Probiotics in animal nutrition today and tomorrow

The European Probiotic Association (EPA) recently held a conference during Victam International 2011 in Cologne in order to discuss the place of probiotics as feed additives, and the opportunities they offer for tomorrow's sustainable and profitable animal production.

This short article reflects on the main issues that the meeting addressed.

How do probiotics work?

Today, the efficacy of probiotics in poultry feed is widely accepted. In Europe, all registered products have had to prove their efficacy with several controlled field trials under various production conditions. According to Professor Guillot, a microbiologist who has been involved in probiotic applications since the early days, if we know that probiotics work we are still not sure of how they actually work. There are many suggested modes of action, but only a few are scientifically demonstrated. He is convinced that a better understanding of probiotic modes of action is crucial for the development of new products. An answer for this could come from the rapid evolution of molecular biology technologies.

Professor James Newbold explained why he thinks that now is a very exciting time for probiotics as, for the first time, we have the tools to see how they actually work. For example, powerful gene sequencing technologies helped him study in detail digestive microbial populations and how they are affected by the administration of probiotic yeast. Professor Newbold also stressed the fact that what is demonstrated for one particular strain of yeast is not necessarily true for another, the same being true for bacteria, an important feature of probiotics known as strain specificity.

When to use probiotics?

According to Professor Newbold, if we understand how a probiotic works, we can know better when it works best and in which conditions. Probiotics, unlike endogenous bacteria, do not multiply in the gut, and a continuous supply is necessary.

In the case of poultry, Professor Guillot suggests that a dose of 10^6 to 10^7 CFU/g of feed administered continuously is necessary to obtain a balance in the gut between probiotic micro-organisms and bacteria of the resident microflora.

Because of their mode of action, probiotics effects are not immediate. For example, when Professor Newbold looked at the effects probiotic yeast had on rumen microbial populations in cattle, it took one to two weeks to be able to observe any changes.

In all animal species, it is particularly recommended to use probiotics at times of great stress and demand on the animal metabolism such as transportation, weaning, dietary changes, pregnancy, farrowing and lactation.

Regulated feed additives

Professor Brufau, from IRTA, in Spain, gave an update about feed additives European regulation and how probiotics stand in the current regulation. Indeed, since 1996, micro-organisms (probiotics but also silage inoculants), are considered as feed additives and producers must document their identity, safety and efficacy for the target species (Regulation (EC) No 1831/2003).

As Professor Brufau pointed out, the EU registration is a time consuming process

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which requests loads of documentation and involves heavy dossiers. But it is the guarantee for users of a product efficacy, safety and quality. 2008 saw an important and positive evolution of the regulation with the introduction of 'functional groups'. Under this concept feed additives are classified according to their function, not their composition. For example, under this regulation, probiotics are usually classified as 'gut flora stabilisers'. This new regulation has been welcomed by the industry as it allows functionality claims to be linked to a product.

Beyond the gut

If today probiotics belong to the gut flora stabilisers functional group, one can very well imagine that in the future, various functionalities and, thus claims, could be officially attributed to probiotics once the appropriate dossiers have been prepared, such an example could be welfare claims. Probiotics have now been used for 25-30 years in animal production and their effects and potential do not stop at gut health. This has been observed by many users and scientific data is now starting to back this up.

Scientists have shown, for example, the benefits of certain probiotics in enhancing immunity or reducing the effects of stress.

When questioned about what they foresee for the future of probiotics, the experts agreed on several promising directions such as animal welfare, a virgin territory of growing needs, but also environmental issues, as well as end product quality.

For example, some strains have shown qualitative and sanitary effects on food products, such as improved egg quality, reduction of salmonella carriage on chicken and meat quality.

So, to quote Bruno Rochet from the EPA scientific seminar in Rome six years ago, more and more professionals are convinced that 'the future is bright for probiotics', and they certainly have an important role to play in tomorrow's sustainable agriculture. ■

Science validated concept

If the benefits of probiotics have been described a century ago by Metchnikoff, their use in animal nutrition only really spread in the last 30 years, first in the US where the concept of direct fed microbials was in use since the 1970s, then in Europe, where the first commercial strains arrived on the market in the mid 1980s.

Much progress has been realised in only 20 years, on the scientific, technical and regulatory sides, coupled with a positive evolution of the probiotic image and increased credibility among the animal production industry and general public.

In the early days, the first companies and scientists who saw the potential of probiotics were met with scepticism: very limited data were available on the concept, the modes of action of probiotics were largely unknown and pharmacological solutions were the rule. In the late 1980s, the early players present on the European market had to lay the ground work by educating the industry and they multiplied field trials to gain and share technical expertise on probiotic and convince animal producers.

At the same time, much technical efforts were put on product development to ensure its stability and activity. Indeed, probiotics are not just like any other ingredients: they are living organisms.

Due to its very definition, a probiotic must remain live and active, from the factory to the animal's digestive tract, its site of action. This implies a resistance to feed production processes and storage, but also to gastric acidity. To ensure probiotic viability, producers worked on selecting the most resistant probiotic strains, and developed optimal production processes as well as protection technologies such as micro-encapsulation or post-pelleting applications which enabled the applications of probiotics to be broadened.

Regulatory set-up

In parallel to technical and scientific advances, an important market driver for probiotics in Europe has been the implementation of the regulation that recognised registered probiotics as zootechnical feed additives.

In the late 1980s, probiotics were submitted to local regulations and there was no European regulation. In 1993, probiotics became zootechnical feed additives, submitted to the feed additive regulation, Directive (EC) No. 70/524, under the newly created category 'micro-organisms'.

From there, the first authorisation dossiers were submitted to the authorities, which had to prove a product (strain) identity, safety and efficacy. A temporary authorisation was delivered for three years, allowing time to the manufacturer for constituting a complete dossier for a permanent authorisation. The present regulation, Directive 1831/2003, was implemented in October 2004. Under this new Directive, authorisations are delivered for a 10 year period (vs. 'no time limit' under Directive 70/524).

Moreover, Directive 1831/2003 defines functional groups for feed additives, allowing a probiotic to be linked to a functional claim.

The new Directive also saw the creation of FEEDAP, the Panel on Additives and Products of Substances used in Animal Feed from EFSA (European Food Safety Authority). Indeed, until 2004, the authorisation dossiers were examined by each member state, while they are now submitted to FEEDAP experts who emit their scientific opinion.

The regulation helped shape the probiotic market in Europe: producers were forced to make important investments to build-up their registration dossiers, a time, energy and money consuming process.

Only approved products, which prove their quality, safety and efficacy, can be marketed as probiotics, bearing defined and proven efficacy claims.

This regulatory set-up participated to the credibility of probiotics and showed the way for other countries.

Evolution of expectations

As the market, the science and the technology have progressed, so have the animal producers' objectives and expectations.

Over the years, as new challenges arise for the animal producer and the science brings additional benefits and potential applications, the reasons to use probiotics have evolved. For example, in the early days, probiotics were used mainly as performance enhancers (increased ADWG), as a potential replacer for antibiotics as the 2006 deadline approached.

Later on, increased awareness about environmental issues and consumers and retailers' demand for safe, natural food products, and animal welfare issues came into the picture. Probiotics can also help answer some of these issues as a natural approach backed by scientific and technical data with a guarantee of traceability and food safety.

In terms of animal welfare, a promising and emerging field of research is the effect of probiotics on stress management, an effect which had been observed by many farmers over the years, particularly in intensive rearing conditions.

Today, producers are faced with increased economical pressure and the potential of probiotics to improve feed efficiency remains a key criteria.

So, what does the future hold? The increased concern about environmental issues and food safety can only open new opportunities for probiotics with possible applications such as the reduction of greenhouse gas emissions, or effects on animal product quality, but also applications beyond the gut and the animal. ■