FEEDING INTO THE 21st CENTURY
MICRONIZATION AND THE STEAM-EXTRUSION SOLUTION

Dr Jennifer H Stewart BVSc BSc PhD MRCVS Dip BEP AAIM
Equine Veterinarian and Consultant Nutritionist to Mitavite

Why do we need to 'process' horse feed? Oats and other plants growing in manure indicate that horses can't fully digest unprocessed feeds.

> ***Horsemen and women have long known that feeds for horses need to be processed.***

For centuries, grains have been cooked, rolled, boiled, baked, steamed, flaked, cracked, crushed and pelleted to improve their digestibility and reduce the incidence of veterinary emergencies such as colic, diarrhoea and laminitis.

A century of change: Although commercial horse feeds were available in the late 1800's, most were of questionable nutritional value, despite claiming confidently to 'make hens lay, cure cholera and improve breeding animals'. In the early 1900's, pelleted feeds appeared, followed in 1958 by horse cubes.

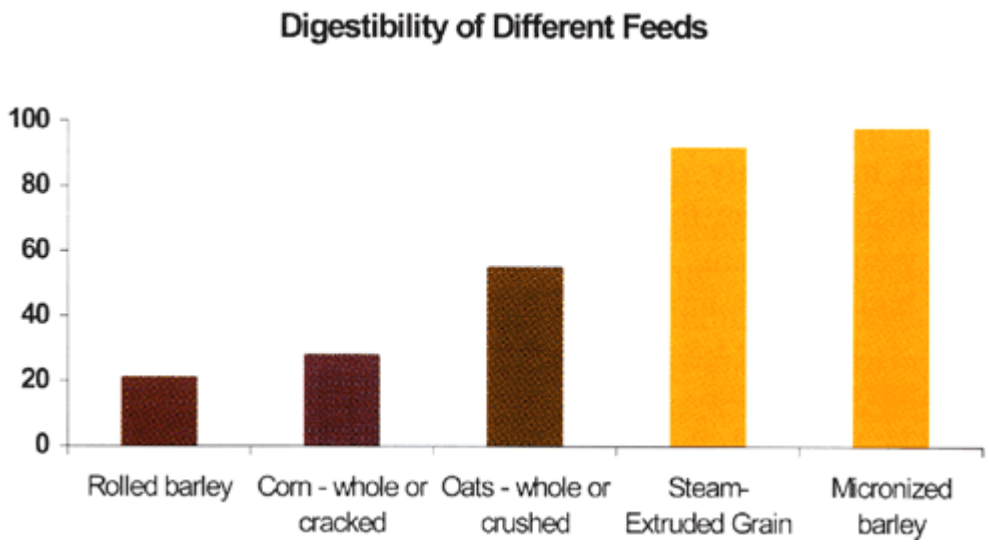
> ***Early methods of processing were relatively crude physical treatments which had a marginal effect on digestibility.***

Lack of precise control over cooking temperature and time meant that many heat-sensitive nutrients were lost and natural vitamins destroyed during processing. In addition, oil oxidation reduced shelf life.

Continuing research has revealed the temperature and duration for which grains should be cooked to improve digestion - wiithout causing damage to the nutrients. This has led to the development of two sophisticated new feed processing methods -

- **micronization:** infra-red cooking in super-heated oil; and
- **steam-extrusion:** steam and pressure-cooking, then oven roasting.

Micronization and steam-extrusion fine-tune and advance the traditional, time-honoured practices of cooking feeds for horses.



What is steam-'extrusion'? Steam-extrusion achieves in 20 to 30 seconds what would take 40 times as long at atmospheric pressure. Feed ingredients are milled, steamed, pressure-cooked and oven-roasted for a short time. Complex structures such as starches, proteins and oils are untangled - allowing digestive enzymes to work up to 100 times faster.

What about Dry-extrusion? Extrusion at low moisture levels results in loss of vitamins and destruction of proteins due to friction and shear in the extruder barrel.

Studies in Switzerland have shown up to 50% lysine damage when dry extrusion is used.

What is micronization? Micronization is an infra-red cooking process. The rapid internal heating of the grain causes starch granules to swell, fracture and gelatinize.

Steam-extrusion of corn and complete feeds and micronization of barley are the processing methods of choice to produce low starch - high-oil-energy dense feeds for pleasure and performance - reducing the risks associated with grain overload and acidosis.

Does the heat damage nutrients? Heat-stable vitamins and minerals are used in Mitavite feeds. Those vitamins and nutrients which are heat-sensitive are spray-coated onto the 'nuts' after processing. Moisture content is only 8% - reducing mould and rancidity (grains are 11 to 13.5% moisture).

The use of stable natural proteinates and chelated minerals prevents interactions between vitamins and minerals, such as those known to occur between iron and vitamin E.

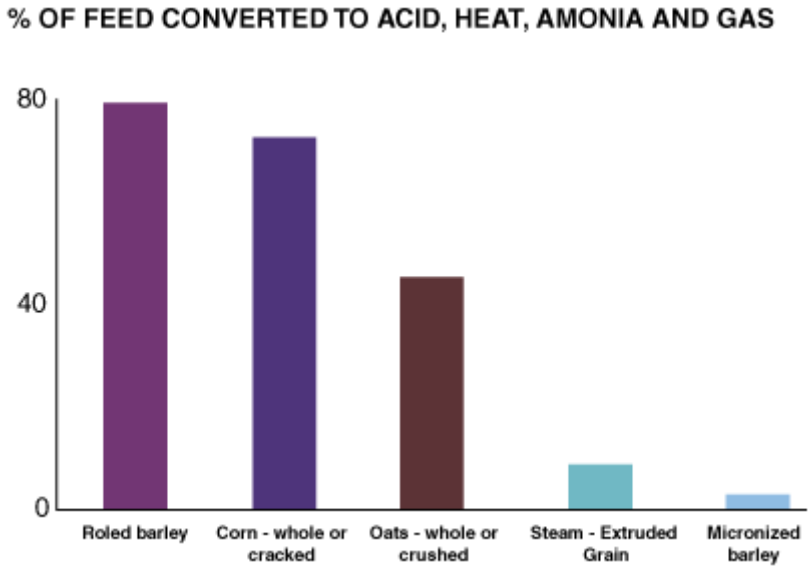
Why do Steam-Extrusion and Micronization make better feeds for horses?

1. **Feeds are highly digestible:** Research has shown that for the same weight gain, growing horses had to eat up to 30% more pellets than **steam-extruded** feed. Thus 1 kg of pellets or grain mix can be replaced with 650 grams of **steam-extruded feed.**
   - especially beneficial for horses with reduced appetites due to stress, intense training, illness, surgery, pregnancy or dental problems.

2. **Reduced heat production:** Feeds produce different amounts of waste heat during digestion. This increases heat stress and the horse has to sweat more to cool itself. As the heat load increases, more and more blood is diverted away from the working muscles to the skin for cooling. Reduced blood flow to the muscles is one of the factors precipitating fatigue during exercise.

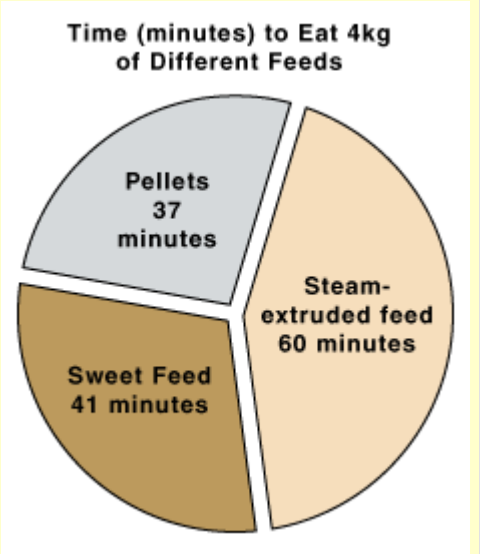
> ***Steam-extruded and micronized feeds produce very little heat of digestion.***

3. **Cool energy:** Fizzy behaviour is reduced. The **'heating'** effect of grains results from their rapid fermentation in the intestine. Micronization and **Steam-Extrusion** promote digestion and inhibits fermentation, reducing restless, fidgety behaviour.



4. **Reduced boredom and stable vices:** Stabled horses spend an average of only 4 hours per day eating and their increased 'leisure time' is spent nibbling stable fittings and chewing wood and bedding. The increased chewing of **steam-extruded** feeds reduces boredom and hence these undesirable behaviours are also reduced.

5. **Prolonged feeding time:**

The increased volume of steam-extruded feed means horses take longer to eat. One of the essential features of pellets is that they can be eaten quickly.	

6. **Stomach Ulcers:** The statistics on ulcers are sobering and provide food for thought: 80-90% of racehorses in training, 84% of yearlings, 50% of ponies on concentrates, 30% of foal deaths.

Certain gastro-intestinal emergencies have been linked to rapid intake of feed.

The major causes of gastric ulcers in horses are stress and prolonged exposure of the stomach to high acid levels.

Adult horses secrete up to 30 litres of gastric acid per day. The acid is buffered by saliva. Horses produce up to 12 litres of saliva per day which lubricates the food, helping prevent 'choke' and buffers stomach acid. When horses go for extended periods (8-10 hours) without feeding, eat 2 large meals a day, have limited access to roughage or consume feed quickly, saliva production is reduced and there is less buffering of stomach acid. The longer horses chew their feed and more saliva produced and the higher the bicardonate concentration of the saliva.

Steam-extruded nuts are eaten more slowly and require greater chewing than both traditional and pelleted feed.

7. **Steam-Extrusion and Micronization** inhibit anti-nutritive factors (including trypsin), bacteria (including **Salmonella):** fungi, spores and weed seeds.

8. **Steam-Extrusion** converts the feed into 'nuts' which are gentle on horses mouths. Dampening with water yields a soft **mash** that can be readily swallowed - especially significant for older horses and for horses convalescing after surgery or dental work

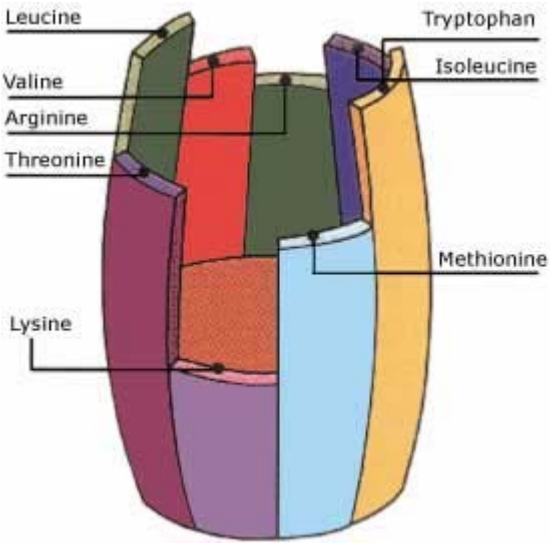
9. **Improved air quality:** These processing techniques also reduce dust, moisture, ammonia production, bacteria, fungal spores and other respirable particles, making clean feeds and improving air quality - which has a direct effect of respiratory health and susceptibility to respiratory diseases.

10. **High oil-enrichment:** Both processing methods allow addition of over 10% oil.

11. **Muscle development or fat deposition:**

> ***Two horses may be gaining similar amounts of weight, but one may be building bone and lean muscle mass and another depositing fat.***

Correctly fed yearlings achieve greater gains in whither height, reach mature height earlier and deposit less fat because their essential amino acid requirements are met. This is related to the essential amino acid composition and digestibility of the feed. Proteins are chains of amino acids. Picture a wooden water barrel. The water level is set by the shortest slat.



Similarly, if each slat represents an amino acid, the amount of bone and muscle a horse can build is set by essential amino acid deficiencies.

The remaining amino acids, which cannot be used, are converted to fat - increasing weight handicap, causing 'blowing' after work and limiting muscle and bone development in young horses.

Three things determine essential amino acid intake:
- amino acid level in the feed
- % protein of the feed
- digestibility of the feed

Steam-extrusion and micronization improve digestion in the small intestine to over 90% - releasing previously unavailable essential amino acids so they are available to the horse for bone and muscle development.

Amino acid deficiencies favour fat. Fine-tuning the amount of protein, amino acid levels and digestibility prevents deficiences and supports muscle and bone development.

12. **Respiratory Implications: The bellows and the piston:**
    During fast exercise there is a one:one coupling of respiration to stride. During expiration the abdominal contents (the majority of which is the gastrointestinal tract, and weighs up to 125kg) lurch forward, impacting with the diaphragm and giving the lungs an additional squeeze.

    During inspiration, the abdominal contents slide backwards, causing the lungs to expand and suck in air. This arrangement matches oxygen supply to oxygen demand because breathing is matched to stride.

    Any narrowing of the small airways due to disease or allergies to dust, ammonia, fungal spores or fragments of bacteria in raw grains, bedding or roughage, can lead to structural closure during galloping. The weight of the gut imposes another limit.

If the gut is overly full and heavy, this gut ballast, or dead weight limits the ability of the diaphragm to move, thereby restricting breathing.

Recommendations in the international literature for steam-extruded feeds and micronized feeds include:

- horses that require over 50% of the diet as grain to maintain body weight in intense training;
- those prone to gastrointestinal distrubances;
- geriatrics;
- horses prone to 'tying up';
- to lower weight handicap by reducing gut ballast in horses working in hot conditions.

FEEDING FOR THE DISCIPLINE: Campdrafting, polo, cutting and Western Performance. Exhaustion of energy reserves and heat build up are the major limitations to performance.

Steam-extruded and micronized feeds assist in reducing lactic acid, ammonia and heat build up - major players in the onset of fatigue.

Available energy increases by up to 40% - meaning less is needed compared to traditional raw feeds. Because only 2/3 as much steam-extruded or micronized feed is required, less water is drawn into the gut - reducing by many kilograms the weight of the gut and therefore the weight handicap.

Dressage: The gymnastics required of the dressage horses place unusual demands on the joints, ligaments and muscles. Maintaining a steady supply of 'cool' energy is essential. Feeds highly digestible and enriched with oil promote a calm temperament because acid and ammonia production in the gut are reduced.

Showjumping: A heavy gastrointestinal tract can be a disadvantage during competition, so highly digested, low residue feeds should be considered.

Endurance and eventing horses: Steam-extruded and micronized feeds allow for an increased intake of roughage which in turn creates a reservoir of fluid and electrolytes in the gut. The horse can draw on this

reservoir to replace fluid and electrolyte losses and maintain normal gut movements during prolonged exercise and sweating.

Thoroughbred racehorses and Standardbred trotters: Reduced weight handicap, lower blood and urine acid levels, glucose sparing effect of increased oil intake, less risk of caecal acidosis which is common on raw grains, reduced heat load during exercise and benefits offered by steam-extruded and micronized feeds.

The leaders in the field: Major advances have taken place in veterinary medicine, genetics and training over the last 50 years, but many horses are still fed in a way that has not changed since last century.

Mitavite, maker of Mitavite feeds, is not simply a horse feed manufacturer.

Nutritionists, equine veterinarians and agricultural scientists combine their fields to provide technical support using feed analysis and a computer-based diet analysis. But to be a leader you have to do research. Over the last 50 years, equine nutrition research has gained momentum.

Mitavite has a commitment to research, with ongoing studies into the prevention of laminitis, tying up, colic, diarrhoea, bone diseases, foal diarrhoea and the relationship between nutrition and performance.

Steam-extrusion and micronization have enabled new feeding strategies which improve health and performance and offer special benefits in tropical and subtropical conditions. Mitavite feeds are the only steam-extruded feeds in Australia - combining the latest international nutrition research with time-honoured principles of feeding horses.

When something is good, it is often copied and presented as equivalent to the original - even though the specialist recognises the difference. A copy often costs the same as the original - but there is really no substitute. You can't beat the quality and results of Mitavite steam-extruded and micronized feeds to improve health and performance.

For further information on feeding horses please fill in our ***nutrition advice form.***