LALLEMAND ANIMAL NUTRITION

SPECIFIC FOR YOUR SUCCESS

In the MIX

FEATURING:
FORAGE KNOW-HOW & THE LATEST SWINE RESEARCH

ISSUE 45, AUTUMN 2018

MAKING SENSE OF FORAGE ANALYSIS RESULTS

Forage analysis is an important source of information, not just to help nutritionists formulate rations, but for producers to adjust their management processes.

"Forage analysis results can help producers understand what happened during the harvest and ensiling process and how to improve feedstuff quantity and quality the next time," Lallemand Animal Nutrition Forage Products Manager, Dr Bob Charley, says.

"For instance, it can show if the crop was harvested correctly or if silages are prone to spoilage. There is no single number that indicates 'good' silage. Silage is a very complex biological system with inherent variability."

Dr Charley advises producers to review these parameters:

- Dry matter (DM): Lower DM levels, especially in lucerne or other high protein silages, can compound issues such as the presence of clostridia from the soil. Lower DM levels also require more acid production and a lower pH for stability.
- pH: Lower pH levels do not necessarily make better quality silage. Forage analysis should show pH stabilisation, even if it's achieved at a higher level.
- Ash: Normal levels in the plant should be around six to eight percent, depending on the crop. Higher numbers can indicate slurry contamination.
- Acid detergent fibre (ADF), neutral detergent fibre (NDF) and lignin: These values should be within average ranges for the type of material harvested. If levels are higher than normal, it may be a sign the material was more mature than ideal. This can also lead to yeast and mould challenges.
- Crude protein (CP): The higher the protein level, the higher the buffering in the material and the more acid is required to bring the pH down. This can facilitate complications from clostridia.
- Acid Detergent Insoluble Crude Protein (ADICP): High levels of bound protein (ADICP > 10% CP) indicate there has been heating in the silage.
- Soluble protein: High levels of soluble protein indicate there has been protein breakdown (proteolysis). This can occur due to prolonged wilting in the field or inefficient silage fermentation.
- Lactic acid: This is the main driver for pH drop and should be at a reasonably high level for the silage pH to rapidly stabilise. This number can vary with the crop ensiled and DM level.

Note that lactic acid levels will be lower in silages treated with inoculants containing Lactobacillus buchneri. This silage typically has higher concentrations of acetic acid, which helps to inhibit the growth of spoilage yeasts that cause heating.

An FDA review has confirmed Lallemand's Lalsil HC forage inoculant, which contains the specific strain Lactobacillus buchneri 40788, improves aerobic stability when applied at 400,000 CFU per gram of forage or 600,000 CFU per gram of high-moisture corn (HMC).

WELCOME

Welcome to 2018! As always, Australia is presenting us with a mixed bag of seasonal conditions and extremes. It's hot in some parts of the country, dry in others and wet in a few more! Regardless, the new year presents lots of challenges and opportunities for everyone. For producers, the endless need to adopt innovation to improve production efficiency will continue. Likewise, the pressure is on their suppliers and advisors to deliver this innovation. At Lallemand Animal Nutrition, we're meeting this challenge head-on. This edition contains some of our latest developments in antioxidant nutrition, rumen health monitoring and new plastics. Enjoy the read and all the best for 2018.

Alex Turney - Country Manager

$3000 SCHOLARSHIP AVAILABLE FOR YOUNG GUNS

Applications are now open for the inaugural Gen Ag Future Fund, a scholarship that aims to foster expertise within the next generation of forage professionals in Australia.

Sponsored by Lallemand Animal Nutrition in association with the Australian Fodder Industry Association, the sponsorship will provide up to $3000 per annum to an individual to assist with education or other costs to undertake a project that will benefit the Australian fodder industry.

To enter, individuals must provide a 500-word cover letter describing their proposed study or project, as well as a resume detailing their education, work experience, contact details and referees. To qualify, you must be an Australian citizen aged 18 to 30 years and a current or eligible AFIA member.

Applications close at 5 pm Tuesday, 1 May 2018. Applications will be reviewed by assessment panel comprising AFIA and Lallemand representatives. The winner will be asked to make a presentation to the 2018 National Fodder Conference, which will be held in Adelaide on 29–31 July, 2018.

For further details, contact John McKew, Chief Executive Officer, Australian Fodder Industry Association on (03) 9670 0523, 0438 182 600 or john@afia.org.au.

FOOTY SEASON KICKS OFF

Thank you to everyone who participated in the Lallemand Footy Tipping Competition last year. Gift cards have been sent to our winners:

■ NRL:
1. Brock Thompson, Lallemand.
2. Anthony Dyson, Mort & Co.
3. Ben Morgensen, Lallemand.

■ AFL:
1. Peter Gronow, Rabar.
2. David Henman, Rivalea.
3. Ben Morgensen, Lallemand.

■ Super Rugby:
1. Richard Lane, Platform Agribusiness.
2. Jeff Dight, Myola Feedlot.
3. Alex Turney, Lallemand.

This year's competition is going to be bigger and better! If you are interested in participating, please contact Ben Morgensen on bmorgensen@Lallemand.com or (07) 5451 0125.

Register and get your game face on. Super Rugby kicked off in February following by NRL and AFL in March.

FIVE QUESTIONS

We put five questions to Lallemand New Technologies & Innovation Manager – Forage Additives & Animal Environment, Julien Sindou.

Q: What is Lallemand innovation strategy in forage preservation?
Our new silage research strategy is inspired by Lallemand's approach to R&D and innovation, which created our successful ruminant and monogastrics feed additives portfolio. The two pillars of our silage innovation strategy are a dedicated research team and a partnership approach. The Lallemand Silage Centre of Excellence is based within the William H. Miner Agricultural Research Institute in the USA. It is led by Dr Pascal Drouin, who has access to the institute's livestock and facilities, as well as our own corporate facilities for microbial genetic, molecular typing and biochemistry. We also partner with the best scientists in the field of silage preservation because one cannot know everything!

Q: What was the first milestone in this area?
In the 1990s, Lallemand was one of the first companies to look closely at aerobic stability, a great source of loss for producers. This led us to invest in Lactobacillus buchneri NCIMB 40788. We patented this technology in 1996, which created a new category of silage inoculants targeting aerobic stability improvement.

Q: And more recently?
L. buchneri NCIMB 40788 is now available commercially throughout the world. However, we were convinced that we could improve further aerobic stability. This is what drove our research over the past decade: looking for a new technology that could enhance aerobic stability, whatever the fermentation time. L. buchneri 40788 needs 60 or 90 days of fermentation to show a real effect, which is not adapted to early opening silos. This led to the discovery of L. hilgardii CNCM 4785, a strain that further improves aerobic stability, whatever the fermentation time.

Q: Is Lactobacillus hilgardii CNCM 4785 the new L. buchneri then?
Not at all! L. hilgardii CNCM 4785 was selected for its ability to act quickly and strongly on forage aerobic stability. It was also selected for its ability to act in synergy with L. buchneri 40788. The idea is to use both strains together when formulating new inoculants.

Q: What are other innovations in the area of silage preservation?
We can select the best possible strain in the lab, but it's useless if the producer does not end up with the appropriate number of live bacteria in the silo! Our innovation program also concerns the optimisation of the end-product quality and applicability for the farmer, such as HC technology. Lallemand HC technology offers the highest concentration and solubility with the lowest sedimentation on the market.

LALLEMAND FORWARD CENTER OF EXCELLENCE

INTERNATIONAL RUMINANT SYMPOSIUM

Lallemand Animal Nutrition will host a satellite conference at the end of the International Symposium on the Nutrition of Herbivores. Held at the French National Institute for Agricultural Research (INRA) on Thursday 6 September, a selection of international ruminant experts will take a deep dive into the risk factors surrounding acidosis, rumen health and management strategies. The conference aims to make the invisible become visible by looking at the modes of action of rumen microbiota and their direct and indirect consequences upon animal health and behaviour. Speakers include Dr Helen Golder, who is Research Director with Scibus at Camden, NSW.
INRA, is Europes largest agricultural research organisation and the facility located in Clermont-Ferrand, France, is a leader in ruminant research. Their works focus on continuousy documenting the biology, mode of action and benefits of existing yeast and bacteria strains dedicated to animal nutrition.

INRA SCIENCE & IMPACT

A WORLD FIRST FOR LEVUCELL SB

At the recent Feed Additives 2017 conference, Lallemand Animal Nutrition Research and Development Director, Mathieu Castex, declared that regulation should not curb innovation.

"We have to make regulators consider the role of probiotics for a more prudent use of antimicrobials and address the question of antimicrobial resistance," he says. "Let's not wait for the regulation to change, let's innovate within the current framework."

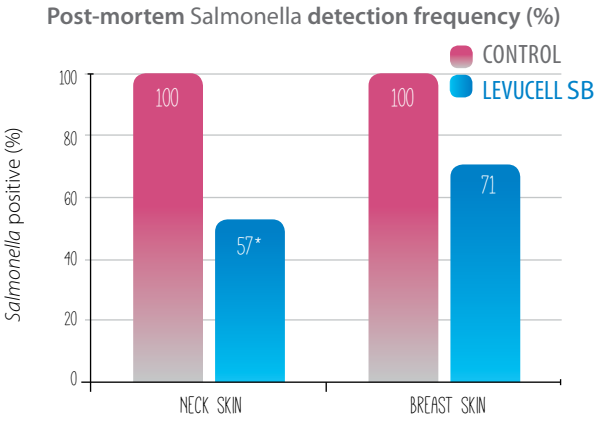
His words are all the more poignant, given the European Commission has recently authorised the use of Saccharomyces cerevisiae var. boulardii CNCM I-1079 (i.e. Levucell SB) as a feed additive for the reduction of carcase contamination by Salmonella spp. in broiler chickens. In doing so, Levucell SB becomes the first and only feed additive to be registered for such a purpose.

In the EU, probiotics are authorised under the category of 'zootechnical additives' and then either the 'gut flora stabilisers' or 'digestibility enhancers' functional groups. Those functions are mainly demonstrated with zootechnical performance data. If other efficacy endpoints can be documented, probiotics are authorised as 'other zootechnical additives' with a specific 'claim' associated to it.

Thanks to a well-documented technical dossier prepared by Lallemand Animal Nutrition, scientists from the European Food Safety Authority acknowledged the potential of the Saccharomyces cerevisiae boulardii CNCM I-1079 to aid in the reduction of carcase contamination with Salmonella spp. by decreasing Salmonella in the faeces.

All told, it took four years to generate the required efficacy data and prepare the dossier. The assessment and authorisation of the dossier took an additional 30 months.

Lallemand is very proud to have once more demonstrated our expertise in the development of innovative feed solutions that not only improve the health and performance of livestock, but helps to safeguard food safety.



✓**Reduced prevalence of** Salmonella enteritidis **contamination on birds' carcasses.**

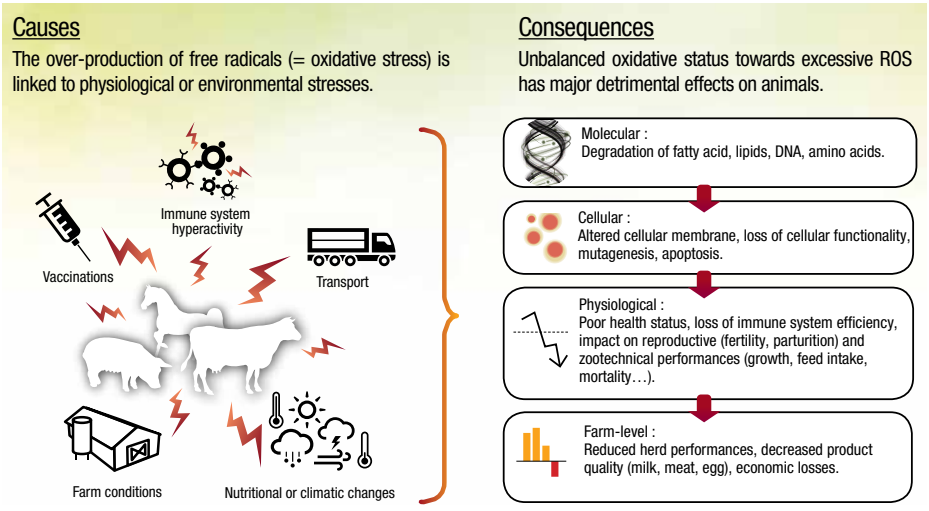
(Mountzouris *et al.*, 2015. Poultry Science, Vol 94, Issue 10, p2245-2455.)

A NEW APPROACH TO ANTIOXIDANT NUTRITION

Oxidative stress can have a significant impact on the performance and profitability of intensively-reared livestock. Until now, nutritionists have focused on second and third-tier pathways, such as vitamins, to boost antioxidant production.

Lallemand now offers a scientifically-proven technology that allows nutritionists to target all aspects of oxidative stress more accurately. Melofeed is a source of superoxide dismutase (SOD), which influences the primary enzymatic pathway of oxidative stress. It is produced from the freeze-drying the pulp of a specific variety of melon that is naturally rich in SOD, plus additional catalase.

Melofeed stimulates the endogenous production of SOD, thereby increasing the levels of primary antioxidants and optimising the antioxidant balance during periods of oxidative stress. With the rising cost of secondary antioxidants, such as Vitamin A, C and E, now is the perfect time to review the antioxidant specifications in your ration.



OMICS TECHNOLOGIES EXPLORE RUMEN FIBRE-DEGRADING ACTIVITY

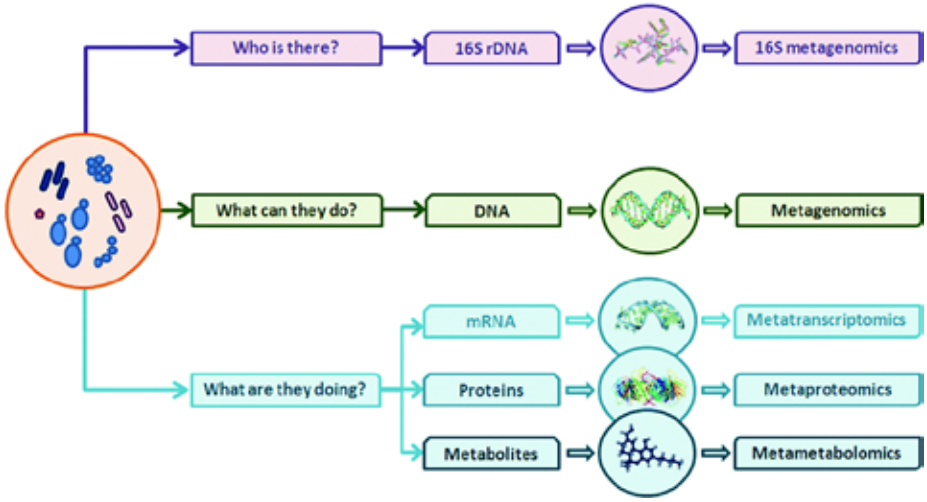
In the field of digestive microflora research, the 'omics' revolution is on everyone's agenda. 'Omics' refers to a group of related technologies – genomics, transcriptomics, proteomics or metabolomics – that can be used to detect genes, messenger RNA (mRNA), proteins and metabolites, respectively.

Lallemand Animal Nutrition has been at the cutting edge of this research, with a particular focus on the important role played by rumen microbiota in fibre degradation.

A recent study used microbial mRNA-sequencing to examine the expression of genes encoding fibre degrading enzymes (CAZymes or carbohydrate-active enzymes) and the fibre-degrading populations of the rumen microbiota.

This study reveals that the contribution of fungi and ciliate protozoa to polysaccharide degradation has been seriously underestimated until now. The study identified 12,237 CAZymes (or 1% of the RNA transcripts), as well as confirming the pivotal role of fibrolytic bacteria (Prevotella, Ruminocccus and Fibrobacter).

Dr. Frédérique Chaucheyras-Durand of the French National Institute



for Agricultural Research recently presented another method for looking into fibre-degrading enzyme activity at the 6th Beneficial Microbes Conference in Amsterdam.

This microarray enables researchers to detect the expression level of 394 different genes coding for CAZymes specific to cellulose and hemicellulose degradation. This was applied to study the establishment of fibrolytic microbiota in young ruminants (lambs) and the impact of probiotic yeast.

The technology enabled scientists to evaluate, not only the type of microorganisms present, but also the potential fibre degradation power of these microorganisms at the gene expression level. This study suggests that young ruminants supplemented with live yeast Saccharomyces cerevisiae CNCM I-1077 harbour a greater fibrolytic potential that is key to the expression of efficient fibre-digesting capacities.

The use of specific 'omics' tools is today particularly valuable to further understand the mode of action of microbial manipulation strategies, such as probiotics, or to decipher the functional roles the microbiota can display.

The knowledge developed have direct implications to optimise the use of our current probiotics and to develop new specific strategies to optimise the functioning of the microbiome.

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LEVUCELL SB TECHNICAL MEETING

More than 110 swine and nutrition experts from throughout Asia, Europe, Australia and South America recently gathered in Ho Chi Minh City to share their knowledge and expertise at the 9th International Levucell SB Technical Meeting. Vietnam is the second largest pig producer in Asia after China, with its national herd of 4.2 million sows producing 2.45 million tons of pork each year. As with many counties, Vietnam is strengthening its efforts to reduce antimicrobial usage in livestock production. The first session, which featured renowned international speakers, focussed on breeding sows and finishing pigs, particularly the growing issues of hyperprolificity and heat stress. The second session focussed on post-weaning piglets, providing the latest scientific updates on the impact of weaning on piglet microbiota, health and performance.

Feeling the heat

While heat stress is most commonly associated with tropical environments, it is a growing issue in the Europe and USA – and a trend that is bound to increase with global warming.

National Institute for Agricultural Research, Director of Research, Dr David Renaudeau, says genetic selection has increased animals' susceptibility to heat stress, selecting productive traits at the expense of robustness.

Heat stress in lactating sows decreases feed intake, feed efficiency, milk production and litter growth; increases body weight loss in lactation; and impairs reproductive performances by increasing the weaning-to-oestrus interval and decreasing farrowing rate. In the growing and finishing phases, Dr Renaudeau showed how animal sensitivity to heat stress increases with body weight.

In Brazil, heat stress is a well-known issue. Professor Bruno Silva, from the Institute of Agricultural Sciences, Universidade Federal de Minas Gerais, is a specialist in the field of nutritional requirements and environmental adaptation of pigs in tropical regions. He explained how climatic effect is intensified with modern genotypes, due to high growth rates, deposition of muscle tissue and hyperprolificity. He also stressed the effect of heat stress on oxidative stress in sows.

Rivalea swine nutritionist, Chris Brewster, estimates that heat stress can decrease feed intake by 10–20%, leading to lower carcase weight and profit, especially at times of higher market demand in Australia (i.e. Christmas). Rivalea is Australia's leading pork producer and processes more than one million pigs per year.

Four types of approaches to reduce the impact of heat stress were discussed:

- Environmental heat abatement methods, such spray or drip cooling systems, are effective but not always economically feasible, especially in small-scale operations in tropical environments. Professor Silva presented different cooling systems, explaining how 'contact' cooling systems, such as cooling floors, are more effective than convective systems.

- Nutritional strategies, including feeding high energy diets (>10 MJ NE/kg) to compensate for the reduced feed intake and high fat/low crude protein diets. The use of feed additives, such as live yeast to enhance feed efficiency or flavourings to stimulate feed intake, were discussed. Antioxidant supplementation should also be considered to protect the animals.

- Feeding management. Professor Silva recommends feeding animals when temperature is lowest (i.e. early morning and late afternoon) to maximise feed intake. Water quality and temperature is often overlooked. Ask yourself if you would drink the water available to your animals?

- Genetic adaptation is a possible longer-term strategy.

Pictured: Chris Brewster, Rivalea

Reducing heat stress with live yeast
Various trials with the scientifically-proven live probiotic yeast strain, Saccharomyces cerevisiae var. boulardii CNCM I-1079 (i.e. Levucell SB) were also discussed.

A trial conducted in Brazil examined the effect of Levucell SB at two different dosages. At the higher dosage, sows ate less but their performance was further improved due to improved feed efficiency. Professor Bruno Silva says the observed benefits are linked to the probiotic effect on gut health.

Rivalea swine nutritionist, Chris Brewster, shared his experience with Levucell SB on finishing pigs during the summer. While feeding a high energy diet is a common strategy to alleviate heat stress over summer, sometimes it can be uneconomic.

A trial was conducted to evaluate the effect of the probiotic on the performance of finishing pigs fed either a low energy diet (high NDF) or a high energy diet (high starch) over the summer. In this trial, Levucell SB improved feed efficiency in both rations, but to a higher extent with a high energy diet than low energy diet.

Lallemand Animal Nutrition General Manager, Dr Yannig Le Treut, who is also a swine veterinarian, concluded the session by sharing new insights into the probiotic's modes of action.

A scientific trial conducted at INRA used metabolic chambers to study the modes of action of the probiotic yeast and its impact on energy metabolism and digestion. Until then, the positive effect of the live yeast on energy metabolism in sows was known but difficult to evaluate precisely.

The study demonstrated the ability of the live yeast strain to increase energy retention of the animal, through the reduction of heat energy losses, enhancing performance.

Speakers at the 9th International Levucell SB meeting. From left to right: D. Saornil, K. Le Phan (Innochems), C. Brewster, M. Baulez, D. Renaudeau, C. Achard, M. Castex, Y. Le Treut, C. Minh Tung (Long Nam University, Vietnam), V. Couture.

Interestingly, the probiotic supplement also improved feeding behaviour, with pigs consuming more meals per day combined with a lower, and more stable, ingestion rate.

In reviewing various studies, Dr Le Treut noted that – even though a lot still needs to be learned on the live yeast's mode of action in what he calls 'a perfect fermenter' – its effects on the gut environment (e.g. oxygen scavenging) can lead to a 2.5 –3% increase of net energy extraction from the diet.

This is mainly due to two effects:

- Reduction of heat production energy losses

- Improved fibre degradation, which is corroborated with the latest studies on microbiota populations and activity.

In practice, this means that the effect of Levucell SB on the diet's net energy value can be taken into account. This is a valuable piece of information for the nutritionist to formulate cost-effective diets for dry sows!

Dysbiosis in post-weaning piglets
Post-weaning diarrhoea in piglets is a result of dysbiosis, a disequilibrium in the gut bacterial population. It is also the timing of the indusry's greatest use of in-feed antibiotics.

Speaking at the Levucell SB Technical Meeting held in Ho Chi Minh City, Lallemand Animal Nutrition Research & Development Director, Dr Mathieu Castex, says the industry needs to adopt alternative strategies to restore this microbial balance and control gastro-intestinal infections in weaned piglets.

Dr Castex says new technologies, such as the PigutIVM (an in vitro model that re-creates intestinal conditions and the evolution of microbiota populations), are improving our understanding of swine gut microbiota and microbial ecosystems.

This dynamic model has already provided interesting insights into the effects of antibiotics and probiotics on the dynamics of microbial populations, such as the positive effect of S. cerevisiae var. boulardii CNCM I-1079 on the decrease of E. coli levels.

Scientists at Lallemand and INRA are looking to go one step further by including a mucosal phase in the model to study various dysbiosis scenarios and new ways to mitigate them.

Lallemand Animal Nutrition Research

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Scientist, Dr Caroline Achard, says the advancement of 'omics' and high throughput sequencing techniques has demonstrated the impact of weaning and heat stress upon microbiota composition.

Dr Achard focused on the metabolic, structural and protective functions of the microbiota in animal health and performance, to which we can add the newer area of brain-gut communication.

Trials have shown the beneficial effects of the live yeast supplementation on performance of weaned piglets and heat-stressed finishing pigs may be, at least partially, mediated by the gut microbiota.

Interestingly, Dr Achard also showed some correlation between zootechnical performance, such as feed efficiency, and certain bacterial species in the gut, which could be used as predictive biomarkers for performance in the future.

Lallemand Animal Nutrition Product Manager, David Saornil, concluded the session by discussing nutritional strategies to reduce antimicrobial usage in post-weaning piglets, a key target for human and animal health worldwide.

Mr Saornil says post-weaning should start well beforehand, e.g. in pre-farrowing sows.

Mr Saornil says there are three pillars to antimicrobial reduction: management and environment, genetics and nutrition.

Mr Saornil reviewed the role of different factors that have a direct impact on gut health:

- Palatability and digestibility of the feed ingredients
- Use of creep feed
- Level of protein in the diets
- Inclusion of some specific raw materials, such as spray-dried animal plasma
- Inclusion of certain levels and types of fibre to improve intestinal comfort
- Reduction of calcium concentration in the diet due to its high buffering capacity
- Inclusion of some feed additives with the aim of reducing the pressure of pathogens in the intestine or improving the integrity of the intestinal wall.

Mr Saornil also discussed the effects of Levucell SB and zinc oxide, which will be phased out from use in Europe in 2022. A recently published trial from Milan University demonstrated the benefits of probiotics in partially replacing antimicrobials without affecting performance.

Mr Saornil also reported new research into the live yeast's modes of action in modifying genetic expression in the intestinal epithelium. In particular, it was found to 'up-regulate' some genes related to intestinal integrity and nutrient transportation: a new piece in the Levucell SB jigsaw!


Pictured: David Saornil, Lallemand

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