

Dr Leon Marchal

'Intrigued by the impossible'

"When the common consensus is that something can't be done, that is when I get intrigued as a researcher," says Dr Leon Marchal, innovation director at DuPont Animal Nutrition. He is passionate about discovering ways that lead to more sustainable animal production. And that is exactly what he and his team have done.

BY FABIAN BROCKÖTTER

The feed industry has taken many steps in the quest to get more food on the table for an ever growing population and to do so with the smallest possible environmental footprint. Using waste streams as feed ingredients, optimizing nutrient uptake and supporting gut function and health are all essential elements in getting the most out of the least input. "But there are limits to what one can do, or at least that is what most of us think. One challenge where we have only dared to scratch the surface so far, is limiting the use of inorganic phosphorus in broiler diets. Albeit with some efforts to reduce its use in finisher diets, it was always said that a totally inorganic phosphorus-free diet from the start of the flock, all the way to the end, was impossible. Well, let's see about that," is how Marchal explains his motivation to rise to the challenge.

"Using inorganic phosphorus comes at a price"

What's the issue with inorganic phosphorus anyway?

"As a nutrient source as such there is nothing wrong with inorganic phosphorus. The animal feed industry has been including it in

diets for decades. Even at this moment in time, the world's feed manufacturers use 7 million tonnes of it per annum. However, there are a few downsides to inorganic phosphorus. The first is that every tonne has a CO₂ equivalent of around 750 kilos, so using it comes at a price to the environment as does the excretion of unused inorganic phosphorus. Secondly, it's a finite resource, there is only so much of it in the world. And thirdly, as the main suppliers are China and Morocco, there is the constant risk of geopolitical scarcity as well. All in all, it is a feed ingredient that can't be counted on in the long run."

But experts say we can't do without?

"I beg to differ and we have proved it. Our research showed that with the right phytase, total replacement of inorganic P in all feeding phases is possible and, more importantly, normal growth characteristics and bone strength are also ensured. We knew in advance that young animals, with their high demand for bioavailable phosphorus, are the hardest to formulate inorganic phosphorus-free diets for. Others have made steps towards this, but until now it had remained unachievable. The last phytase frontier was to fully replace all inorganic phosphate in commercial vegetable broiler diets, starting from day 1, while maintaining performance and animal welfare. And, last but not least, it had to be economically competitive as well."

So what was your approach in the research?

"To start with, of course, there needs to be enough phytate in the diet in all phases which can be broken down with a high efficacy. We therefore aimed for at least 85-90% IP6 degradation using



Profile

Dr Leon Marchal is innovation director at DuPont Nutrition & Biosciences and has an impressive track record in the food and feed industry. He has been active in research and product development in different parts of the food and feed industry for more than 20 years. A bioprocess engineer by education, Leon Marchal obtained his PhD in enzymology from Wageningen University in the Netherlands. Working for many years in northwest Europe and at the global forefront of antibiotic reduction and sustainability, Marchal brought his knowledge to DuPont's Nutrition & Biosciences business, where he and his team are working on new solutions for sustainable antibiotic-free animal production.

phytase. In our philosophy, we believe that many diets already provide a good phosphorus (phytate) resource but not in a digestible form. And if not, it can easily be achieved by changing the diet formulation. On top of that, we used the latest insights to optimize calcium levels in the diet based on limestone solubility, with the intention of not overfeeding calcium while still meeting the minimum requirements for bone development. We further encourage good gizzard development by including some non-soluble rich material, in this case, oat hulls (husks), and we tested various phase-specific dosing strategies. It is important to note that our hypothesis was not just tested in a lab. To demonstrate and validate our theory with the novel consensus 6-phytase, we did extensive animal trials in association with Texas A&M and Wageningen University. Actual bird measurements taken included body weight, FCR and carcass yield. We also measured phosphorus availability via bone ash and tested the bone breaking strength. Based on performance and FCR we calculated the feed costs per kg of body weight (2019 international feed prices) and were able to validate the economic viability of our models."

What are the benefits to producers?

"First of all, we want to change the way we think about including

inorganic phosphorus. We can do without it, for sure. There is one 'but' in this equation which is that the amount of phytate phosphorus in a corn-soy diet is too limited to make it work. However, in many countries other feedstuffs are included or can be included. To be able to step away from inorganic phosphorus, you need to pull in sufficient phytate from wheat, rice bran, sunflower or rape seed meal. You need the substrate to make it work and enough enzyme to do the work. The inclusion of otherwise discarded by-products from day one leads to more sustainable animal production and opens up a way to use locally-produced ingredients as well. And you don't have to rely on an inorganic phosphorus supply."

Are there consequences in terms of the feed composition?

"Well, for some feed manufactures this could mean a different approach to formulation. At the moment some ingredients are simply not taken into account, like rice bran, for instance. It is common practice just to include inorganic phosphorus by default, which will not be necessary anymore. Realistically, our work enlarges the nutritionists' toolbox to formulate an even more competitive diet, while reducing environmental pressure and ensuring optimum growth of the birds."