

The importance of species appropriate feeding and eating behaviour of horses

by Lennart Denkhaus

This article focuses on the importance of species appropriate feeding/eating behaviour of equines. However, as also mentioned in the five freedoms (Farm Animal Welfare Council, 2009), which are building the base of the animal rights and protection, other factors are crucial in order to guarantee the well being of the horse:

1. **Freedom from Hunger and Thirst** - by ready access to fresh water and a diet to maintain full health and vigour.
2. **Freedom from Discomfort** - by providing an appropriate environment including shelter and a comfortable resting area.
3. **Freedom from Pain, Injury or Disease** - by prevention or rapid diagnosis and treatment.
4. **Freedom to Express Normal Behaviour** - by providing sufficient space, proper facilities and company of the animal's own kind.
5. **Freedom from Fear and Distress** - by ensuring conditions and treatment which avoid mental suffering.

Not only species appropriate feeding, but also being free to express other species appropriate behaviours, such as herding and movement and many more are from utmost importance and need to be fulfilled in order to guarantee the health and well being of the horses (and any other animal).

Scientifically spoken equines are herbivore hind gut fermentors, having evolved to almost constantly eat little portions of rough fiber being low in energy. Observations and researches showed that horses being free to choose their feed stuff spend approximately 60% (~14 hours) of the day grazing (Gudmundsson and Dyrmondsson, 1994; McGreevy, 2004). Horses in scarcer environment spend approximately 16-17 hours per day grazing, which may even exceed 19 hours in harsh seasons (McGreevy, 2004). However, the time spend eating strongly depends on several factors such as whether conditions, availability of feed stuff, the gender, state of maturity and many more factors (Gudmundsson and Dyrmondsson, 1994).

Given the possibility to free range and express species appropriate eating behaviour the horse will exert an approximate intake of roughage of 2-2,5% Dry matter (DM) of their body weight within 24 hours (National Research Council (U.S.), 1987; Kiley-Worthington, 1987; Dowler, et al., 2009; Wright, 1999).

Being able to free range and spend most of the day grazing is resulting in approximately 57.0000 chewing movements (Cuddeford, 1999) on high fibre roughage (and about 40.000 on roughage with an average fibre content, which in this research is the more likely number to work with) (Frape, 2004) Figures as such are often critically questioned as they are mainly derived from researches and observations from wild, feral or semi feral equines, however the genetic make up of ingestive related behaviour/instincts and physiology of the digestive tract have remained relatively unchanged over the last 6000 years of domestication and breeding (Koene and Gremmen, 2002; Dierendonck, 2006), which is then directly linked to the high occurrence of health and behaviour problems due to inappropriate nutrition.

The same eating behaviour performed by free ranging horses can be seen in domestic horses when given the possibility to execute this normal and instinctive behaviour (Kiley-Worthington, 1987). However, most of the nowadays domestic horses are only limited able to express normal eating behaviour due to management, as for example pre cut grass in form of hay and haylage and/or concentrates in form of pellets, mueslis or oats are fed in restricted meals. This change of feedstuff also results into a change of eating behaviour in terms of eating time, chewing movements and with that also saliva production.

A horse being free to graze 24/7 will exert an approximate DM intake of grass of 2Kg per 100Kg bodyweight per day (600 Kg horse). When being limited in grazing the horse will approximately consume 0,8Kg DM of grass in one hour. The horse given limited hay will approximately spend 40 minutes per 1 Kg of hay, resulting in about 1,2Kg DM intake per hour (Ellis, 2004). When given hay ad libitum it is most likely that the horse will take longer for 1Kg of hay with the time, as they have continuous access and can eat when ever they want and need to. However, the eating time and DM intake strongly depend on the fibre content of the roughage. The eating time for 1 Kg of concentrates differs considerably; as the horse will only spend approximately 10 minutes eating for 1Kg of concentrates (Ellis, 2004). This means that it has a high energy intake in a very short time, which firstly the digestive system has not really developed for and secondly the horse will spend much less time eating. This might result in a higher risk of occurrence of stereotypic behaviour and other health problems (Davidson and Harris, 2000) and might therefore influence the short and long term performance of the horse.

The horses' teeth have evolved to heavy exposure as it is named previously and thus would need similar conditions in order to wear in normal rates (Baker and Easley, 1951).

It has been observed that the change of the angle of the incisors is something which does not occur to such an extent in feral or wild horses as it does in domestic horses. This means that abnormal wear takes place on many of the domestic horses. Such misalignments can have severe consequences on the digestion and the whole equine body, as the temporomandibular joint gets in misalignment and plays a crucial role in the biomechanics. Besides that a change in the angle of the incisors means that the surface to surface contact of the molars is also in an abnormal state and the horse needs to clench its jaw to be able to chew the feedstuff properly (LaFlure, 2001). Reasons for that abnormal wear are that firstly the horse is fed with too little high fibre roughage, secondly it does not need to bite anymore (reduced usage of the incisors), because the roughage most likely is to some parts pre-cut and thirdly the horse gets too much concentrates on which it needs to chew at least four times less than on hay (approximately 3000 chewing movements on 1kg hay and 750 on 1kg concentrates) (Frape, 1998).

As the production of saliva is linked to chewing (Alexander and Hickson, 1970) direct relations can and must be drawn. While eating a minimum of 14 hours a day and an amount of approximately 2-2.5% DM of the body weight the horse produces approximately 4,5l of saliva per one Kg DM roughage, resulting in approximately 40-60 liters per day (Harris, 1999; McGreevy, 2004). Producing sufficient saliva is crucial for the buffering effect of stomach acidity, as the saliva with its high bicarbonate content has an alkaline level and thus is able to balance the acid level in the stomach (Picavet, 2002). If not sufficient saliva is produced on constant rates spread over the whole day, the buffering effects of bicarbonate are diminished, the gastric acidity rises and the risk of gastric ulceration increases considerably (Pagan, 1997). It has been observed that the occurrence of gastric ulceration happens most commonly in the upper region of the horse's stomach as these parts of the stomach do not contain a mucous layer and neither do they produce bicarbonate as acid neutralizer. The only protection that this region of the stomach has from gastric acid is the bicarbonate coming from saliva production and the buffering capacity of roughages (Pagan, 2008). Being exposed to a higher acidic level for more than three to four hours tissue resistance dramatically decreases and first signs of damage become visible after ten to twelve hours (Steward, 2003). Studies showed that approximately 60% of performance horses and approximately 37% of leisure horses show gastric ulceration (Picavet, 2002). The highest occurrence of gastric ulceration is found in race horses. More than 90% of all race horses show gastric ulcerations in various degrees (Pagan, 2008). It has been indicated that horses would not voluntarily starve themselves for more than four hours (Krazak, et al., 1991) as acid levels in the stomach increase then.

Having evolved to a constant grazer it also means that constant movement of the digestive tract is present and necessary to keep the micro environment healthy and active as the presence of beneficial bacteria prevents the spreading of other, potentially pathogenic bacteria (Pagan, 2008). If this constant peristaltic is not assured, the risk of colics (abdominal pain) increases considerably. In order to guarantee this, the horse being restricted in roughage intake often will be observed occupying itself with bedding eating as it lacks fibre and saliva production as well as it needs time occupation. However, excessive consumption of other sources of roughage, e.g. wheat straw (containing larger amounts of lignin, which is more difficult to digest), has been implicated in the development of impaction colic (Thorne, et al., 2005; Cohen, et al., 1999). Bedding eating is certainly beneficial for chewing, saliva production and time occupation and thus decreasing the risk of gastric ulceration, but straw should not be the major source of roughage (also as it has almost no nutritional value).

Applying sub optimal feeding regimes and not guaranteeing these natural requirements of almost constantly eating, chewing, producing saliva and having a "full" digestive tract, does have severe

consequences on the physical and mental health. The development of gastric ulceration, colics, but also the development of abnormal behaviours, such as crib biting, (e.g. Kiley- Worthington, 1987; McGreevy, et al., 1995) might result and with that have a direct influence on the horses welfare, wellbeing and thus on the five freedoms (Waran, 2007).