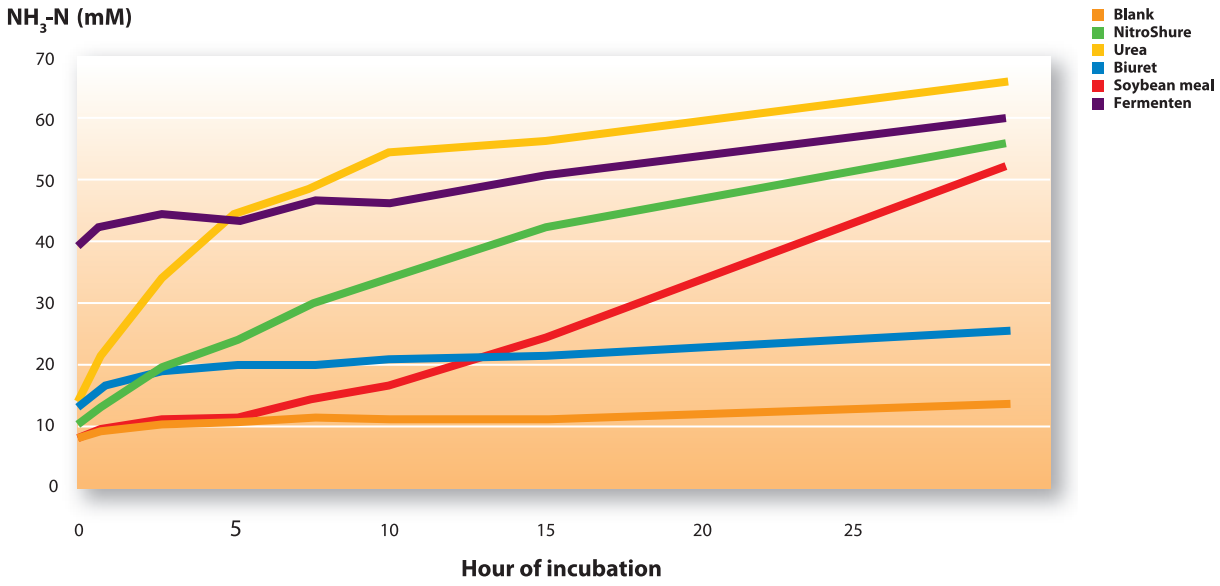
Evaluating Rumen Nitrogen Sources

When the rate of degradation of carbohydrates to nitrogen in the rumen is right, microbial protein production is maximized. Several nitrogen sources exist, but are not all equal. Some release nitrogen in a more timely fashion than others.

Research

The results of research by Di Lorenzo and Di Costanzo in 2007 show how several rumen nitrogen sources compare in their ability to provide NH_3-N for rumen microbial protein synthesis (Figure 1).

Figure 1
Ability of nitrogen sources to provide NH_3-N for rumen microbial protein synthesis



Di Lorenzo and Di Costanzo, 2007

A follow-up study included Optigen and demonstrated that Optigen has a nitrogen release profile similar to that of soybean meal. On the surface, this may seem to be a good thing if one is replacing soybean meal with Optigen. However, this is not the best release profile.

Nitrogen Source Comparison

- **Raw urea releases nitrogen too quickly.**

  Microbes in the rumen use available carbohydrates and rumen ammonia to synthesize microbial protein. This can be done effciently as long as both carbohydrate and ammonia are available at the same time or synchronized, if you like. The disadvantage of raw urea is that, as the graph shows, it is released very rapidly elevating rumen ammonia levels rapidly. As ammonia levels increase beyond the point where there is enough readily available carbohydrate for microbes to capture it and convert it to microbial protein the excess ammonia is absorbed and much of it is excreted as urinary nitrogen or milk urea nitrogen.

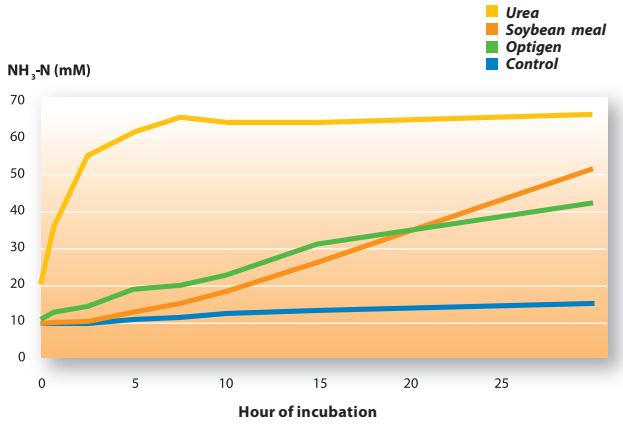
EVALUATING RUMEN NITROGEN SOURCES

- **Soybean meal releases nitrogen too slowly.** Soybean meal has a much slower release pattern. In fact it is too slow to provide adequate ammonia in the presence of rapidly fermented carbohydrate sources, such as ground corn and barley, to optimize microbial protein production. Having a release pattern similar to soybean meal in this situation is not beneficial.

- **Optigen's nitrogen release curve is not optimal.** The release pattern of Optigen is actually slower than that of soybean meal at later times *(Figure 2)*. Considering that approximately 30% of soybean protein bypasses digestion in the rumen, the release pattern of Optigen would suggest that a significant portion of its urea completely escapes rumen fermentation. If released post-ruminally, this urea (ammonia) would contribute directly to increases in urinary nitrogen excretion and MUN.

Figure 2

NH_3-N concentration of different sources of N in batch incubations



Initial concentration of N = 54.35 mM (considering N added by N source + buyer + cysteine HCl).
Adapted from Optigen brochure, EU version
Di Lorenzo et al, 2007 (unpublished

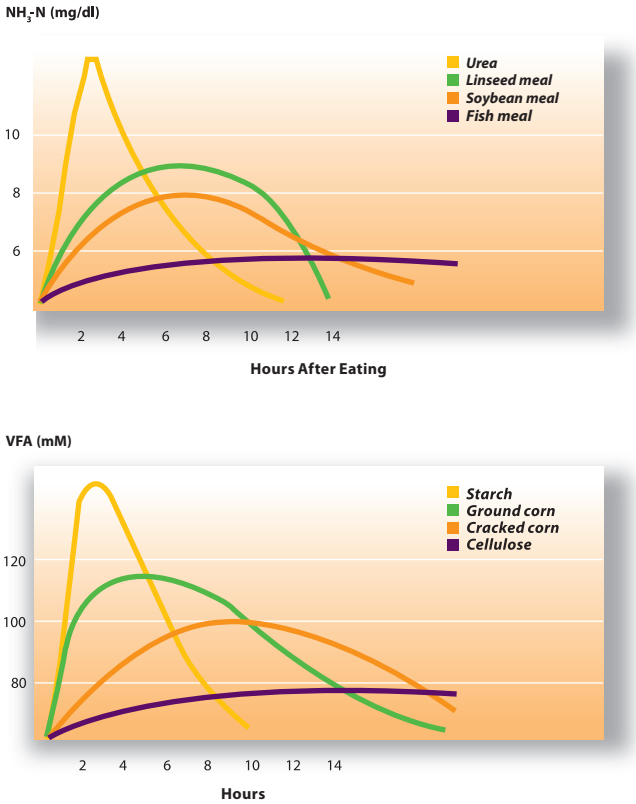
The NitroShure™ Advantages

In comparison, the release pattern for NitroShure™ *precision Release Nitrogen* is well timed: slower than urea, but faster than soybean meal *(Figure 3)*. The NitroShure advantages are:

- **Timely nitrogen availability.** Ammonia release is better synchronized with the carbohydrate fermentation, increasing the capture of nitrogen as microbial protein.

- **More complete release of urea nitrogen in the rumen.** Nitrogen must be available in the rumen for the synthesis of microbial protein.

Figure 3



NitroShure™
Precision Release Nitrogen

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