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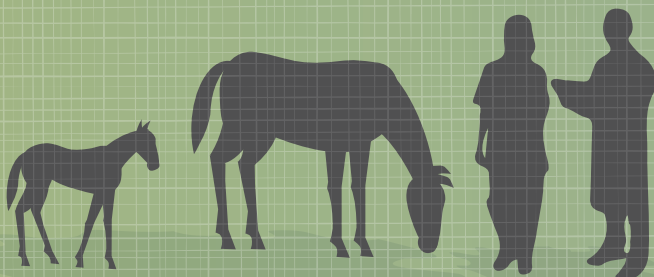
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How diet can affect the equine microbiome

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Gut microbes

It is only in recent years that we have begun to understand more about the microbes that reside in the equine gastrointestinal tract. Bacteria, protozoa and fungi all inhabit the horse's gut, but bacteria appear to be present in the largest numbers and have been the primary focus of most research studies looking at gut microbes in horses. Bacteria ferment digesta entering the hindgut to produce volatile fatty acids (VFAs) that are absorbed across the gut wall and used as an energy source by the horse. There are numerous types of bacteria present in the hindgut of horses, many of them being fibre degraders. However, bacteria can also degrade nonstructural carbohydrates (NSC), such as starch and fructan.

While protozoa are present in fewer numbers in the gut, they are physically larger in size than bacteria and as such they may equal bacteria in terms of total mass. Protozoa also degrade plant constituents and research has also shown that they have the ability to ferment starch to produce VFAs rather than lactic acid, which is commonly produced in bacterial fermentation of starch and can lead to lactic acidosis, colic, laminitis and even death. VFAs do not negatively impact on reducing the pH in the hindgut in the same way that lactic acid does and as such protozoa are believed to help maintain a more stable hindgut environment. Fungi are also present in the gut and can also breakdown fibrous material to provide VFAs.

Dietary constituents

Diet is the primary factor that affects the gut microbes in the horse. Diets high in fibre compared to those containing NSCs promote different conditions in the hindgut. NSCs entering the hindgut can have a detrimental effect on the hindgut environment, particularly if ingested in higher amounts, also potentially leading to hindgut acidosis, colic and laminitis. Diets containing starch reduce microbial diversity and this in turn can lead to less stable microbial communities and, potentially, gastrointestinal dysbiosis. Conversely, feeding a high-fibre diet, for example, a hay-only ration, promotes higher levels of diversity and stability, and lower lactic acid bacteria, which are associated with gastrointestinal disorders. When concentrate containing starch is added to the diet, fibre-degrading bacteria decline and lactic acid bacteria increase compared with a forage/fibre-only diet.

Dietary changes

The stability of equine gut microbiota can also be disrupted by dietary changes, which can also result in a disruption of the hindgut environment, increasing the risk of colic or other gastrointestinal disturbances. A sudden change in diet, even if it is just a change of forage type, can also impact gut microbes, for example, a change from hay to haylage and even a change in the batch of forage fed. Another sudden change that is often overlooked is a change from grass pasture to feeding conserved forage, and vice versa, which can also impact the microbial populations in the hindgut of horses. In fact, even horses maintained at pasture will experience sudden changes in diet during the year as grass growth and nutrient contents can rapidly change over months, days, and even hours of the day.

Probiotics

Probiotics are defined as 'live micro-organisms which, when administered in adequate amounts, confer a health benefit on the host'. Probiotics used in animal feeds include bacteria and yeasts; however, while probiotics containing bacteria have been used in other species and in research trials in horses, there are none currently registered for use in horses within the European Union (EU). There are three yeast strains approved by the EU under the category of zootechnical additives and as part of a functional group of 'digestibility enhancers' for use in horses. Yeasts are single-celled micro-organisms that are part of the fungi kingdom. All of the yeasts that are registered are strains of *Saccharomyces cerevisiae*.

The most common observation in yeast-related research studies is an increase in the fibre-digesting bacteria population and consequently fibre digestibility, mainly in fibre-rich diets. It is also thought that yeast uses oxygen from the gut environment, making it more favourable for proliferation and activity of fibre-degrading microbes that are known to require an anaerobic environment. Higher levels of fibrolytic bacteria make it more difficult for the less oxygen-sensitive lactic acid-producing bacteria to compete, thus lower levels of lactic acid are produced, and pH is maintained at higher levels, which is beneficial to gut health.

Yeast can also help maintain a healthy gut when diets containing starch are fed and can minimise any disruption to the hindgut that can occur as a result of stress, for example, travelling horses, which has been reported to impact on gut microbes. Therefore, feeding yeast when travelling and competing can help minimise disruption to the gut that can arise from the stress associated with this. Yeast is unable to colonise the equine gastrointestinal tract, which means it has to be supplemented on a daily basis according to manufacturers' recommendations.

Maintaining a stable microbial population

- Feed a high-fibre diet.
- Feed any high-starch concentrate feeds little and often.
- Make any changes to diet gradually over a period of 2 weeks.
- Make any changes to management gradual, e.g. amount of time in the stable or at pasture.
- Consider the use of a yeast supplement that can help maintain gut health.

Further reading

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