TECH TALK

The Importance of Fungi in the Gut

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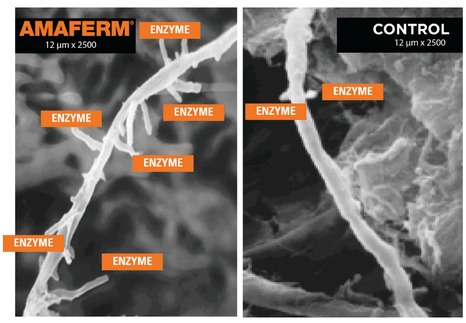
The gut is home to a diverse array of microorganisms, collectively known as the gut microbiome, which includes bacteria, viruses, archaea and fungi. To date, most research on the gut microbiome in humans and animals has focused on the abundant and complex bacterial component. Recent research has begun to explain the mycobiome or fungal component of the gut microbiome. Though still prominent, the quantity and diversity of fungi occupying the gut is several orders of magnitude smaller than that of the bacteria. However, several recent research studies have suggested that the gut mycobiota (fungi) may be intricately linked to health and disease.

Evaluation of the gut mycobiota in ruminants has also revealed that fungi account for approximately 8 to 10% of the total gut microbial mass and play a very key role in digestion.



In fact, the rumen fungi are critical to the breakdown of the fiber in grass, hay and other forage, as they are relied upon to break the lignin-hemicellulose bonds of these forages. Their essential role in the breakdown of fiber is primarily due to two factors: 1) their production of filamentous rhizoids, also known as branches, and 2) their enzymatic activity.

The production of filamentous rhizoids creates what is often referred to as “fungal branching.” The branches physically act upon the plant cell walls, breaking them apart and facilitating access to more digestible portions of the forage, which can be broken down by the gut bacteria. Since bacteria digest cellulose and hemicellulose by attaching to them, having the fungi create more surface area for bacterial attachment is critical to maximizing fiber digestion. The invasive growth of filamentous rhizoids is also associated with the production of a variety of polysaccharide degrading enzymes, which further assist the digestion process.

Building on the ability of the fungi to start off the digestion process strongly, Amaferm®, BioZyme® Inc.’s proprietary prebiotic, works to amplify the effect. Amaferm‘s stimulation of the rumen fungi is unique and impactful. Research conducted at Washington State University showed that Amaferm accelerated both the rate and extent of fiber digestion through increased growth of the fungus Neocallimastic frontalis EB188 (Chang et al., 1999).

This study resulted in a 4X increase in fungal branching compared to control, partially explaining how Amaferm improves digestibility. Additionally, Amaferm was shown to accelerate the enzyme production of the rumen fungus Neocallimastix frontalis EB188, resulting in a 37% increase in carboxymethyl cellulase, a 162% increase in β-glucosidase, and a 306% increase in amylase, showing that the effects of Amaferm are not limited to enzymes responsible for fiber digestion, but also those that assist with starch digestion (Schmidt et al, 2004).

Not only does Amaferm work to enhance the fungi’s role in breaking open the fiber to create attachment sites for bacteria to futher the digestion, it also provides a 79% increase in the total number of ruminal bacteria and a 188% increase in the number of cellulolytic bacteria compared with the control (Frumholtz et al., 1989).

Amaferm increased the growth rate of the fiber digesting bacteria in the rumen, Fibrobacter succinogenes S85 and Ruminococcus albus 7, as well as several strains of the lactate utilizing bacteria Megasphaera elsdenii, Selenomonas ruminantium, and Selenomonas lactilytica (Beharka and Nagaraja, 1998).

The end result is improved digestibility through more fungal branching, which creates more attachment sites for bacteria and releases more enzymes, and more bacteria growing and doubling faster. This mode of action yields results regardless of the fiber source. Combine that with Amaferm’s unique ability to increase nutrient absorption by up to 30%, and a reliable feed additive that maximizes performance is most certainly the result.

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References

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