Yeast products in feed: What, why, where and when?

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What are they?
The use of live microbial organisms as feed supplements for ruminants is not a new concept. Particularly, feeding large amounts of “beneficial” microbes to livestock under stress or confronted with a disease challenge. Microbial products used in this manner were originally called “probiotics,” or products “for life.” However, the term “probiotic” implied a curative nature. The feed industry, in conjunction with regulatory agencies, has accepted the more generic term of “direct-fed microbials” (DFM) to describe microbial-based feed additives. In addition, a list of accepted microorganisms for use in animal feeds was developed.

Interest in the use of fungal direct-fed microbials in ruminant nutrition is considerable. The ban of antibiotic growth promoters in feed for production of animal foods in the European Union has increased interest in evaluating the effect of yeast products (YP) on the gastrointestinal ecosystem, rumen microbial populations and overall animal performance.

Do they really work?
It is clear from these research efforts that yeast product supplements can beneficially modify microbial activities, fermentative and digestive functions in the rumen. The research has demonstrated that viable yeast product preparations can stimulate specific groups of beneficial bacteria in the rumen and has provided mechanistic models that can explain their effects on animal performance.

Fungal DFMs have been popular additions to ruminant diets for many years. In general, three types of fungal additives are available. First, some products contain live yeast (Saccharomyces cerevisiae) only or associated with their growth culture medium. Second, other products contain S. cerevisiae and culture extracts but make no guarantee for live organisms. Third, there are fungal additives based on Aspergillus niger and Aspergillus oryzae fermentation end products that also make no claim for supplying live microbes.

The most common yeast species used in the feed industry is Saccharomyces cerevisiae. It is typically fed in dairy cattle rations to alter rumen fermentation in an attempt to improve nutrient digestion, N utilization, reduce the risk of rumen acidosis and improve animal performance.

Rumen pH regulation is a key determinant in the maintenance of an optimal rumen function. Stabilization of rumen pH in the presence of live yeast has been reported in literature.

The impact of live yeast on ruminal lactate concentration has been confirmed in several in-vivo studies. In sheep, during their adaptation to a high-concentrate diet, ruminal lactate concentration was significantly lower in live yeast-supplemented animals compared to control animals. Consequently, rumen pH was maintained at values compatible with an efficient rumen function, as shown by higher fibrolytic activity. In dairy cows, reductions in rumen lactate concentrations have also been observed with live viable yeast.

Recent multi-study analyses performed both in dairy and beef cattle have shown significant benefits with live yeast (Saccharomyces cerevisiae I-1077) on milk yield and feed efficiency.

In ruminant animals, when forage is ingested, it is coated with a layer of air bubbles on the surface. Moreover, ruminants consuming a high-forage diet spend at least 12 hours per day eating and ruminating. These two activities increase the amount of oxygen swallowed into the rumen. Live yeasts can utilize this oxygen for their metabolism – thus, decreasing the redox potential in the rumen, which is necessary for the survival of strict anaerobes: protozoa, fungi and bacteria. Once the oxygen is removed, the rumen bacteria attack efficiently onto the fiber particles and digest the forage. The extent somewhat depends on the exact strain of the yeast, which are numerous. One live yeast strain (Saccharomyces cerevisiae I-1077) has been reported to increase fiber digestion.

Why should I use them?
No animal – herbivore or omnivore – can digest unaided the principal structural carbohydrate of plants: cellulose. The digestion of plant foods is always brought about by a symbiotic relationship between the herbivore animal, in this case the ruminant, and the microbiota contained in its digestive tract, and these microorganisms are the actual agents of cellulose digestion. Moreover, modern livestock industry practices inevitably increase the risk of clinical and subclinical enteric diseases. This is mainly associated to higher stocking rates, high-energy-density diets and the possibility of horizontal transmission of diseases. Thus, animals have become more vulnerable to harmful microorganisms. Traditional husbandry practices have relied on therapeutic drugs, i.e. antibiotics, to deal with these challenges. Correct maintenance of the gut microbiota can be achieved by using direct-fed microbials, like yeasts, as an available alternative to reduce our dependence on traditional therapies, without sacrificing production efficiency. The concept of “probiotics,” or direct-fed microbials, is not new. It was originally used in human medicine in 1907.

How should I evaluate these products?
Since the early 1980s, feeding yeast products has increased in popularity, particularly in lactating dairy cows. Other

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common applications for these products have been to newborn calves (reducing enteric disorders), at weaning (reducing stress, improving intake) and for cows in transition (improving production efficiency). A more recent survey indicates yeast products usage in rations for lactating cows is now around 38 percent.

Dr. Mike Hutjens, who recently retired from the University of Illinois, refers to the 4 R’s: response, return (What is the return on investment?), research and results (farm) when evaluating feed additives in a ration.

Response: A recent meta-analysis reported a 2.1 lbs per day milk response in lactating cows supplemented with live yeasts.

Return: Based on the results from the meta-analysis, and considering current milk prices and commodity prices, a minimum response of 0.25 lbs per day is required to obtain a 2:1 return on investment (ROI).

Research: More than 40 peer-reviewed research papers have been published in scientific literature to support the use of live yeasts in rations for lactating dairy cows.

How much do I have to feed (dose, level of inclusion)?

There has also been some debate on exactly how much of a given yeast product needs to be fed by the producer. Some products on the market guarantee high numbers of live yeast cells (e.g., 10^9 CFU per g) with low recommended feeding rates (0.5-1.0 g per day), while other products are less concentrated and fed at higher levels of inclusion (more than 10.0 g per day) and suggest that live organisms are not required for beneficial effects because the end products of fermentation (metabolites produced by the yeast cells) are considered as the “active” ingredients.

Some products are concentrated and can be added to a premix, or further diluted to be top-dressed or mixed into the total mixed ration. Most recommended doses are based on dose response studies and are yeast strain-specific. Look carefully at the label recommendations and the research data behind the product. The effects of yeast products on animal productivity are strain-dependent. So, all yeast product preparations are not bio-equivalent in efficacy. This aspect opens a new field of research for new strains, each being more specialized in its use. The goal of many of these research activities has been to define the application and production strategies that can optimize animal responses to yeast supplements.

References available upon request.

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