Interview: Evolution of enzyme application and advances in enzyme mode of action understanding

Interviewees:

Juan Ignacio Fernández, EMEA Director, AB Vista

Rob ten Doeschate, EMEA Technical Director, AB Vista

Mike Bedford, Research Director, AB Vista

In a recent press release, you talked about AB Vista exploring opportunities to improve profitability with a new enzyme application at EuroTier. Can you explain what you mean by this?

Juan Ignacio Fernández: We have conducted extensive research to determine the effect of targeted enzyme application to degrade both phytate and NSP, reducing the antinutritive effects of both substrates. This research has yielded a new enzyme application called Maximum Matrix Nutrition, which delivers complete phytate breakdown whilst reducing viscosity and increasing fibre fermentability. With this approach diets can be formulated with higher nutrient credits whilst maintaining animal performance, offering considerable cost savings and minimising waste. We have validated Maximum Matrix Nutrition in 10 pig and poultry performance trials globally, and our results have shown cost savings of up to €25/t with this application when compared with traditional enzyme application. Maximum Matrix Nutrition delivers equal performance at a considerably lower feed cost.

What are the key areas of research within the field of feed enzymes? Can you tell us about some of your more recent pieces of work published?

Mike Bedford: Recent research looking at phytase and NSPase mode of action has improved our understanding not only of how they work, but as a consequence, how to extract maximum value from their use. In the field of phytase research it is clear that the phytate enzyme has 5 substrates, not one, and it is the activity on all of these substrates (IP6, IP5, IP4, IP3 and IP2) that needs to be considered if you want to extract maximum value out of the phytase employed. The presence of excess P and Ca impedes not only the rate of IP6 to IP5 hydrolysis, which has been known for a long time, but also the rate of degradation of lower esters as well. This means excess Ca and P will reduce inositol production and, as a result, the benefits of using higher inclusion levels of phytase – or 'superdosing' – will be reduced as well, resulting in poorer gain/FCR responses than anticipated. In the case of Maximum Matrix Nutrition, excess Ca and P could mean failure to fully deliver the matrix expected.

Over the last five years we've heard a lot from AB Vista on the topic of phytase application; what developments in this area can we expect to hear about next?

Rob ten Doeschate: We have done a lot of work to investigate how best to translate the extra-phosphoric effect of phytase into matrix values that can be applied when using high phytase doses. It has been really interesting to see the opportunities for reducing digestible amino acid and energy levels whilst recovering performance by maximising phytate breakdown. This would be of particular interest where reduction of feed cost, either as price per tonne or in terms of feed cost per kg meat produced, is a key parameter. This applies to both chicken and pork producers, showing that the concept has a wide application.

…and aside from phytase, what developments can we expect to hear about with regards to other feed enzymes?

Rob ten Doeschate: As part of the work described above we also considered how best to deal with the eternal question of combining additives and combining nutrient release values from different products when included in the same diet. Every nutritionist has to deal with this issue, and often the research on individual additives doesn't really predict how they perform in a practical diet where several additives are included. We have shown that the combination of xylanase (Econase XT) and high levels of phytase (Quantum Blue) can deliver 80% of combined nutrient release. Data has also been published that shows that adding a protease to a diet already including other enzymes doesn't further improve digestibility, which is a prime example of a type of product that works in principle but doesn't add value in a commercial diet because the benefits are not sufficiently additive. We will continue to look for opportunities to improve performance using enzyme products, but always considering whether a new or extra additive would really add value given what is already there in most diets.

You referenced an increased understanding of mode of action of NSPases; could you shed more light on this and the relevance of this commercially?

Mike Bedford: AB Vista has invested in a significant amount of research into NSPases over the last four years, which has improved our understanding of NSPase mode of action. We have been able to show that the benefit of feeding an NSPase is driven largely by its ability to produce small quantities of NSP oligosaccharides from the diet, and that these oligosaccharides are instrumental in signalling the microbes resident in the large intestine to develop a much more effective fibre degrading capacity. Effectively we are enabling greater diet digestibility by improving the extent of fibre digestibility at a younger age than would normally occur. This is achieved by early signalling and focussing the microbes inhabiting the large intestine to attack undigested xylan. In this instance, NSPases, and xylanases in particular, can be considered as tools to train the microbiome to be better able to degrade fibre more effectively. Steps are in place to optimise the signalling pathway to increase the scale and frequency of positive responses.

Considering NSPases as tools to train the microbiome – do you see these types of products replacing others that claim an impact on gut function?

Juan Ignacio Fernández: This is a really interesting area, very much one to watch I would say. There is a whole range of products that claim an impact on gut function, some of those may well work together in a positive manner and thus achieve a synergistic effect, some may show negative interaction and some could be simply replaced by the right NSPase. So the answer is 'Yes', but it is fair to say that the science is rapidly developing in this field. It is exciting to be involved in this area and I am sure our understanding will increase rapidly in the years to come.