

ALL ABOUT FEED

G A T E W A Y T O T H E G L O B A L F E E D I N D U S T R Y

Water:
Critical but
overlooked



THE PROOF IS IN: SiloSolve® FC wins over yeast, mold, dry matter loss - AND THE COMPETITION

**SILOSOLVE® FC IS A COMPLETELY NEW SILAGE INOCULANT
THAT DEFENDS SILAGE VALUE TWO WAYS:**

 **SiloSolve® FC promotes healthy fermentation.**

As soon as the bunker is sealed, it immediately establishes ideal anaerobic conditions that effectively inhibit CO₂ production and reduce dry matter loss.

Scan the code to see the proof in this CO₂ inhibition video.



 **SiloSolve® FC keeps silage fresh.**

It effectively reduces yeasts and mold to prevent the loss of nutrients. So you can maintain highly profitable levels of milk production.

Scan the code to see the amazing difference SiloSolve® FC makes in the mold & yeast count video.

CHR HANSEN

Animal Health & Nutrition

Rooted in science, grounded in agriculture. Since 1874

It all started in a rural Danish farming community in 1874. Today, thanks to our team of scientific specialists, Chr. Hansen has the largest collection of microbial strains for probiotics and silage inoculants in the world. So we can help you boost efficiency and profitability, while meeting all regulatory requirements for safety, stability and efficacy.



COVERSTORY

Water quality
deserves ongoing
attention

18

CONTENTS

The use of bacterial endoxylanase in layers

09

Does EFSA's opinion pave the way for insect protein?

12

What to put in young animal feed?

15

Effect of feed on microbiota balance in piglets

22

Sugar: Solution for pain control in piglets?

26

NUTRITION AND HEALTH

The most important time in the life of good performing pigs is likely to start during gestation. The right nutrition will help the animal live up to its potential.



06

FEED ADDITIVES

Amino acid use
in practice

30





CIBENZA[®]
DP100

Realize the Hidden Value

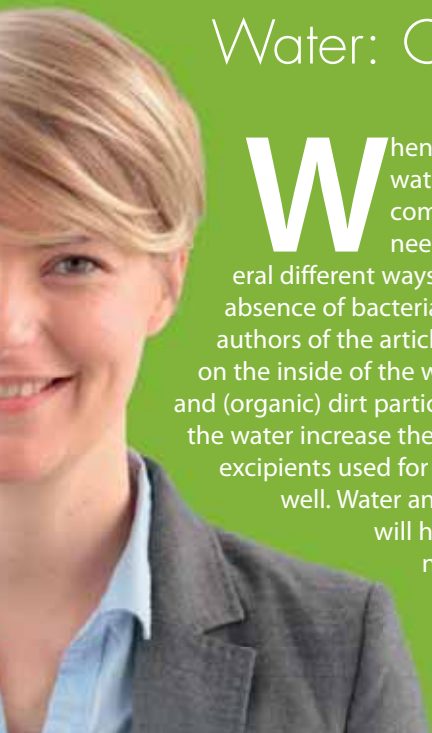
Reduce feed costs and still maintain strong flock performance. CIBENZA[®] DP100 is the intrinsically heat stable protease proven to reduce feed cost and help you realize more value from the ingredients in your rations.

NOVUS[®]

Visit www.novusint.com/CIBENZA.

* NOVUS and CIBENZA are trademarks of Novus International, Inc., and are registered in the United States and other countries.
©Novus International, Inc. All rights reserved. 3891_Reed_AAF

Water: Crucial for good performance



When we talk about animal nutrition and diet formulation, we don't automatically put water intake and water quality into the matrix. Water is the most critical, but also the most overlooked nutrient when it comes to flock performance in the poultry industry. In this respect, the quantity and quality of water needs ongoing attention, as stated in the article on *page 18* of this issue of *All About Feed*. There are several different ways to characterise water quality, including taste, colour, odour, alkalinity, acidity, pH, the presence or absence of bacteria, etc. All of these factors can affect the health and performance of the animals. As explained by the authors of the article, the quality of drinking water is mainly affected by the possible presence of biofilm, a slimy layer on the inside of the water pipe. A biofilm in a water pipe is formed when micro-organisms grow on deposits of minerals and (organic) dirt particles form on the side of the pipe. Increased amounts of iron, manganese, lime and such elements in the water increase the chance that biofilm will form. It can also lead to extra wear, blockage and leaks. The substances and excipients used for things such as vaccines, antibiotics, vitamins and wormers can stimulate the growth of biofilm as well. Water and feed intake are also strongly correlated. According to Mississippi State University, feed availability will have a major influence on water intake. The birds will drink little water, even if it is available, if they do not have access to feed. And they will eat little or no feed if they do not have access to water. So, when we talk about feed formulation, never forget the water component. Otherwise, the precisely formulated diets won't produce the results that you hope for.

Emmy Koeleman, editor *All About Feed*

COLOPHON

All About Feed is published by Reed Business International Agri Media, part of Reed Business Information bv, the Netherlands. Copyright © 2015. All rights reserved.

ISSN: 0928-124X
Frequency: 10x per year
Circulation: 17,000

Managing director: Casper Niesink
Publishing director: Roel Leferink
Advertising sales manager: Amber van Remmen
Advertising sales team: Sandra Duvnjak, Geke Koudenburg, Antoinette Kwakman and Dhierinder Ramcharan.
Media file available on request (salesint@reedbusiness.nl)
www.rbiagri.net; Tel: +31 314 349 968
Sub editors: Sunita van Es-Sahota, Zanap van Dijk
Supporting sub editor: Hugo Claver
Web content coordinator: Allison Winstanley
Designers: Paulus Maessen and Lex Aalders
Traffic manager: Karin Benning



Production co-ordinator: John van Hummel
Marketing manager: Koen Leuverink
Sales marketer: Sven Spekking
Subscriptions: www.allaboutfeed.net/subscribe
Or contact our customer service at Tel: +31 314 358359 or email: customerservice@reedbusiness.nl
Subscriptions can start at any chosen time. Subscribe via the website or directly at our Customer Service. Subscriptions will automatically continue unless Customer Service receives a cancellation notification at least 30 days prior to subscription end date. Notification of subscription termination can be done either in writing or by e-mail.
For information regarding running subscriptions, you can also contact Customer Service.
Banker: Citibank Philadelphia, Lock Box 7107, PO Box 7247-7101 Philadelphia, PA 19170-7107, USA
Account no. 4067-7681; Cheques payable to: Reed Business bv
Address:
Reed Business bv
PO Box 4, 7000 BA Doetinchem, the Netherlands

Tel: +31 314 349 104 Fax: +31 314 342 408
Published, printed in co-operation with Senefelder Misset, Mercuriusstraat 35, 7006 RK Doetinchem, the Netherlands
Tel. +31 (0)314 355 500, Fax +31 (0)314 355 647.

The publisher and authors declare that they have compiled this document carefully and to the best of their knowledge. However, no warranty or representation is made as to the accuracy or completeness of the information contained in this document. The publisher and authors assume no liability whatsoever for any damage resulting from the use of this document or its contents.

Reed Business bv, publisher of *All About Feed*, collects data on subscribers to this magazine and when you contact our organisation. These data may be used for direct marketing purposes for Reed Business bv, its ventures and carefully screened companies. You can block your data for use in direct marketing by writing to Reed Business bv, attn. Address Processing, PO Box 8080, 7000 AV Doetinchem, the Netherlands, or by e-mail to adresregistratie@reedbusiness.nl.



Emmy Koeleman
Editor All About Feed & Dairy Global
+31 314 349125
emmy.koeleman@reedbusiness.nl



Vincent ter Beek
Editor Pig Progress
+31 314 349677
vincent.ter.beek@reedbusiness.nl



Fabian Brockotter
Editor World Poultry
+31 314 349611
fabian.brockotter@reedbusiness.nl



Rosie Burgin
Assistant editor
+31 314 358237
rosie.burgin@reedbusiness.nl



Roel Leferink
Publishing & editorial director
+31 314 349826
roel.leferink@reedbusiness.nl



Amber van Remmen
Sales manager
+31 314 349171
amber.van.remmen@reedbusiness.nl



Geke Koudenburg
Key account manager Asia, Oceania,
France, Spain & the Netherlands
+31 314 349834
geke.koudenburg@reedbusiness.nl



Sandra Duvnjak
Key account manager Germany, Austria,
Switzerland, Italy & Eastern Europe
+31 314 349551
sandra.duvnjak@reedbusiness.nl




Dhierinder Ramcharan
Key account manager Benelux &
Nothem Europe
+31 314 34551
dhierinder.ramcharan@reedbusiness.nl



Antoinette Kwakman
Key account manager North and South
America, Africa, Middle East, UK & Ireland
+31 314 34561
antoinette.kwakman@reedbusiness.nl



Sven Spekking
Sales marketer
+31 314 349632
sven.spekking@reedbusiness.nl



Closing the gap between potential and performance

The most important time in the life of good performing pigs is likely to start during gestation. As from that moment, until roughly six weeks after birth, the young piglet is 'programmed' by nature. The right nutrition will help the animal live up to its potential.

By Andre Damveld, product manager young animal feed, Trouw Nutrition and Sandra Paredes, technical manager piglet nutrition, Trouw Nutrition

Agriculture is an increasingly vital industry. The challenge faced by the farming industry in terms of global pressure is to double food production and halve the pressure on the planet to feed 9 billion people by the year 2050. Worldwide, the productivity of farm animals is 30-40% below their genetic potential due to suboptimal conditions and their health status. Innovations aiming to narrow the gap between genetic potential and performance at the farm level are therefore needed to meet the challenge of feeding the increasing global population sustainably. Trouw Nutrition R&D has developed a programme dedicated to reducing the gap between genetic potential and performance on farms to 20%. By providing farmers with natural, sustainable ways of improving animal health and performance, its LifeStart programme promises value through science and good life performance.

Key principle

The key scientific principle behind this programme is known as 'metabolic programming'. It highlights the fact that environmental and nutritional influences during early life have a profound and long-lasting effect, both in humans and in animals. In 1992, the British researchers Charles Hales, University of Cambridge, and David Barker, University of Southampton, demonstrated the long-term influence of early life events by relating the increase in susceptibility to type 2 diabetes in adulthood to inadequate early nutrition in humans.

In swine, there are indications that differences in methyl donor supplementation of the feed of the F0 (grandparent) has an effect on carcass traits up to the second generation F2. This thus shows that diet-induced epigenetic modifications also have a trans-generational effect in our target species, the pig. Furthermore, the principle of metabolic programming also describes a window of opportunity, which is a timeframe in early life within which interventions could take place in order to reprogram the system. The critical timeframe varies, depending on the target species. For pigs, it is postulated that the window of opportunity for intervention starts in the gestational phase and lasts up to six weeks of age. This timeframe allows one to develop tailor-made programmes dedicated to reducing the gap between genetic potential and actual performance on the farm. By bringing together world-class expertise on animal health and nutrition with practical farm management experience, it is possible to find sustainable ways to improve productivity.

Higher early feed intake

Pig farming has provided an ideal test-bed for the systematic

application of metabolic programming because the results are relatively easy to measure and compare. The pig industry faces unique challenges as farm and litter sizes expand in the relentless search for sustainable efficiency. The LifeStart programme has the potential to help the global swine industry take a quantum leap forward by supporting piglets in better preparation for growth. Early high quality nutrition is important for giving them the best start. High amounts of dry matter feed intake, while piglets are still with the sow, support the early development of the gastro-intestinal tract. During the first days of a piglet's life, the stomach and intestines grow rapidly. The sow's colostrum and early nutrition are essential in promoting the intestinal development required. Moreover, preweaning nutrition can induce accelerated maturation of the digestive system to prepare the piglet for greater and healthier growth.

Furthermore, newborn piglets have very few immunity cells in the gut and its associated lymphoid tissues. Initially, they are protected only by the maternal immune factors provided through the sow's colostrum and milk. In the first phase of life, piglets develop their own immune system, but this is a slow process. At the age of weaning, the immune system is not yet mature and the impact of abrupt removal of maternal protection, coupled with stress and potential infections, creates an immunity gap. Adding functional nutrients that augment immune development in the young animal to feeds can provide a competent immune system in later life, while reducing the need for antibiotic interventions.

Smooth feed transition

A smooth transition from the preweaning to the post-weaning period can be achieved by feeding piglets high quality feeds before and after weaning, and having a phase 1 diet that perfectly matches the weaner feed. This can reduce the neophobic instinct with respect to ingredients present in the weaner diet, enhance faster feed intake and reduce the detrimental effect on gut integrity due to fasting. Furthermore, it reduces the post-weaning feed intake dips, see *Figure 1*. All of these can be translated into higher growth and better faeces consistency, allowing higher within-batch homogeneity in later phases.

Sustainable growth for higher performance

Trouw Nutrition conducted a trial with diets for piglets up to six weeks of age. Supplementing the sow's milk with Milkiwean Yoghurt during the first two weeks of life increased within-batch homogeneity at weaning, resulted in improved gastrointestinal tract development, ensured higher cell proliferation and increased gene activity at intestinal level. There was also the added benefit of higher growth in later phases.

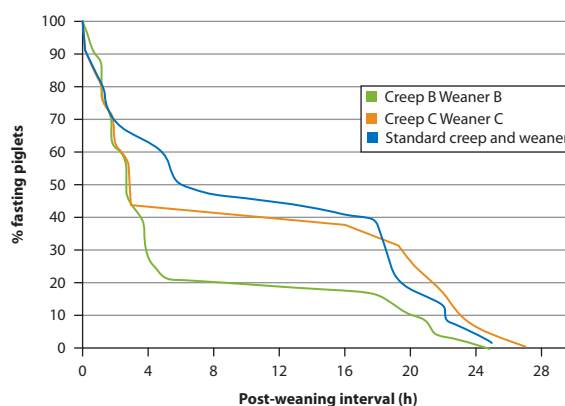
Combining a supplement of Milkiwean Yoghurt with the Milkiwean high-quality diets for piglets up to six weeks of age yielded higher weight at the end of the nursery phase and up to the time of slaughter. The main advantage was seen in the most vulnerable population, the lightweight piglets. This implies that the extra supplementation of milk replacer, combined with a high-quality starter feed, has an advantage in terms of within-batch homogeneity and bodyweight gain, see *Figure 2*, a reduction in days to slaughter and a reduction in cycle/year; all resulting in economic benefits for the farmer.

High quality nutrition in early life, with emphasis on the first six

weeks of life, improves the uniformity of litters because smaller piglets tend to catch up in size. Furthermore, the additional growth obtained in the first six weeks of life leads to higher slaughter weight and a reduction in days to slaughter. The impact on farm economics is significant, as it leads to higher farm throughput and more meat produced per m².

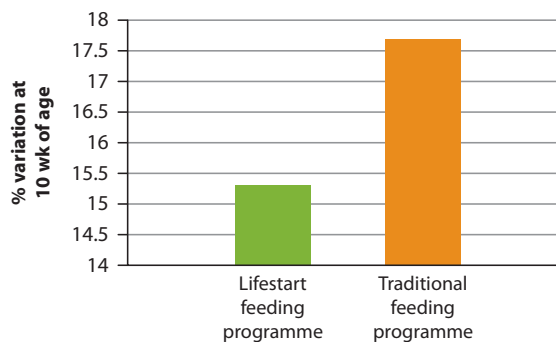
References available on request.

Figure 1 - Effect of preweaning diet composition on transition in the immediate post-weaning phase and effects on growth and improvement of faeces consistency.

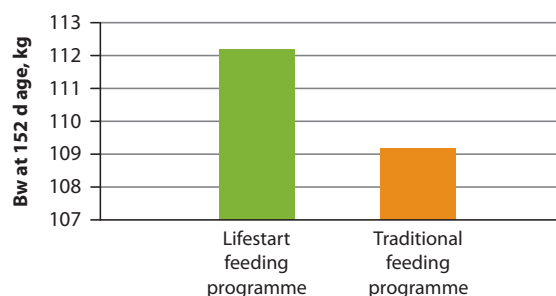


Source: Trouw Nutrition R&D, 2013

Figure 2 - Comparison of LifeStart vs. a traditional feeding programme's effects in terms of within-batch homogeneity and bodyweight gain up to growth-finish phase.



Source: Practice research from Inssolpig, Belgium, 2013





Your animals are your business.
Protecting them is ours.

Alltech[®] **MYCOTOXIN MANAGEMENT**

From the field to the feedmill and your farm to our fork, Alltech Mycotoxin Management can help you safeguard the health of your animals, the quality of your feed and the security of our food supply.

ALLTECH 37⁺[™], ALLTECH MIKO, MYCOSORB A⁺[®]

Alltech European Bioscience Centre
Sarney, Summerhill Road, Dunboyne, Co. Meath, Ireland
Tel: +353 1 825 2244 | Fax: +353 1 825 2245

For further information please contact us.



Alltech.com

 [AlltechNaturally](https://www.facebook.com/AlltechNaturally)

 [@Alltech](https://twitter.com/Alltech)

The use of bacterial endoxylanase in layers

The use of NSP enzymes not only reduces the anti-nutritional effects of the non-starch polysaccharides, but also creates a prebiotic by-product which, in turn, is converted to butyrate. This has both zotechnical and economic benefits.

By Ronny Mombaerts, Anne Goderis and Kurt Van de Mierop,
Nutrex, Belgium

The improved performance seen when using NSP hydrolysing enzymes in monogastric diets is often explained as a result of reduced gut viscosity, which improves nutrient digestibility. Yet this mechanism is unlikely to be of much significance in relation to insoluble NSPs, as they have little or no effect on gut viscosity, but rather cause nutrient entrapment, also referred to as 'cage-effect'. Furthermore, the amount of evidence for the indirect prebiotic effect of a certain type of xylanase keeps growing. The main idea is that a partial hydrolysis of soluble and insoluble arabinoxylan (AX) into smaller arabinoxylan oligosaccharides (AXOS) makes them ferment faster and favours desirable microbiota. This results in the production of important levels of desired SCFAs and improves morphological and histological changes in the small intestine as well.

Effect on gut health and eggshell quality

Improved intestinal health not only influences nutrient digestibility, but also affects carcass composition and the quality of egg(shell)s. Poor eggshell quality is one of the most important issues in the poultry industry, influencing the economic profitability of egg production and hatchability. Mabe et al. (2003) indicated that cracked or broken shells account for 80-90% of eggs that are routinely downgraded. One of the main concerns is the decrease of eggshell quality as hen age increases, because the incidence of cracked eggs can exceed 20% at the end of the laying period. Furthermore, the high breaking strength of eggshells and the absence of shell defects are essential for protection against the penetration of pathogenic bacteria into the egg. In the past, several studies have shown the effects of bacterial endoxylanase on microbiota composition. Alireza et al. (2015) designed a study to unravel the true mechanism by which gut microbiota are affected by the addition of feed enzymes. The bacterial xylanase significantly increased the number of bacteria belonging to Clostridium cluster IV (butyrate producers), total bacteria and butyryl CoA-acetate CoA-transferase genes (Table 1). In addition to the effect on microbiota, the intestinal

morphology was also clearly affected, since villus length and villus/crypt ratio increased by 24% and 42%, respectively. The results suggest that the tested bacterial xylanase likely affects the gut microbial profile through a combination of providing readily fermentable arabinoxylan fragments together with an overall change in digesta composition as substrate for gut microbiota. Promotion of good intestinal health and feed intake may help to obtain better eggshell quality. Due to the lower pH caused by enhanced production of SCFA, an increased bioavailability of minerals can be expected. At the same time, increased production of butyrate may improve the absorptive capacity of the intestinal mucosa.

Results of trials

To study the 'side' effect of xylanases on egg quality, a number of trials were conducted in co-operation with IRTA (Spain) and ILVO (Belgium). The main results of these trials are summarised in Table 2. In trial 1, a significant increase in laying rate (92.4% vs 95.3%) was observed for the hens in the bacterial endoxylanase group when compared with a negative control group. FCR also improved significantly by 5.1% for the enzyme group versus the negative control group. Besides the influence on performance, a significant enzyme effect on eggshell was also seen. The incidence of broken or cracked eggs decreased from 2.33 to

Table 1 – Effects of bacterial endoxylanase on microbiota and intestinal morphology.

	Dietary treatment		p-value
	Corn	Corn + 100ppm bacterial endoxylanase	
Butyryl CoA: Acetate CoA – transferase	8.01	8.32	< 0.05
Clostridium cluster IV	9.39	9.74	< 0.05
Clostridium cluster XIV	8.42	8.38	NS
Villus height (µm)	963a	1202b	< 0.05
Crypt depth (µm)	168	147	NS
Ratio villus/crypt	5.9a	8.4b	< 0.05

1.63%. The objective of trial 2 was to evaluate whether NSP enzymes from different origins had similar effects on performance and eggshell parameters in commercial layers. Feeding laying hens diets supplemented with either a fungal enzyme cocktail (FX) or a bacterial endoxylanase (BX) had no significant effect on their zootechnical performance. However, laying rate, egg weight and daily egg mass were numerically higher for the BX-supplemented laying hens compared with their FX-supplemented counterparts. Due to their higher egg mass and their lower feed intake, feed conversion was decreased by 28 points (1.934 vs. 1.962). In addition, there was also a treatment effect on egg quality. Eggs from hens fed BX had a significantly thicker eggshell and had fewer cracked eggshells than hens fed FX. Trial 3 was set up to research the effect of bacterial endoxylanase (BX) on performance and eggshell quality in older layers (54 – 74 weeks of age). Supplementing the feed with BX significantly improved the laying percentage (87.9% vs 83.7%) and egg mass (58.3 g vs 55.3 g), resulting in a significantly better feed conversion ratio (1.974 vs 2.085). The incidence of broken and dirty eggs was moderate and comparable between treatment groups, whereas the incidence of soft-shelled eggs was significantly lower (0.04% vs 0.47%) for the BX-supplemented group. For Haugh units (HU), a significantly higher value for the laying hens fed the diets supplemented with BX (90.14 vs 87.60) was noticed. Supplementing a bacterial endo-1,4-b-xylanase resulted in more efficient egg production and increased HU when compared with the negative control diet (Delezie et al. 2015).

Conclusions

Based on these results, we conclude that NSP enzymes not only reduce the anti-nutritional effects of the non-starch polysaccharides, but also create prebiotic arabinoxylan-oligosaccharides which are fermented in the ceca to produce high levels of butyrate. The benefits of butyrate in terms of eggshell quality are widely accepted, so if use of certain NSP enzymes can reduce or replace the addition of butyrate, feed prices will drop distinctly. Since eggshell quality has a significant impact on the profitability of layer farms, enzyme choice must be made taking into consideration not only the effects on energy uplift and zootechnical performance, but also the effects on egg quality.

References are available on request.

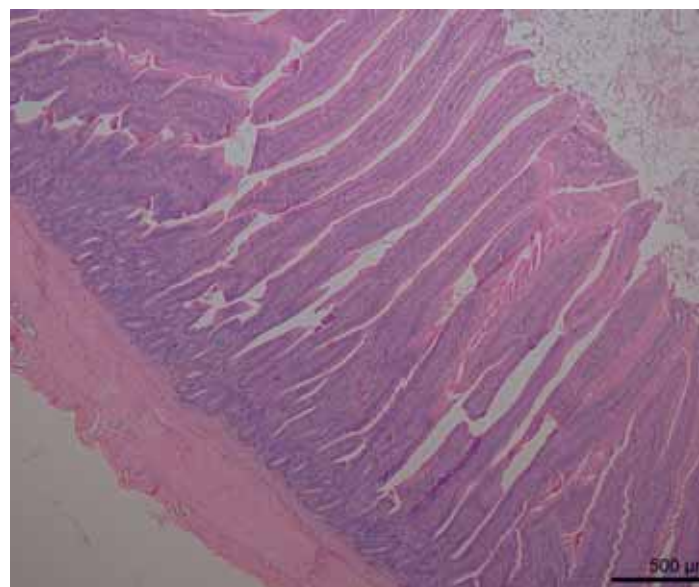


Table 2 – Summary of layer trials.

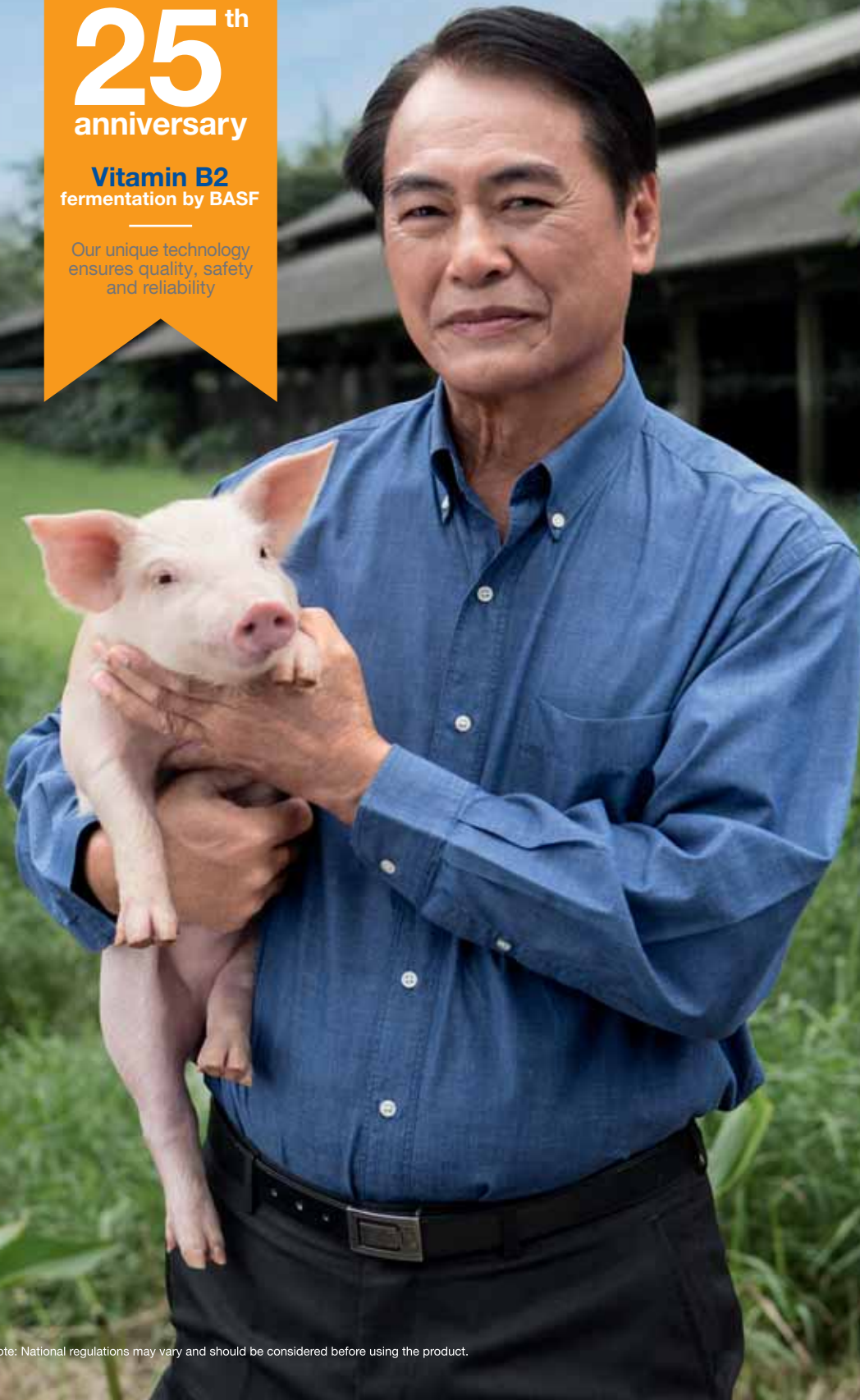
		Laying rate (%)	FCR	Eggshell quality/cracked eggs (%)	“Egg thickness (1/100mm)”	Haugh Unit
Trial 1 (IRTA)	Negative control	92.4	1.959	2.33		
	Bacterial endoxylanase	95.3	1.859	1.63		
	p-value	< 0.05	< 0.05	< 0.05		
Trial 2 (ILVO)	Fungal enzyme cocktail	95.3	1.96	1.46	35.8	
	Bacterial endoxylanase	95.5	1.93	1.02	36.8	
	p-value	NS	NS	< 0.05	< 0.05	
Trial 3 (ILVO)	Negative control	83.4	2.085	2.27	38.9	87.6
	Bacterial endoxylanase	87.9	1.974	1.99	39.31	90.14
	p-value	< 0.05	< 0.05	NS	NS	< 0.05

We create chemistry that makes efficiency love good partnerships.

25th
anniversary

Vitamin B2
fermentation by BASF

Our unique technology
ensures quality, safety
and reliability



- **Glycinates:**
Zinc, Copper, Iron, Manganese
- **Mycotoxin binder:**
Novasil™ Plus
- **Vitamins:**
A, AD₃, B₂, E
Calpan (B₆)
Choline chloride
- **Carotenoids:**
Red: Lucantin® Red
Pink: Lucantin® Pink
Yellow: Lucantin® Yellow
- **Enzymes:**
Natugrain® and Natuphos®
- **Organic acids:**
Formic acid: Amasil®
Propionic acid: Luprosil®
- **Omega 6:**
Lutalin® and Lutrell® Pure
- **1,2-Propandiol USP**

www.animal-nutrition.basf.com

150 years

BASF

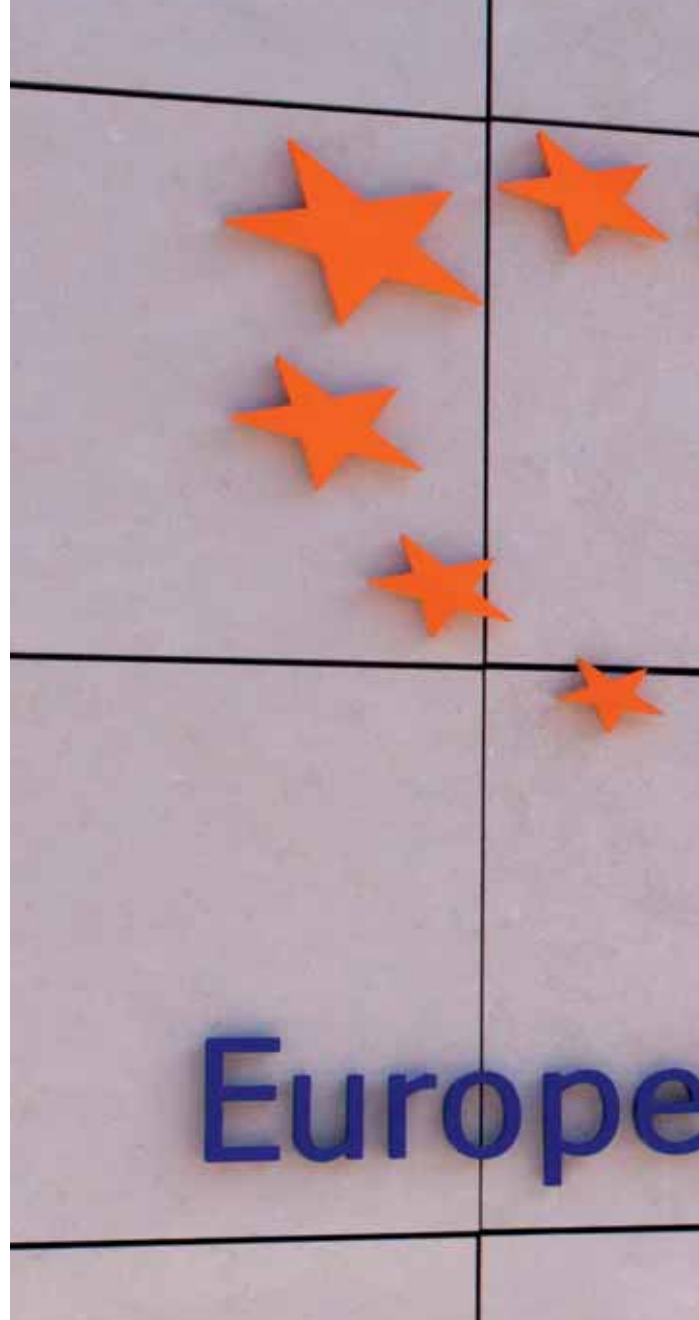
We create chemistry

Does EFSA's opinion pave the way for insect protein?

The long awaited EFSA opinion on the safety of using insects in animal feed and food is out. But its scope seems to be broad. So the question is: does this opinion really speed up the approval of insect meal for use in livestock feed?

By Emmy Koeleman

When you look at the main conclusions from the EFSA opinion, it is clear that some safety issues still need to be overcome and some data gaps need to be addressed before the safe use of insects as a food or feed source can be guaranteed. Yet it is good to bear in mind that this risk assessment from EFSA is not based on the use of insect protein for livestock feed alone. The use of insects as human food is also considered and different types of substrates are looked into. For the use of insects in animal feed, the TSE legislation provides an important set of rules. When insects are used for human food, the 'novel foods' regulation comes into the picture. Tarique Arsiwalla, founder of Protix and spokesperson of the International Platform of Insects for Food and Feed (IPIFF), further addresses this: "It is a good thing that EFSA has published its scientific opinion. The problem, however, is that the scope of the opinion is too wide. It is based on the risks for animal feed and human food. In addition, all insect species are covered and all kinds of substrates are included. As insect producers (in the EU), we are not looking at substrates that are currently not allowed to be used (such



as manure) and we simply don't want to use them. We stick to the approved substrates and, in this opinion, EFSA also states that "when currently allowed feed materials are used as substrate to feed insects, the possible occurrence of microbiological hazards is expected to be comparable to their occurrence in other non-processed sources of protein of animal origin". IPIFF would like to see a more specifically formulated opinion on the use of insect protein. "Start with narrowing it down to insect protein only, a few insect species that are mainly used and raised on approved substrates and only for use in aquafeed. The legislation for aquafeed still prohibits the use of insect protein in fish diets, although it would take less effort to change this particular legislation than it would to change the rules to include insect meal in livestock diets, such as pigs and poultry."

Quality control is key

EFSA concludes in its report that, when EU-allowed feed materials are used to feed the insects, the possible occurrence of microbiological hazards are comparable to when these



feedstuffs are used for the production of other types of animal protein. Franck Ducharne, Entofood CEO, agrees. “Any feedstuff used in animal feed has to comply with quality standards and biosecurity. Insect protein production is not an exception and must follow the procedures of QC along the production chain to guarantee best performance of the insect population and to make sure that insect-based products will meet the international standards of quality for feed (contaminant legislation). For example, feeding vegetables heavily treated with pesticides could pose a risk for the insect population and also for the quality of the end product. So it’s only a matter of setting appropriate procedures.” Ducharne also thinks it is important to enter the validation process of insect use in greater detail. “It is important to separate the use of insects as food from their use as livestock feed, as the two involve different stakes and, as a result, research and regulation will evolve differently. For us as producers, the issue is not to prove whether processed insect products are safe for animal feed, but rather to define how to organise the supply chain and processing standards and,

eventually, Quality Control standards for the meal in order to prevent potential contaminants from getting into the production line,” says Ducharne.

Opening up the market

All parties involved in production, research and government agree that the need for alternative sustainable protein is growing. The body of evidence that insect protein has great value for livestock and aqua species is also growing. Many trials are being conducted by the insect producers themselves, as well as by other organisations, such as the EU-funded project PROteINSECT. Ducharne from Entofood is positive, “If standards for feedstuffs are strictly followed by insect-based products (meal and oil) and standard processing practices for meal production are respected for processed products, I think and hope that, yes, insect meal will soon be authorised in animal feed.” Tarique Arsiwalla from Protix believes that when narrowing the scope, steps can be made quicker to actually implement the use of insect protein in aquafeed.

EFSA concludes that studies on the occurrence of human and animal bacterial pathogens in farmed insects used as food and feed are very scarce in scientific literature.

EXCELLENT!



KaSa
Mag98[®]

And certified.

KaSa Mag98 is a high-purity magnesium sulphate and complies with all regulations of the EU food and feed law, without compromise! With its natural origin it stands for excellent quality. This is why feed manufacturers worldwide apply our KaSa Mag98 made in Germany. For more information about the product and our certification, please contact us.



What to put in young animal feed?

PHOTO: HANS PRINSEN

The health and growth of farm animals may be negatively impacted when they are weaned or experience other types of stress. Focusing on the right type of feeding at the right time can help to get them through these critical periods.

By Dave Cook, global research and development director,
Cargill Animal Nutrition

There's no denying that every young production animal goes through a period of fragility and immense change. For poultry, it's the shift to eating solid food. For swine and calves, it's the transition of being weaned from their mother's milk.

It is in these critical, early stages that precise nutrients can set the foundation for a healthy gastrointestinal tract and jumpstart an optimal performance trajectory. That's why it is critical to focus on a feed portfolio that encourages immune system development, assists in digestion, produces a variety of nutritional compounds and creates resistance to the colonisation of pathogenic microbes.

Underlying mechanisms

To help producers operate efficiently through this transition window, the animal nutrition industry as a whole has amassed a range of insights into how and why certain products or nutritional strategies work. For the moment, however, most of these insights are hypotheses at best. We're moving from a phase of empirical observations to a phase of understanding underlying mechanisms. As a result, we are in a better position to recommend the additives and nutritional plans that will serve our

customers best. Agronomists have learned more about nutrition uptake in row crops in the last 15 years than in the previous 50. Knowledge of young animal nutrition is following a similar path. To deliver the amount of high-quality protein we need by 2050, we need as an industry to be more refined in our understanding of when and what we recommend to put in young animal diets. Although we're good, we can be a lot better. Fortunately for many animal nutrition companies, producers are generally well aware of the sensitivity of the young animal transition period and the value a good young animal nutrition programme brings. With that awareness, producers are ready and willing to make the necessary investment to optimise the young animal nutrition window. But this is a substantial investment for producers, making it critical for nutrition companies to better understand modes of action. If you look at the plethora of additives out there, you wonder how much cost you're adding to a diet without having insight into how things work. It's about making sure we're understanding mode of action and using products at the right time, the right level and in the right situations.

Species-specific applications

The applications for young animals may change per animal. Pigs, for example, are a great young animal nutrition laboratory. Inherently, a pig is exposed to more stress and change

than other animals. From a numerical perspective, we expect to see more advances made in pigs than we will in chickens. With this period of high stress and change in view, Cargill Animal Nutrition has spent the last few years researching different ways to improve different aspects of piglet health. In 2012, Cargill demonstrated that adding a mixture of antioxidants to a lactating sow's diet made it possible to increase the quality of the sow's colostrum, leading to an improved sow lactation feed.

This research has also focused on improving piglet nutrition during the critical window between weaning and reaching a body weight of 25 kg. Additionally, in an effort to improve neonatal health, our swine team has developed a neonatal offering comprised of both dry and liquid feeds. Together, these offerings have shown benefits of a 6% livability increase, a 1.3 to 1.7 kg increase in birth weight and a 6.5 to 8 kg increase in weaning weight.

Poultry and aquaculture

A recent poultry study conducted by Cargill showed that providing young chicks with more highly digestible feed during the first week of their lives boosted weight gain by 30 grams (roughly 17%). In addition, the chicks maintained above-average weight gain throughout the other stages of their lives, were

healthier and required less medication than usual.

In the area of aquaculture, our studies have shown that the use of hatchery feeds that do a better job of delivering the nutrients to young fish and shrimp is highly beneficial. These hatchery feeds also lower the amount of nutrients that leach into the water, decreasing stress on the animals and reducing the risk of parasite infestation. No matter what the species, activation of the immune system is a key indicator of whether or not something negative is taking place in the intestinal tract.

Understanding why it happens and understanding key markers of the immune system help us to better understand the situation that animals are in and therefore design better solutions.

Forward into this frontier

The industry continues to gain understanding of the interaction between microflora and an animal's metabolism, gaining a sense of what key bacteria populations are doing, either positively or negatively. In the long term, we can be even more precise about which additives should be used by continuing to amass enough insights to enable us to direct the populations of bacteria to a beneficial state for the animal. As much as we're looking at this from a human perspective, we can do the exact same thing in animals. And we're not satisfied to know just that something works... we want to know how it works.





29 - 31 MARCH 2016 · BITEC EXHIBITION HALLS, BANGKOK, THAILAND

Asia's largest additive and animal feed technology event

●●● What's on show at FIAAP Asia 2016?

- **Ingredients • Additives • Formulation • Laboratory equipment**
- **Quality control**

●●● What's on show at VICTAM Asia 2016?

- **Feed production technology • Packaging • Energy efficiency**
- **Auxiliary equipment • Biomass pelleting technology**

●●● Co-located with GRAPAS Asia 2016

The show for rice and flour milling, grain processing, industrial pasta and noodle processing, extruded snacks and breakfast cereal production

●●● Conferences

Each of the exhibitions will have their own conferences, including:

- The FIAAP Asia Animal Nutrition Conference 2016 • Petfood Forum Asia 2016 • Aquafeed Horizons Asia 2016 • Global Milling Conference with GRAPAS Asia 2016 • Biomass and Biomass Pelleting 2016
- The second ASEAN Feed and Rice Symposium • The second ASEAN Feed Summit

●●● Supported by

- Thai Ministry of Agriculture & Co-Operatives • Thai Department of Livestock Development • Thai Department of Fisheries • Thai Feed Mill Association • Thai Rice Milling Association • Thai Chamber of Commerce
- Federation of ASEAN Feed Associations
- Thailand Convention & Exhibition Bureau 

●●● Organized by

Victam International BV, PO Box 197, 3860 AD Nijkerk, The Netherlands
T: +31 (0)33 246 4404 F: +31 (0)33 246 4706 E: expo@victam.com
www.fiaap.com www.victam.com www.grapas.eu

See us on Twitter, Facebook, LinkedIn and Google+ or scan the QR codes









●●● Free on-line registration

Free on-line visitor registration is available from 1st November 2015 at:
www.victam.com/?pk=

AveMix® XG 10

AveMix® MCT

AveMix® P5000

AveMix® Essence

AveMix® 02 CS

AveMix® Plus



AVEVE Biochem's Feed Speciality Enzymes

- Fibre degrading:
- High levels of glucanase, xylanase and pectinase
 - Improved feed formulation flexibility
 - Maximized animal performance

- Phytate degrading:
- New generation E. Coli 6-phytase
 - High thermal stability through molecular coating

AveMix® XG 10 - AveMix® 02 CS - AveMix® P5000
the key to your nutrients



Biochem

AVEVE Biochem NV is part of AVEVE Group, the leading feed and agricultural business in Belgium

avevebiochem@aveve.be

www.avevebiochem.com

More technique More efficiency



- ▶ **Phytase**
 - *Thermostable, Liquid, Powder*
- ▶ **NSP Enzyme**
 - *Xylanase, Mannanase, Cellulase, etc*
- ▶ **Probiotics**
 - *B. Subtilis, B. Licheniformis*



  **FAMI-QS**
www.chinaphytase.com

Beijing Smile Feed Sci. & Tech.Co.,Ltd.

Email: asiasmile@chinaphytase.com

Tel: +86-10-8216 8288 Fax: +86-10-6219 9256

The Biggest Feed Enzyme & Probiotics Manufacturer in China

Water quality deserves ongoing attention

Broiler farmers generally have full confidence in the drinking water they supply to their broilers. Especially when it is obtained from the water supply company. Yet this confidence often appears to be unjustified. Research in the Netherlands showed that almost 8% of water at nipple level is unsuitable and almost 20% is less suitable as drinking water for poultry.

By Jan van Harn, Francesca Neijenhuis and Hilko Ellen,
Wageningen UR Livestock Research

It is important that drinking water from the water supply network or a farm well is of good quality, but it is just as important to have good-quality drinking water in the area of the drinking point (the nipple). The quality of drinking water is mainly affected by the possible presence of biofilm, a slimy layer on the inside of the water pipe. A biofilm in a water pipe is formed when micro-organisms grow on deposits of minerals and (organic) dirt particles

form on the side of the pipe. Increased amounts of iron, manganese, lime and such in the water increase the chance that biofilm will form. It can also lead to extra wear, blockages and leaks. The substances and excipients used for things such as vaccines, antibiotics, vitamins and wormers could stimulate the growth of biofilm as well. Bacteria that could be present in a biofilm include Legionella, E. coli (including the bacteria producing ECBL), Campylobacter, Pseudomonas, Salmonella, as

PHOTO: JAN WILLEM SCHOUTEN



Tips for good drinking water

Check whether your water installation has sufficient capacity (peak loads). Preferably use PVC materials. Check your installation: Is the filter situated at the front of the water pipe system? Are there any unnecessary bends? Are there any dead-end pipes? Is your supply pipe line sagging? Make the necessary adjustments. Have the drinking water checked regularly (four times a year). Have the water quality analysed both at the source and in the area of the animal (chemically and bacteriologically). Clean the filter after every regular round. Clean and disinfect the water pipe after every regular round. Make sure your dosing system works properly and you have the correct dosage (preparation solvent). Check the operation of the pressure regulator of the drinking lines on a regular basis and make sure

that the water level in the corresponding piezometer tube is clearly legible. Check regularly whether the water supply to the nipples is evenly distributed in the drinking line. Flush the drinking lines frequently during the round, especially when it concerns young animals. When drinking lines are not being used the first couple of days, flush these before use. Flush the drinking lines prior to and after administering medication or vaccines. Check the smell, clarity and colour of the water yourself during your regular round. A (transparent) water filter helps identify discoloration in turbid water at an early stage. Make sure the drinking line hangs horizontally and does not sag. Make sure the drinking lines hang at the right height. Replace leaking or malfunctioning nipples immediately.



well as Enterococci and Clostridium perfringens. In short, virtually the whole spectrum of bacteria that occur in nature can be found in the biofilm. Of all bacteria present in the drinking line, the majority (95-99%) is situated in the biofilm. When these bacteria present in the biofilm 'break away', they end up in the water and form a potential threat to animal health. The presence of biofilm in the water pipe can lead to reduced production, health problems, the decomposition or removal of additives, a reduced effectiveness of medication / vaccination, blockage or leakage in nipples and possibly contribute to resistance. Recent research of the GD showed that 20 weeks after administering medication in drinking water there were still residues and traces of antibiotics present.

Problems not directly connected to the source

Problems with the quality of drinking water at the nipple can arise in both water from an on-site well and water from the water supply company. But the risk of problems occurring is greater with water from a farm groundwater source. Indeed, this water can contain high concentrations of manganese, iron, nitrate and/or nitrite. Concentrations one will not find in water from a water supply company. But, as mentioned before, problems with the quality of drinking water can also arise in water obtained from a water supply company, namely problems

arising in the water pipe inside the house. The temperature in the broiler houses is ideal for the development and growth of micro-organisms. Broilers are kept at temperatures between 32-36 °C. In addition, the water flow is not very good during the first few days that the broilers are indoors. Suppose there is a house with 30,000 vacancies for broilers and in this house there are 6 drinking lines (ø 30mm) 70 metres long. In this case, there are almost 300 litres of water in the drinking lines alone. Assuming a broiler consumes twice as much water as feed in the first week, the daily water intake in the first week varies from 25 ml (day one) to 70 ml (day seven). This means the daily water use of the entire house ranges between 750 litres (day one) and 2,100 litres (day seven). In other words, 2.5 – 7 times the capacity of the drinking system.

Monitoring the quality of water personally

A broiler farmer is able to monitor the water quality quite easily. It is recommended that he monitor it every regular round so he can intervene in the case of possible derogations from set standards. An appropriate moment to monitor the drinking water quality is when the broilers are between seven and 14 days old, because that is just after a critical period of high temperatures and poor flow in the drinking lines. How can a broiler farmer monitor the water quality himself?

The temperature in the broiler houses is ideal for the development and growth of micro-organisms.



PHOTO: VAN ASSENDELF

Once the water pipe is uncontaminated, it can be kept clean by adding (a low dose of) disinfectants/detergents to the drinking water.

Look and smell

Tap some water into a clean, glass jar at the beginning and at the end of the water installation. Tap some water from the faucet in the kitchen for the purpose of comparison. Shake the jars and leave them untouched for 30 minutes. Assess the colour, clarity and sediment of the jars against a white background (e.g. white paper). In addition, assess the smell of the water. Water is supposed to be clear, odourless and colourless. If the water is clear and does not smell, the likelihood of it being suitable drinking water is 85%. But if the water is turbid and smelly, something might be wrong with the quality and action should be taken. If you do not trust your own eyes and nose, take the water to an authorised laboratory for screening.

Wastewater detector

By installing a wastewater detector in the drinking line, the clarity/turbidity of the water is measured constantly through light measurement. If the sensor detects 'polluted' water, the drinking lines have to be rinsed out. This could be done either manually or automatically.

ATP kit

Another possibility is to check the water quality by means of an ATP kit. By using this kit, it is possible to get an idea of the

(microbial and organic) pollution in the drinking water within a few minutes, instead of a few days. Please note that it is not possible to determine the kind of bacteria present in the water (E. coli, Campylobacter, Salmonella, Legionella, etc.), only to indicate the presence of bacteria. An (electronic) pH gauge is often included in the ATP kit. If this is not the case, it is recommended that you purchase one. Using litmus paper strips is also an option. In this way, it is quite feasible to monitor the quality of drinking water during the regular round.

Preventing and removing the biofilm

If it turns out that the water at the drinking points is contaminated, the polluted water pipes and the system (such as the supply tank) should be properly cleaned. Decomposing the biofilm is difficult. Drinking water pipes are not suitable to clean with a brush. That is why broiler farmers depend on detergents and flush the pipes using high (water) pressure. There are also systems that can blow pulsating air through the drinking lines. Furthermore, drinking lines can be cleaned ultrasonically. Mechanical vibrations are generated with an ultrasonic noise, which will loosen the dirt through vibration, as it were. In this way, it is possible to clean a drinking line mechanically. Of course, a combination of mechanical cleaning and detergent to remove the biofilm is also a possibility. Once the water line is uncontaminated, it can be kept clean by adding (low doses of) disinfectants/detergents to the drinking water. Please note that the substances used for this must be allowed as additives to drinking water. The substances may be added to the drinking water continuously or periodically (add it a few days and then stop a few days). Please bear in mind that most substances inactivate vaccines or reduce the effect of antibiotics. So, if a vaccination or a medicinal treatment is planned, the water treatment must be stopped in time and the water pipes must be flushed prior to commencing the medicinal treatment.

Table 1 - Cut off values for drinking water for poultry.

Parameter	Good	Bad
Chemical		
pH	5 tot 8	<4 en >9
ammonium (mg/L)	< 1	>2
nitrite (mg/L)	< 0.1	>1.0
nitrate (mg/L)	< 100	>200
chloride (mg/L)	< 200	>300
natrium (mg/L)	< 100	>200
iron (mg/L)	< 0.5	>2.5
manganese (mg/L)	< 0.5	>1.0
sulfate (mg/L)	< 100	>250
Bacteriological		
yeasts and moulds (kve/mL)	-	>10,000
E-coli (kve/mL)	<10	>100
Total cell count (per/mL)	<10,000	>100,000
Chemical oxigen use (mg/L)	<50	>100

Biofilm, an invisible risk of disease


It is not immediately visible. It is a deposit of minerals, organic materials and bacteria, yeasts and fungi on the inside of the drinking line. It can develop extremely rapidly and contaminate the clean water during transport, which constitutes an increased disease risk for animals. It can clog the pipes, block nipples or cause leaks in nipples (leakage). It can decompose additives in the drinking water and reduce the effectiveness of vaccines and medication. Factors that affect the development of biofilm are: stagnant water, temperature, the installation and materials of water pipes, additions to the drinking water (including vaccines, additives and medication).

Trends that **FEED** the industry



Join us Jan. 26-28, 2016, in Atlanta, Ga., USA, for the world's largest annual feed, meat and poultry technology exposition. Brought to you by American Feed Industry Association, North American Meat Institute and U.S. Poultry & Egg Association.

Register at www.ippexpo.org

  #IPPE



Effect of feed on microbiota balance in piglets

A balanced gut microbiota helps the weaned piglet to stay healthier and maintain growth. In this study, the effects of probiotic, inulin and a combination of the two was analysed for their effects on the bacteria in the piglet's gut.

By Verity Ann Sattler, University of Natural Resources and Applied Life Sciences, Austria

It is already well-known that, after weaning, the gut microbiota diversity of piglets changes when the diet switches from liquid to solid. During this change, piglets are highly susceptible to enteric diseases such as post-weaning diarrhoea, which causes an overgrowth of enterotoxigenic *Escherichia coli* and a reduction of lactic acid bacteria (LAB) in the gastrointestinal (GI) tract. To support animal health and reduce the effect associated with weaning without using antibiotics, nutritionists often use feed supplements to stimulate and contribute to an optimal intestinal microbial balance.

Detection techniques have improved

Trials conducted to examine the effect of feed additives on the microbial ecology of the GI tract of newly weaned piglets have been performed before, such as by Mair et al in 2010. But not all the effects of certain ingredients on the microbiota could be detected with the cultivation-dependent methods used. The recognition of limitations in isolating bacteria resulted in the introduction of higher resolution molecular techniques for an



PHOTO: HENK RISWICK

improved analysis of complex microbial populations, such as the intestinal microbiota. Denaturing gradient gel electrophoresis (DGGE) enables the visualisation of the dominant microbial profile and diversity in a complex environment without prior knowledge of its composition. With real-time PCR, specific bacteria of interest can be quantified with high sensitivity and high-throughput 16S rRNA gene sequencing technologies provide the opportunity to identify members of the microbiota and to determine the relative abundance of GI microbes.

Experimental set-up

A feeding trial involving healthy weaned piglets was conducted for 28 days as described previously (Mair et al., 2010). It analysed the piglets' general performance, intestinal microbiota and microbial metabolites using classical methods. Piglets with an average age of 26 days and a live weight of 9.2 kg were assigned to four groups: control, probiotic, inulin and synbiotic. The control group received the basal diet, the probiotic group the basal diet with a probiotic formulation (1×10⁹ cfu/kg feed of mixture of *E. faecium*, *L. salivarius*, *L. reuteri*, *B. thermophilum*), the inulin group the basal diet with 0.4 % inulin (Frutafit® IQ, Sensus, Roosendaal, the Netherlands, average chain length 8-12 monomers), and the synbiotic group received both, the probiotic formulation and inulin. Genomic DNA was extracted from 250 mg of intestinal digesta and further used for analysing bacterial profiles.

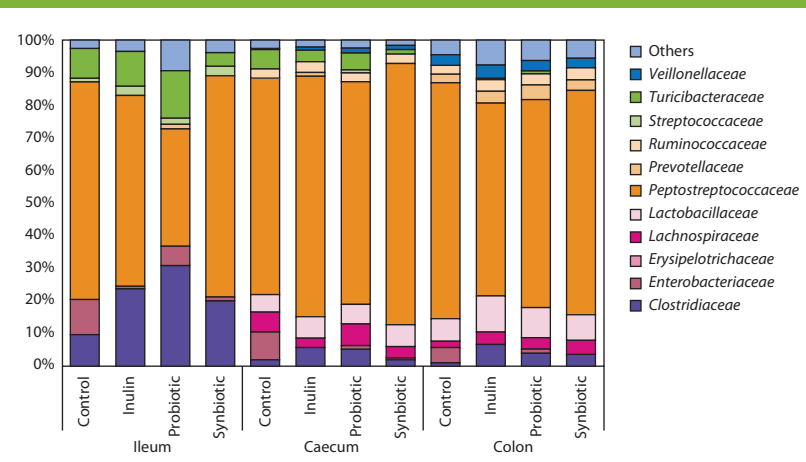


Results are side-specific

Bacterial diversity assessed by DGGE and/or pyrosequencing was increased by inulin in all three gut locations and by the synbiotic in the caecum and colon (Figure 1). In contrast, the probiotic only affected the microbiota diversity in the ileum. Shifts in the DGGE microbiota profiles of the caecum and colon were detected for the probiotic and synbiotic fed animals, whereas inulin profiles were more similar to those of the control group. 16S rRNA gene pyrosequencing revealed that all three additives could reduce *Escherichia* species in each gut location, indicating a potential beneficial effect on the gut microbiota. An increase in the relative abundance of Clostridiaceae in the large intestine was found in the inulin group, as was an increase in the relative abundance of Enterococcaceae in the ileum of probiotic fed pigs. Furthermore, real-time PCR results showed that the probiotic and synbiotic increased bifidobacterial numbers in the ileum, which was supported by sequencing results. To different extents, the probiotic and inulin changed the diversity and relative abundance of phylotypes, and the community profiles of the porcine microbiota. But alterations in the bacterial community were not uniform between gut locations, demonstrating the functionality of feed additives is site-specific. Gut sampling from various locations is therefore crucial when investigations aim to identify the composition of a healthy gut microbiota after its manipulation through feed additives.

This article is an adaptation of the original article: 'Impact of a probiotic, inulin, or their combination, on the piglets' microbiota at different intestinal locations', published in the Journal 'Beneficial Microbes'.

Figure 1 – Relative abundance of operational taxonomic units assigned to family taxa level showing the intestinal microbiota composition of pigs fed with or without feed additives.





Delayed Russian lysine plant moves forward

Construction is ongoing at the site in Volgodonsk.

PHOTO: DONBIOTECH

A joint venture to construct the first lysine production plant in Russia has faced many challenges that have delayed its initial completion target date. As demand for lysine is expected to more than double by 2020, the company is determined to complete construction in 2016.

By Vladislav Vorotnikov

The joint venture between Evonik Industries of Germany and the Russian company Donbiotech to construct a plant for deep grain processing for the production of feed lysine will now be completed in 2016, the CEO of Donbiotech, Vadim Varshavsky, has confirmed. The construction, launched in 2013, was scheduled to be finished in 2015. But it has faced numerous challenges over the past two years, such as a changing market conjuncture, the devaluation of the Russian rouble and an ongoing issue with its energy supplier. In the initial plans, a €170 million investment was provided to construct the first Russian plant for the production of lysine

with an overall production capacity of nearly 100,000 tonnes per year under the brand name Biolys. The current capacity, however, has been downgraded to 80,000 tonnes with the annual processing volume of 250,000 tonnes of grain. The final investment amount is still unknown, as the project is largely dependent on currency fluctuations. “At the moment, we have invested about €70 million in our Volgodonsk plant in Rostov Oblast,” Varshavsky explained. “We bought the equipment and it is currently manufacturing. We are also finishing the work on all the buildings and housing facilities and expect to receive the first lysine by the end of 2016.”

Russian lysine production

The total size of the Russian lysine market in 2014 was estimated at 40,000 tonnes. And the forecast of the Russian Institute of the Agricultural Marketing Studies estimates that annual demand will jump to nearly 100,000 tonnes by 2020, as the Russian compound feed industry is now actively exploring the potential of this amino acid. Price is expected to be a huge success factor, as domestically produced lysine will be cheaper than imported lysine. “When we started, the base price was less than €1 per kg. Now the price of lysine is €1.4 per kg. This is partly because the Chinese government has abolished subsidies for the production of lysine,” Varshavsky explained. There is a chance that the Volgodonsk plant will also produce a number of by-products, including 95,000 tonnes of offal,

20,000 tonnes of gluten and 11,000 tonnes of starch, and further expand to produce other types of amino acids. Speaking several years ago at Graintech-2012, Matias Moll, Evonik's vice president strategic projects said, "In Volgodonsk, we started with lysine, but this project's potential is so huge that we'll consider adding the production of two other types of amino acids here." It is unclear whether things have changed since then, but representatives of Donbiotech agree that the potential to produce other amino acids is high. "Russia needs more amino acids and, among others, it is necessary to produce methionine," Varshavsky said. "Lysine also has good export potential – as 1 kg of lysine replaces 70 kg of wheat in feed production." He estimates the project payback period to be six and a half years. He also expects the export targets to enable the plant to shorten the payback period due to the devaluation of the rouble. "We will export amino acids initially to emerging markets in Asia and the Middle East, such as Iran, where Evonik is currently estimating all of the logistics. We chose Volgodonsk as this is the port from which you can send products via the Black Sea to Turkey and via the Caspian Sea to Iran," he explained.

Expanding market

Over recent years, several large projects for the production of feed lysine have been announced in Russia with an overall investment close to €600 million and capacity close to 250,000 tonnes per year. The first one, Shebekino plant in Belgorod Oblast, which was launched in 2014, but was commissioned only in September of 2015, is designed for an annual production of 54,000 tonnes of lysine per year. It is expected that the first lysine will be produced here at the end of 2016. Two similar projects in Tyumen and Rostov Oblast have a capacity of 35,000 tonnes and 80,000 tonnes, respectively, and both should be launched in 2016/17.

Concerns have been voiced that these projects may encourage an oversupply problem, due to the lack of export opportunities. These concerns have been supported by rumours that appeared in the Russian media in 2014 to the effect that a group of Chinese investors are planning to build a plant for the production of feed lysine in Crimea. Yet no further details on this project have materialised.

Troubled energy supply

The whole project was also called into question as the management failed to solve an energy supply issue. The company entered into a legal dispute with local energy supplier Lukoil-Rostovenergo over the connection of the facility to the Volgodonsk thermal power plant. The dispute resulted in the project being delayed by one year and so far no conclusion has been reached on the matter.

The company is now preparing its own power generating facilities, which will require about 300-500 million roubles (US\$ 5-9 million) of additional investments. This situation is rather awkward as Lukoil-Rostovenergo is a stated-owned company and the regional authorities have repeatedly promised full support for the project. "This is the biggest facility for lysine production in Russia and probably one of the biggest in Europe," commented Sergey Gorban, vice-governor of the Rostov Oblast. "We must build it. All agriculture will benefit as we will no longer depend on either America or Europe," he concluded.



Stonehenge is a prehistoric monument located on Salisbury Plain, England. It dates from around 3000BC.

**Cleverly designed
and built to last.**

CPM engineers design specialised machines for pelleting, grinding and hygienic treatment for the feed industry. Designed without any compromise, they are built for long-term results and durability.

When continuous production and the lowest operational costs are key, you can rely on CPM.

Phone: +31 75 65 12 611 / www.cpm europe.nl



CPM Europe. Your Partner in Productivity

Sugar: Solution for pain control in piglets?

A spoonful of sugar helps the medicine go down, but can it also help to treat pain during, say, castration or tail-docking? Research was conducted at Canada's Prairie Swine Centre to evaluate the outcomes. The piglets' behavioural responses look particularly hopeful.

By Krista Davis, BSc and Yolande Seddon, PhD,
Prairie Swine Centre, Saskatoon, SK, Canada

Pain control is an important area for the global pork industry to address concerns over pig welfare and the ethics of performing painful husbandry procedures on piglets shortly after birth, such as castration or tail-docking. It is becoming less acceptable to allow routine management procedures that inflict pain on pigs to continue without alleviating the pain. This has led to legislative and code-of-practice changes around the world that require pain control for painful husbandry procedures or alternatives to procedures such as tail-docking and castration. Recent research at the Prairie Swine Centre (PSC) explored whether sugar could play a useful role in controlling pain in piglets following castration. The choice was obvious: there is a long history of using sugar to alleviate pain in human infants during procedures such as neonatal heel prick, vaccination, blood sampling and circumcision. So why not try it with pigs?

Piglet procedures

The global swine industry routinely performs painful procedures on piglets after birth, such as castration, tail-docking, teeth-clipping and identification (ear notching, tagging or tattooing). Collectively, these procedures are referred to as piglet processing. Outside of the EU, pain control is generally not provided. The processing of piglets involves both immediate and longer-term pain, potentially lasting several days. There is substantial evidence that castration is a particularly painful procedure. The scrotum and spermatic cords have a rich supply of nerves and piglets show strong physiological and behavioural indications of suffering pain during processing.



PHOTO: PRAIRIE SWINE CENTRE

A piglet navigates the handling chute that was especially constructed for this research.

Processed piglets vocalise more during the procedure than those that are only handled and tail-docked piglets grunt more after processing and have been observed jamming and wagging their tails more frequently.

Piglets castrated without pain control were also found to spend more time away from other piglets and the sow and to display more pain-related behaviours than piglets handled similarly but not castrated. Piglets castrated without pain control show a greater increase in the stress hormone cortisol following the procedure, indicating that castration without pain control causes greater stress.

Similarly, piglets that were tail-docked had a greater cortisol response than those that were handled but not docked. Taken together, these physiological and behavioural differences provide clear evidence that processing is painful.

Due to the pain experienced by piglets during processing, these husbandry procedures have been broadly criticised. In Canada, the newly revised Code of Practice for the Care and Handling of Pigs requires, as of 1 July 2016, that castration be performed with analgesics to control post-procedural pain. The European



Union (EU) has proposed a voluntary ban on castration as of 2018 and currently requires that pain medication be used. In the USA, no pain mitigation is required and no analgesic drugs have been approved for the treatment of piglets. Realistically, some degree of piglet processing is likely to continue, e.g. tail-docking, for which there are currently few viable alternatives to reduce tail biting. So, from an ethical standpoint, the swine industry needs to identify more effective pain control options to reduce pain.

Options for controlling pain during the castration procedure include general or local anaesthetics such as lidocaine, an injectable numbing agent.

Analgesic drugs are then used to control post-procedure pain. Meloxicam and ketoprofen are the most widely studied analgesics for controlling post-procedural pain in the non-steroidal anti-inflammatory class of drugs (NSAIDs). One drawback of NSAIDs is that they take about 20 minutes after administration to take effect. So, if the goal is to control pain immediately after surgery, then the drugs need to be administered well before processing. Piglets would need to be handled twice, increasing labour requirements and imposing

greater handling stress on the animals.

Recent studies have shown that the stress imposed on piglets is directly related to the handling time for procedures. Furthermore, when evaluating these procedures, the cost and labour of providing both analgesia and anaesthesia at processing have been found to be significant.

Sucrose: reducing pain

Sucrose (sugar) has been shown to reduce pain in humans and rodents and may offer an economically viable and effective solution to help reduce processing pain in piglets. When fed an oral sugar solution before a painful procedure, rats displayed fewer pain behaviours and had reduced levels of corticosterone. Table sugar is inexpensive and can be easily prepared in a solution that is given orally at the time of processing. Although precisely how it works is unknown, sugar is believed to act immediately through taste receptors to activate the endogenous opioid system. It could therefore have potential as a low-cost method of pain control for producers – reducing pain immediately after surgery. If combined with an analgesic,

it could provide some initial pain mediation while NSAIDs take effect and avoid the problem of handling piglets twice. The Prairie Swine Centre (PSC) investigated the effectiveness of an oral sucrose solution at relieving pain in piglets following castration. Five treatments were tested:

1. Control group: piglets castrated without pain control;
2. Sugar given before castration;
3. Sugar given after castration;
4. Sham castration with sugar: handled as if to castrate, but not castrated and given sugar;
5. Sham castration: handled as if to castrate, but not castrated.

To evaluate the effectiveness, the team looked at:

- a. Navigation times through a piglet handling chute: A specially designed chute that contained two ten-centimetre hurdles was fitted to the back of the farrowing pen. Piglets were placed in the closed end and had to navigate over the two hurdles to exit back into the farrowing pen. Previous work at PSC has shown that piglets that were in pain took longer to navigate the chute than those that were not in pain;
- b. Piglet behaviour in the farrowing pen; and
- c. Cortisol levels in blood.

Faster navigation times

Piglets given the oral sucrose appeared to be less affected by pain directly after castration, showing faster navigation times through the handling chute than piglets not given pain control (Figure 1). And the chute behaviour of piglets given sucrose was similar to that of piglets that were sham handled, as piglets given sucrose had navigation times comparable to sham-treated piglets. Similar to previous work, the piglets castrated without pain control had the greatest response, taking significantly longer to navigate the handling chute.

Castrated piglets also had a greater increase in cortisol after castration than sham-handled piglets, indicating that castration is painful and stressful. But piglets castrated with sugar had cortisol levels similar to piglets castrated without.

These results suggest that the sucrose had a measurable effect on the behaviour of the animals, but did not significantly reduce the physiological response to stress. There were no significant differences between treatments with respect to any of the behaviours observed in the farrowing pen (prostration, trembling, isolation, standing, lying and suckling). This is consistent with previous research that found that the individual behaviour of piglets in the farrowing environment is highly variable and is therefore an unreliable measure of pain. The piglet handling chute offers a more

Krista Davis, BSc:

“There is a long history of using sugar to alleviate pain in human infants.”



straightforward, objective and sensitive measure of castration pain for piglets.

Inconclusive

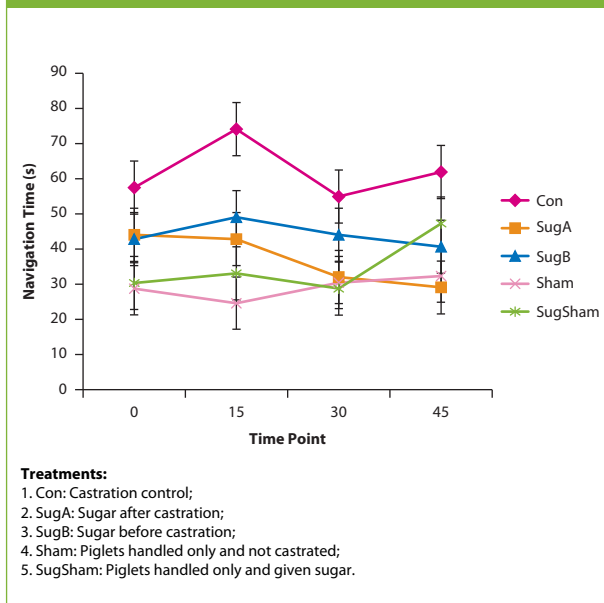
Based on these initial results, the question of whether sucrose provides measurable pain control at castration is still unanswered. There was some behavioural evidence that sucrose is effective, but there is as yet no physiological evidence.

Evaluating another physiological pain marker, such as Substance P, which has been shown to respond only to pain and not to stress (cortisol increases in both painful and stressful situations), may provide greater insight into the effectiveness of novel pain management options. Increasing the concentration of oral sucrose given could improve the effect and combining sucrose with an analgesic may potentially allow for a lower dose of analgesic.

In conclusion, sugar helps the medicine go down and shows promise for reducing pain at processing, but further studies are needed to help us understand how it works, how best to use it and how effective it may be.

This research was supported at Prairie Swine Centre through funding by the Saskatchewan Agricultural Development Fund, Sask Pork, Manitoba Pork, Alberta Pork and Ontario Pork.

Figure 1- Navigation times.



THE LARGEST FEED MACHINERY MANUFACTURER & ENGINEERING CONTRACTOR IN CHINA

Tel:+86 21-64188282 Fax:+86 21-64163299
 E-mail:china@zcmc.com www.zhengchang.com
 Floor25, Friendship Building No.159, Zhao Jia Bang
 Road Shanghai P.R.China PC.200032



We have built more than 2,000 turnkey projects worldwide in one century covering areas of livestock and poultry feed, aquatics feed, pet feed, premix, concentrated feed, fertilizer, silo storage, sawdust pellet and rubbish treatment.





Setting a new standard in biosecurity

“Tested positive against PEDv with 99.8 % virus reduction capacity”.



SIGN UP FOR THE FREE EMAIL NEWSLETTER

The latest global industry brands and development directly into your mailbox!

ALL ABOUT FEED

www.allaboutfeed.net/newsletter



WORLD POULTRY

www.worldpoultry.net/newsletter

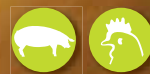
Your multimedia guides to the global Feed and Poultry industry!



- One enzyme for all diets
- One enzyme for all species
- Improve FCR and growth
- Ensure dry litter

Nutraxe Xyla

Put the best in, get the most out



Achterstenhoek 5 • 2275 Lille • Belgium
Tel: +32 14 88 31 11 • sales@nutrex.be • www.nutrex.be

Amino acid use in practice

Amino acids are important for dairy cows. Here we present some practical examples from 'on top application' and 'reformulation', the two amino acid strategies a farmer can use.

By A. Schröder, I. Eisner, A. Mercier, J. Mateos from Kemin Animal Nutrition and Health, Europe and C. G. Schwab from the University of New Hampshire, USA

Amino acid (AA) nutrition will prevent many current problems, but it is also a long-term strategy to support dairy farm sustainability. It improves the Nitrogen (N)-efficiency of the overall farm, thus reducing the N-load to the environment and having a positive impact on milk production, milk quality, animal health and feed costs. The latter is especially important, as feed costs can be up to 50% of a farm's total expenses.

Two different ways

Nutritional models are now available to predict supplies of AA for dairy cows and methionine (Met) is accepted as the most limiting AA. Two different AA strategies can be applied; On Top application or Reformulation. Rumen-protected AA (RP-AA) supplements are added on top of the feed formulation to improve animal performance. This strategy is usually applied at times of higher milk prices. In Reformulation, RP-AA are utilised to reformulate the diets to obtain the same or better animal performance at lower rumen-undegradable protein (RUP) and CP levels with a less expensive raw material mix.

Practical cases

The following examples represent actual on-farm cases for both of the above-mentioned strategies and are meant to give some practical cases for nutritionists to examine. Every diet was developed by a consultant or nutritionist taking the local availability of raw material and prices into account. Moreover, farm characteristics vary significantly, not only within a country but between countries, and therefore responses to diet changes are different. As the data relates to commercial farms, it provides a good idea of the impact of AA formulation in dairy diets.

On Top application on a German farm



PHOTO: MARK PASVEER

A farm in North-West Germany had 75 Holstein-Friesian dairy cows. Average milk production was 11,714 kg of milk with 3.89% fat and 3.30% protein. The farm was equipped with a milking robot that allowed the individual administration of a specific mix. The feeding system of the farm followed a partial mixed ration (PMR) with two types of compound feed fed in the milking robot station according to the stage of lactation and milk yield. The PMR consisted of a combination of grass and corn silage, 3 kg/cow of protein concentrate and 200 g/ cow of mineral feed. A rumen-protected methionine (RP-Met) was included at a daily rate of 15 g/cow in the mineral feed for all lactating cows fed in the milking robot. The feeding of RP-Met started in September 2013, after one month of regular milk recording, and lasted until April 2014. The test followed the OFF-ON approach. Results from the OFF period were taken from the last milk recording without RP-Met in September 2013. The ON period refers to the months thereafter with the inclusion of RP-Met.

Maximum effect after three months

Feeding the cows 15 g of the rumen-protected methionine in an On Top application increased milk performance in early and middle lactation. The maximum effect occurred after three months of treatment. After a few weeks of treatment, the early lactation cows responded with greater milk yield, where-



as middle lactation cows responded with greater milk protein content and with greater milk yield later. The delayed response from middle and late lactation cows can be explained by better milk curve persistency in the cows that move from fresh to later stages of lactation during the RP-Met feeding period. Under these conditions, one is advised to feed RP-Met for at least three months to observe the maximum effects.

Reformulation on a French farm and a Spanish farm

On a French dairy farm, a typical diet was 15 kg DM/cow/day of corn silage, 2 kg DM/cow/day of grass silage and 3.5 kg of a protein concentrate. Reformulation of the protein concentrate was done using the SmartMILK matrix. The RP-Met source used is a product known for its stability during pelleting. The reformulated protein concentrate had a cost of €314/tonne, compared with the original at €327/tonne. Under the market conditions at the time of the trial, the reformulation approach provided savings of at least €13/t in the protein concentrate. Experience at the field level over the past four years indicates the reformulated formula has become very competitive in the market and has also helped to reduce N load in the environment, while improving milk quality by about 0.3 g/kg of milk protein content. In Spain, the situation was studied on an association of farms located in the North-West part of the country. All these farms had more than 800 dairy cows and

the main common characteristic was that they fed the cows the same total mixed ration (TMR). The TMR was produced by a feeding centre that took care of raw material purchasing and silage making. On average, the cows produced 10,000 kg milk/year with a milk composition of 3.65% fat and 3.25% protein. The objectives for the reformulation exercise were to maintain milk production during the summer heat and reduce feed costs, because at that moment prices for soybean meal were at a record high.

Reduction in feed costs

In the reformulated TMR, soybean meal was significantly reduced and other alternative raw materials, such as rapeseed meal and DDGS wheat, were included. A RP-Met source was used. The crude protein level of the diet declined by 1.1% units and the LysDi/MetDi relationship improved from 3.77:1 to 3.06:1 by keeping grams of LysDi constant and improving the supply of MetDi. The first direct benefit was a reduction in the feeding costs by €0.84 per cow per day. Even though improved milk performance is not one of the key objectives when reformulating diets, in this case the average milk production went up by 2 kg and the milk protein percentage and yield also increased. This resulted in a direct improvement of N efficiency by nearly 3 points.

Two different strategies to balance amino acids in the feed can be applied: On Top application or Reformulation.

Pancosma

Feed additives company, Pancosma, has appointed **Dr Goetz Gotterbarm** as chief executive officer. He will be chief in command from December 1, 2015. Dr Gotterbarm joins Pancosma coming from Biorigin, a Brazilian company focused on the use of biotechnological processes for animal nutrition.



IFIF

Joel G. Newman

president and CEO of the American Feed Industry Association, has been elected chairman of the International Feed Industry Federation for 2016-2017. Newman previously served as chair of IFIF's Policy Committee and as a member of the IFIF Board of Directors.



Lallemand Animal Nutrition

Dr Christian

Scheidemann (pictured)

has joined Lallemand Animal Nutrition as country business manager to manage and drive direct business in Germany. Scheidemann has many



years of successful sales and business management experience in the feed additives sector, particularly in yeast fermentation products, organic trace elements or silage additives. In addition, **Christian Roques** has been appointed pet business development manager. His role will be to develop and promote a portfolio of microbial nutritional solutions for pet food. He has 25 years of experience in the pet food business and expertise in probiotics.

Kemin

Kemin Industries has appointed **Akram Talibov** as commercial director for the company's animal nutrition and health division in Europe. Talibov most recently worked as general manager at Biotechnology, where he led the Greenprotein Project.

Nuscience Group

Johan De Schepper is to succeed Patrick Keereman as CEO of the Nuscience Group. De Schepper is the current chief operating officer at the Nuscience Group. He was previously responsible for managing and restructuring the INVE Group (premixes, aquaculture and additives).

GM proposal will lead to higher feed costs

COCERAL, FEDIOL and FEFAC, representing commodity collection and trade, oilseed crushing and compound feed manufacturing, have released their Economic Impact Assessment of the Commission's Genetically Modified (GM) 'opt-out' proposal.

The study assessed the potential implications for the feed and livestock sector of four EU Member States potentially opting out of GM authorisation (i.e. France, Germany, Hungary and Poland). Nutritional and farming reasons dictate that not all soy in feed can be replaced by alternative protein sources. The bulk of soy (currently GM) in feed would therefore need to be substituted with non-GM soy for a premium, set between €44/t and €176/t (i.e. 15% to 50% of the value of the product).

The Economic Impact Assessment finds that substituting GM soy with non-GM soy would lead to an increase in feed costs of around 10% for the livestock sector, i.e. €1.2 bln in the four countries potentially opting out or €2.8 bln for the EU livestock sector if all EU countries were to opt out.

The increased feed costs would irremediably affect the competitive position of the livestock industry in these countries, both in their



domestic markets and at respective export destinations. The limited demand for non-GM fed animal products on the global market would prevent demand adaptation in the case of supply reduction, which, coupled with the extra costs of non-GM supply chains, would inevitably lead to the closure of livestock holdings in opting-out countries.

Feed: A solution for foodstuff waste

In the EU, around 3.5 million tonnes of former foodstuffs are used in livestock feed. This can be doubled with the right regulatory guidance, according to EFFPA, the European Former Foodstuff Processors Association. Former foodstuffs should not be confused with swill, food and catering waste that is not allowed for use as animal feed.

Examples of former foodstuffs used in animal feed are broken biscuits and chocolates, surplus bread, incorrectly flavoured crisps and breakfast cereals. Former foodstuffs must be in full compliance with EU feed safety requirements and the General Food Law's requirements regarding traceability to become eligible for feed use.

At a recent conference on EU food waste, EFFPA President Paul Featherstone recently said: "It may surprise people, but energy-rich former foodstuffs like biscuits, chocolates and confectionary are highly valued resources in animal feed manufacturing. In fact, our end-product can be used as an alternative to cereal grains, thereby reducing the dependence on raw materials requiring land and thus the environ-



mental footprint of foodstuffs of animal origin." EFFPA calls on EU policy makers to clarify the regulatory framework for former foodstuff processors through the planned proposal on the circular economy, making it clear that former foodstuffs are by-products and by no means legal 'wastes'.

Geography, climate cause Fusarium in China

Rice, wheat and maize are the most important crops for food and animal feed in China. The quality and safety associated with these crops, therefore, directly relate to the health of people and livestock locally and internationally.

Compared with the relatively low exposure of Fusarium species in rice, wheat and maize have been facing a greater threat. The hazard caused by Fusarium species not only results in yield reduction, but also in the production of mycotoxins, such as trichothecenes, zearalenone (ZEA) and fumonisins.

Every district of China has been affected by Fusarium mycotoxin contamination to varying degrees, with the most seriously affected districts being East China, Central China and North China. Considering the contamination situation and the hazards of Fusarium mycotoxins, some researchers have conducted extensive studies to determine the causes of Fusarium mycotoxins. The occurrence of Fusarium mycotoxins involves multiple causes, which produces challenges for their prevention and control.

Among these multiple causes, the geography and climate, and the variety of characteristics in plants are probably the two important drivers in China. Responding to these challenges requires



improvements in two main areas: supervision and management by the government and enterprises, and relevant improvements in technology research, such as detoxification, cultivation mode and finding varieties with a high resistance to FHB. Geography and climate, in particular, is an important driver, but cannot be controlled by the Chinese government. It is important to note that the latest legal limits for Fusarium mycotoxins in feed were promulgated in 2011 and the legal limits in feed are in the process of being revised.

Feed-a-Gene: Innovation for monogastric feed

The new project Feed-a-Gene aims to step up the current feed resources and feeding practices for monogastric animals. Coordinated by INRA (France), the

project wants to develop new and alternative feed resources and feed technologies, identify and select animals that are better adapted to fluctuating conditions, and develop feeding techniques for

optimising the potential of the feed and the animal. Feed-a-Gene involves an international consortium of 23 public and private partners from Europe and China. The project is planned to last for five years and has been allocated a



budget of €9 million. It is funded under the EU Framework Programme for Research and Innovation Horizon 2020.

According to the project founders, environmental issues (phosphate and nitrate concentration in water) caused by monogastric livestock production must be addressed and new solutions to increase the efficiency and sustainability of livestock production systems must be developed.

Feed-a-Gene therefore formulated several objectives to gain more knowledge on how to solve these issues.

New app for swine feed recommendations

Trouw Nutrition has launched an online swine feed recommendation application for every phase of production. The tool helps farmers to determine the ideal feed formulation for breeding, growing and finishing swine based on a wide variety of variables.

The modelling behind the application is based on the latest nutritional scientific norms.

Currently, manual reference source consultation and calculation is needed to determine the optimal combination of feed components. The new online swine recommendation application has automated these steps and delivers faster and more reliable results.

Furthermore, the tool is capable of taking real-time variables into consideration. These include environmental factors such as temperature and health status, as well as management factors such as the nutritional energy system (i.e. metabolic or net energy) that is being used. The result includes recommendations on nutrients, vitamins, minerals, protein, feed additives and raw materials. To access the swine feed recommendation app, register on the website www.feedadvice.com.

InVivo acquires Welgro in Indonesia and expands in Asia

InVivo NSA has acquired Welgro, a leading nutrition player in Indonesia. This acquisition confirms the company's ambitions to further grow in Asia. With previous experience in Asia, the company now has the means to accelerate its development in the region and consolidate its current positions in Vietnam, Indonesia, China, India, Myanmar, the Philippines, Thailand and Cambodia.

The Indonesian company Welgro, which has 110 employees and an industrial plant with a capacity of 150,000 tonnes located south of Jakarta, falls exactly within the strategy. In the high potential, complete poultry feed market, it is not only recognised for the quality of its products, but also has a strong trademark - Gelang Merah. This acquisition will enable InVivo NSA to accelerate the development of its complete feed range in Indonesia and strengthen its market share.

Hypo-allergenic dog foods: Supply and demand overwhelm need

Petfoods labelled hypo-allergenic convey the impression that they have little likelihood of causing an allergic reaction. The term hypo-allergenic has no legal definition and no designated minimum efficacy. In the marketplace, hypo-allergenic foods are ubiquitous. Certain dog food lines are all hypo-allergenic, whereas most brands position one or more products as being hypo-allergenic or sensitive.

A food allergy is an individually determined, immune-mediated reaction to a dietary protein. Dogs get an itch, which causes them to scratch and lick, leading to skin lesions. Similar diet-induced symptoms elicited by non-immune mechanisms are considered to be food intolerance, which in popular speech is connected with food allergy. The cure for food sensitivity consists of avoiding the offending food component(s). Veterinarians or pet owners must identify an appropriate food for the dogs concerned.

Purported content claims of hypo-allergenic foods include a limited number of ingredients, novel protein sources and the exclusion of proteins known to cause allergic reactions. Food labels list between two and six protein-containing ingredients, but undeclared protein sources may be detectable. Novel proteins are assumed to be uneaten and would not have triggered immune responses. Some veterinary hypo-allergenic foods contain protein hydrolysates with impaired immune recognition.

Different types of skin disorders share similar symptoms. Veterinarian-guided feeding tests are necessary to diagnose food sensitivity. A hypo-allergenic elimination diet should suppress the symptoms, followed by relapse when the dog is fed the original food. Amelioration on a commercial elimination diet encourages owners to proceed with the diet without diagnosis, while looking for a similar product in retail for reasons of price and convenience. Other owners skip veterinary consultation and find an acceptable hypo-allergenic food by trial and error.

Some 50% of pet dogs consume industrially produced dry food only. Assuming that 5% of the dry segment is labelled as hypo-allergenic or sensitive and the prevalence of true canine food sensitivity is 0.05%, the supply of hypo-allergenic foods surpasses the need. Food is often blamed for skin problems, clarifying the high demand for hypo-allergenic foods. This demand is maintained by the perceived effectiveness of hypo-allergenic foods as a result of spontaneous recovery, a shift in season or associated interventions. It is reassuring that well-formulated hypo-allergenic foods provide good nutrition.

Anton C Beynen is affiliated with the R&D department of Vobra Special Petfoods in Veghel, the Netherlands and has been a well-known industry expert on pet foods and pet health for many years. In his column for *All About Feed*, he sheds some light on recent remarkable developments in the pet food industry.



We've got you covered.



You can do more to reduce risk in poultry operations.

Diamond V's all-natural **Original XPC™** covers:

- **Poultry health**
- **Performance**
- **Pre-harvest food safety**

Controlled research proves that Original XPC helps maintain poultry immune strength by balancing immune response. Multiple modes of action promote a strong immune system, helping to support food safety and overall bird health and wellness.

Veterinarians, nutritionists, live production and food safety managers — we've got you covered with Original XPC.

Make smart, science-based decisions.



For more information visit us at www.diamondv.com



Selisseo®

Selisseo®

THE 100% EFFECTIVE ANTIOXIDANT THAT YOU HAVE BEEN WAITING FOR.



Preferendum

Discover Selisseo®, the innovative 100% effective antioxidant.

The only seleno-hydroxymethionine on the market, fully supporting the benefits of organic selenium for enhanced stress resistance, improved reproduction capacities and better meat, egg and milk quality.



100% Effective



100% Pure



100% Reliable



100% Stable



100% Easy-to-use

