The Importance of Fibre

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By now we should all have got the message about the message about the importance of dietary fibre through Government sponsored ad campaigns like “Eat More Fruit and Veg” and “Three Plus Five” coupled with massive promotion by commercial companies touting the advantages of high fibre cereals in the prevention of everything from heart disease to pimples. Despite the hype, the basic message it true – and if it’s true for humans, then its even more important for herbivores like the horse, whose natural diet and digestive system is designed by evolution to eat high fibre foods exclusively.

First up, what exactly is fibre? Fibre is part of the carbohydrate fraction of feed comprising the woody materials which give structural support to plants. The compounds, together called “crude fibre” include some cellulose, hemi cellulose, pectin and lignin, all of which are digested less easily than other carbohydrates like starch and sugars.

Lignin is tough stuff and cannot be digested at all, so the higher the lignin content of a feed (crude fibre) the lower the digestibility.

Carbohydrates like starch and sugars are broken down by enzymes secreted mainly by the small intestines. Enzymes cannot digest fibre and animals rely on microbes to do that for them. In the horse, these microbes (bacteria, fungi and protozoa) live mainly in the large intestine and in huge numbers – roughly 50% of the dry weight of horse manure is made up of dead microbes. Remarkably, the number of bacterial cells in the large intestine is more than ten times the number of all tissue cells in the horse’s body, and the population is continually changing hour by hour, to cope with the different feeds passing through.

Fibre digestion by the microbial flora takes time, and in the horse, fibre is diverted into the a large blind ending pouch, the caecum, where it is held for some time – up to 60 hours, depending on the particle size of the material. Digestion continues in the colon and the cellulose and the hemi celluloses etc are broken down to yield volatile fatty acids which are absorbed and converted into energy. The microbes themselves also contribute to the equation – when they die, the horse absorbs their protein and sugar content. In nature, nothing goes to waste.

So what proportion if the total digestion effect is contributed by this intestinal microbial fermentation? Studies have shown 30% of protein, 15 – 30% of soluble carbohydrate and 75 – 85% of structural carbohydrate (fibre) digestion is provided this way. That’s why fibre is so important.

The horse is a herbivore, literally a ‘grass eater’, a fact too often forgotten when diets are being put together. Evolution has resulted in efficient systems for extracting nutrients from large amounts of low energy plant material derived by grazing up to 20 hours per day. Logically then, we should feed horses as much grass (or hay, or chaff) as possible and minimize other feeds. As a rule this is true, and will get the best results in terms of health and good digestive efficiency. However, in Australia and elsewhere, two factors prevent us from applying that totally natural system.

The first is energy. Horses can do well on grass alone, provided they are not required to do any work. As soon as you ask the horse to perform work (including exercise or bearing a foal), his/her energy requirements increase, often above the level they can

manage to extract from grass alone. Enter concentrates, the scourge of horses used by man for millennia! To increase the "energy density" of the overall diet, man introduced extra energy in the form of starch - first as raw grains like oats, barley and corn, and more recently, as manufactured feeds. These all contain some fibre, especially the outer parts of the seed coat, but much less than forages (around 10% for oats, as opposed to 30% for oaten hay). So, in order to get more **energy** into the horse, his **fibre** intake was reduced proportionally, and the troubles began.

Starch gets digested in the small intestine by enzymes secreted there. If it gets into the large intestine, those fibre consuming microbes are suddenly presented with a much easier energy source, and grow in numbers exponentially to take advantage. Some of those bugs produce gas, and gas colic results. Others can produce toxins which get absorbed into the blood, affecting circulation and resulting in laminitis. The same effect can occur on lush pasture which is sugar rich, but the ultimate cause is the same. That is too much "easy' energy in the large intestine with overgrowth and imbalance of those microbes which were supposed to battling away at the fibre. Starch is dangerous stuff in the wrong place.

Why does starch get into the large intestine? Isn't it supposed to be digested before it reaches there? Certainly, but the system is not 100% efficient. If it's overloaded, some starch gets through to cause trouble. You can get away with a little, but not too much at once. Conditioning the gut microbe population is also important and this is why changes in energy intake (hard feed) need to be made gradually. With conditioning, horses can handle larger and larger amounts of concentrates – enough to kill them if the same amount were fed suddenly to a grazing animal.

The second factor is grass quality. Even if the grass could provide enough energy, in this country it is very often short on other nutrients like minerals and trace elements – and with much of Australia in severe drought, the quantity and quality of available pasture is very limited in many places.

If the fibre balance in the diet is out of whack, the horse's whole world gets out of shape, so we will offer some practical suggestions on how to maintain the balance.
First some figures on approximate crude fibre content of common feeds.

HIGH FIBRE FEEDS OR FORAGES	**FIBRE CONTENT**	**LOW FIBRE FEEDS OR CONCENTRATES**	**FIBRE CONTENT**
OAT HAY & CHAFF	**29 – 32%**	OATS	**10 - 12 %**
WHEAT HAY & CHAFF	**25 – 29%**	CORN	**2 %**
LECERNE HAY & CHAFF	**20% - 25%**	BARLEY	**5 %**
FRESH PASTURE GRASS	**5% - 8%**	MANUFACTURED FEEDS	**5% - 20%**

Don't be fooled by the low content of fresh grass, horses will consume a lot of it and it's 70 – 85% water whereas the others are only 10% water or less. As a percentage of dry matter, pasture has 25 to 35% fibre. Good stuff!

We now appreciate the necessity of adequate fibre intake, but what is the best way to achieve it and how much is enough? All the above forage feeds alone or preferably in combination will do the job. Fresh pasture is preferable whenever it's available, as many useful vitamins and other nutrients like bio- flavinoids and anti oxidants are lost during drying and storage. There is still no substitute for a bit of "Dr. Green".

As us rule of thumb, the maximum 50: 50 rule is a safe practical guide – 50% each by weight of concentrates and forages, for horses in **hard work**. This can be stretched to 60% concentrates by weight short term during periods of intense work, but should be reduced back to 30% concentrates prior to rest days or light work. Whenever the work load is reduced, the concentrate ration should be reduced also, or the risk of digestive upset and energy storage problems like 'Tie Up' will rise.

For empty mares and spelling horses at rest, most will do well on 90 - 100% of good quality hay or pasture, but will require some supplementation to maintain adequate intake of minerals and trace elements – a mineral block free choice is the simplest solution when no hard feed is being used. Maiden fillies from the racetrack may be in poor condition and require additional hard feed at 12% protein to gain weight. It is important for reproductive performance that empty mares and maidens enter the breeding season on a rising plane of nutrition.

For the first two trimesters of pregnancy the mare can be fed the same as for empty mares with reliance on forages and limited concentrate feeds to maintain body condition. The amount of hard feed required will depend on the quality of the high fibre forage feeds which should be fed "free choice".

Most of the foetal growth occurs during the last 90 days of pregnancy and this is when the increased energy demands are normally met by extra hard feed. During lactation the energy and protein requirements are even higher, greater than for any other stage of the mare's life. Generally these needs cannot be met by forages alone. Wet mares on poor quality hay / pasture may need several kilos of concentrate per day as well as mineral and

trace element supplements which are important to reduce the incidence of foal abnormalities.

For a Thoroughbred broodmare weighing 500 Kg the table below shows approximate quantities of hard feed required when hay or pasture is fed *ad lib*.

Kilos of Concentrate Feed Required by Broodmares.

	Average Quality Hay / Pasture Kilos of hard feed per day	Good Hay / Pasture Kilos of hard feed per day
Empty Mare & Early pregnant	1.5 – 2.0	0 – 1.0
Pregnancy – last trimester	3.5 – 4.5	2.0 – 3.0
Early Lactation	6.0 – 7.0	5.0
Lactation – 90 days to weaning	3.5 – 4.0	2.0 – 3.0

An understanding of the energy level of the hard feed helps to decide how much is needed. Prior to weaning and until dry, the hard feed intake needs to be reduced to limit milk production but the mare should not be allowed to become too thin or her breeding potential may be affected.

An awareness of the relative energy level of different concentrates helps. Corn for example contains about 20% more energy than oats by weight, with barley roughly in the middle between these two. Energy values for manufactured feeds should be printed on the bag, if they are not then you are in the dark about their potential effect. Manufactured feeds have the advantage of being balanced in terms of minerals, energy and protein for the intended use, removing some of the guesswork.

The most important single thing to remember is that you cannot hurt a horse by offering more fibre, but you certainly can by offering too much concentrates. If in doubt, err on the side of caution and give more fibre – it's what they were meant to eat in the first place, and nature really does know best.