1.75
  - Growth – x 2+ (varies)
- Late pregnancy ≈ light work
- Early lactation ≈ heavy work

Energy requirements

- For 500 kg idle gelding = 68 MJ DE/day
- Given ad lib access to hay will eat:

  500 x 2% =10 kg hay = 10 x 90%= 9 kg DM

- If given full flower lucerne hay @ 9.2 MJ DE/kg DM

  9.2 x 9 = 82.8 MJ DE

Energy requirements

- For 500 kg lactating mare = 135 MJ DE/day
- Given ad lib access to hay will eat:

  500 x 3% =15 kg hay = 15 x 90%= 13.5 kg DM

- If given full flower lucerne hay

  @ 9.2 MJ DE/kg DM

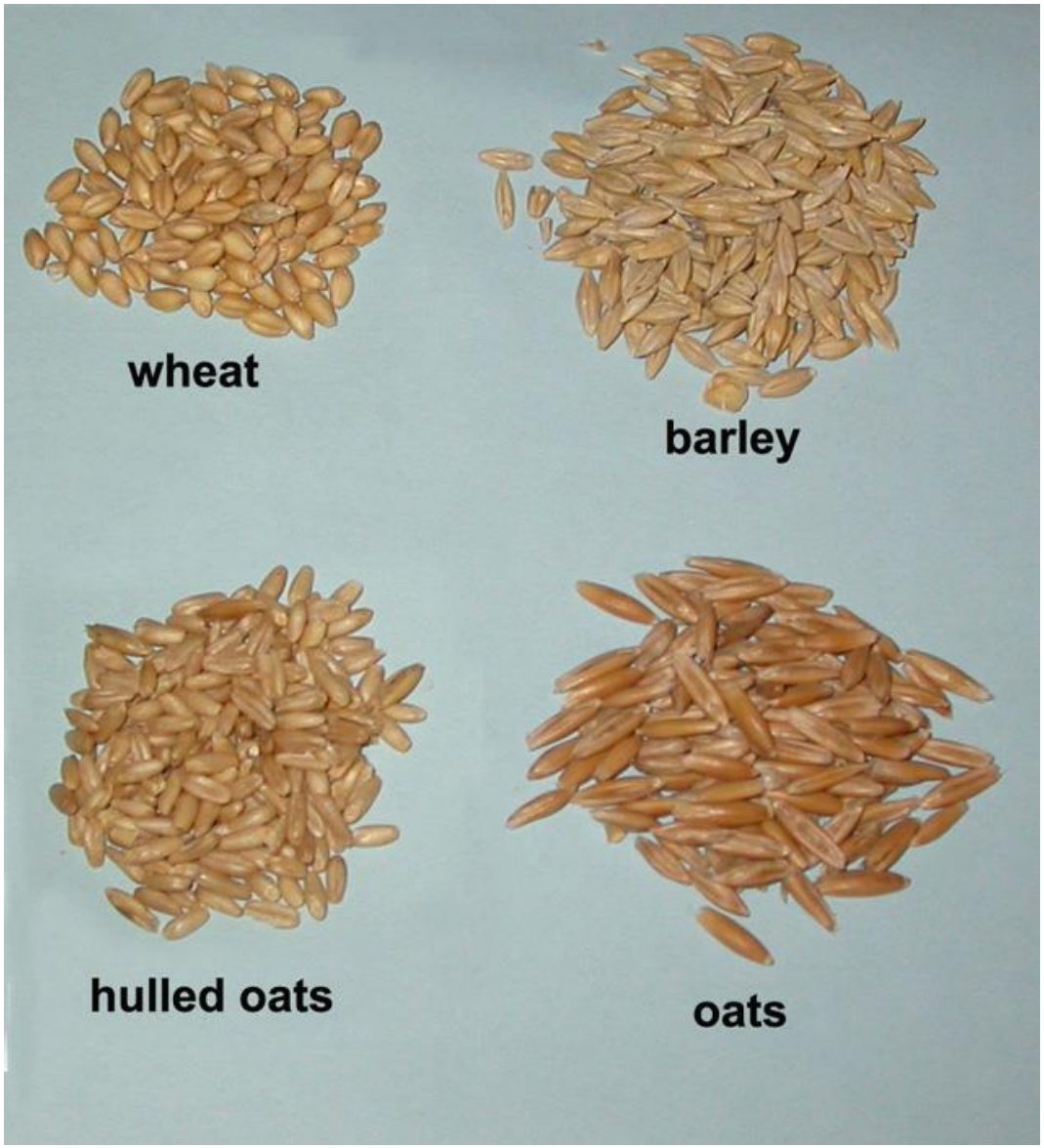
  9.2 MJ DE/kg DM x 13.5 kg DM

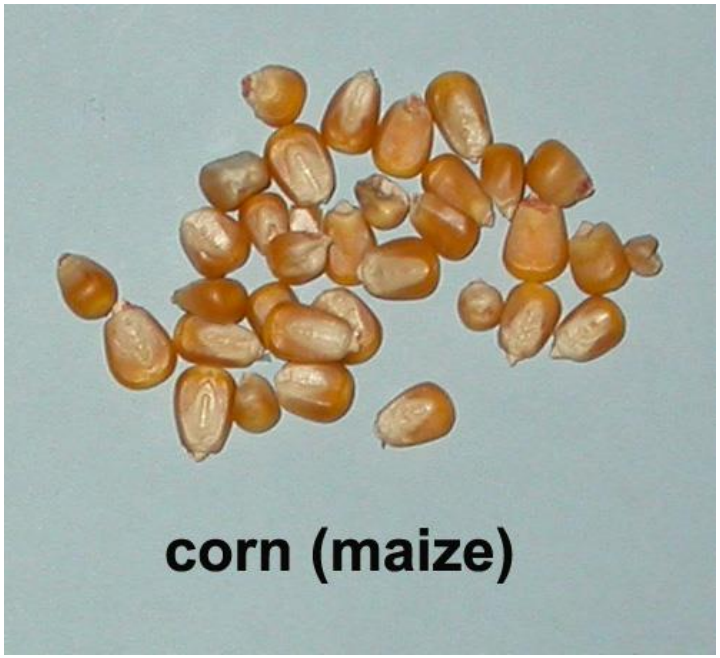
  = 124.2 MJ DE

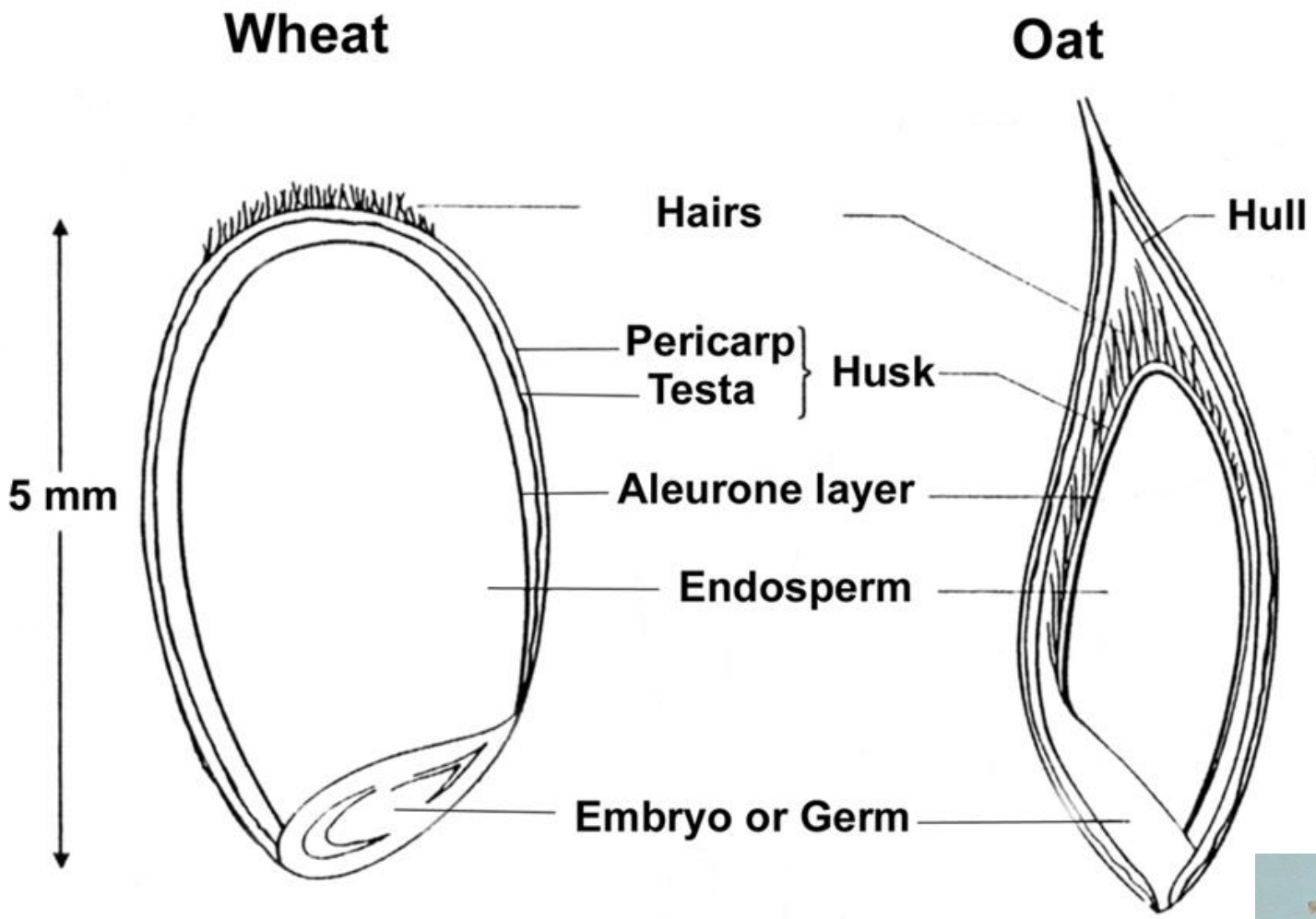
Grain feeding

- Starch - good source of energy, BUT:
- Digestive capacity of equine SI may be exceeded
- Grain should never form more than 50% of the diet
- Do not exceed 0.4% bwt /day
- ** Always make any diet change gradually **

Cereal grains

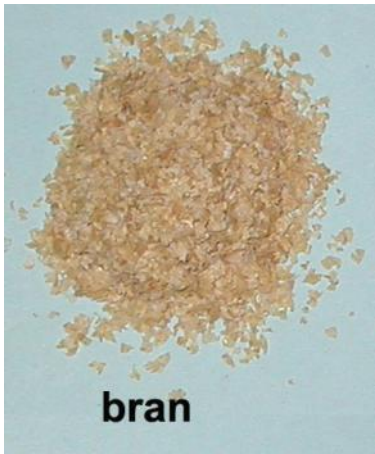






from
Equine Nutrition and Feeding
D Frape 2nd ed 1998
Blackwell science, Oxford

SEED STRUCTURE



Grain processing

- Improves digestibility
- Less risk of hindgut fermentation

Starch digested in SI

• Oats (whole)	• 83%
• Oats (rolled)	• 85%
• Barley	• 22%
• Corn (whole)	• 45%
• Corn (cracked)	• 46%
• Corn (extruded)	• 90%

Protein requirement

- Relates directly to energy requirement

  9.6 g protein/MJ DE

  (maintenance, exercise and early pregnancy)

- Protein in feed expressed as a % DM

- Typical sources:
  - (grass, hay, grains)
  - Lucerne
  - Soybean meal; beans; lupins

Protein requirement

500 kg idle gelding

- 9.6 g x 68 MJ DE = 653 g (0.653 kg) protein daily
- 0.653kg protein in 9 kg DM = 7.25% protein

500 kg gelding in hard work

- 9.6 g x 136 MJ DE = 1305.6 g protein daily
- 1.3056 kg protein in 13.5 kg D
- 1.3056/13.5 = 9.8% protein

Therefore:

- Maintenance /early pregnancy: ~8%
- Exercise: ~10%

Protein requirement

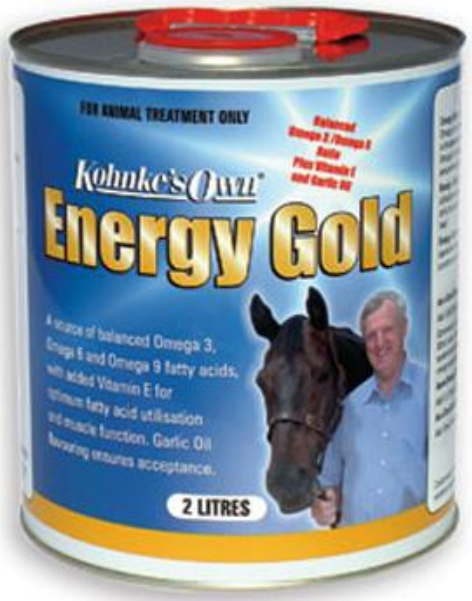
- Protein required per unit energy is increased by:

	g protein/MJ DE	% protein
late pregnancy	10.5	11
lactation	12	13
weanling growth	12	14.5

Fats and oils

- Concentrated energy (oil = 38 MJ/L)
- Alternative energy source to grains
- Especially for endurance type exercise
- Will tolerate up to ~250ml (1 cup) vegetable oil daily

Sunflower seeds



Oilseed grains