

# Feed Additive

INTERNATIONAL MAGAZINE FOR  
ANIMAL FEED & ADDITIVES INDUSTRY

[www.feedandadditive.com](http://www.feedandadditive.com)

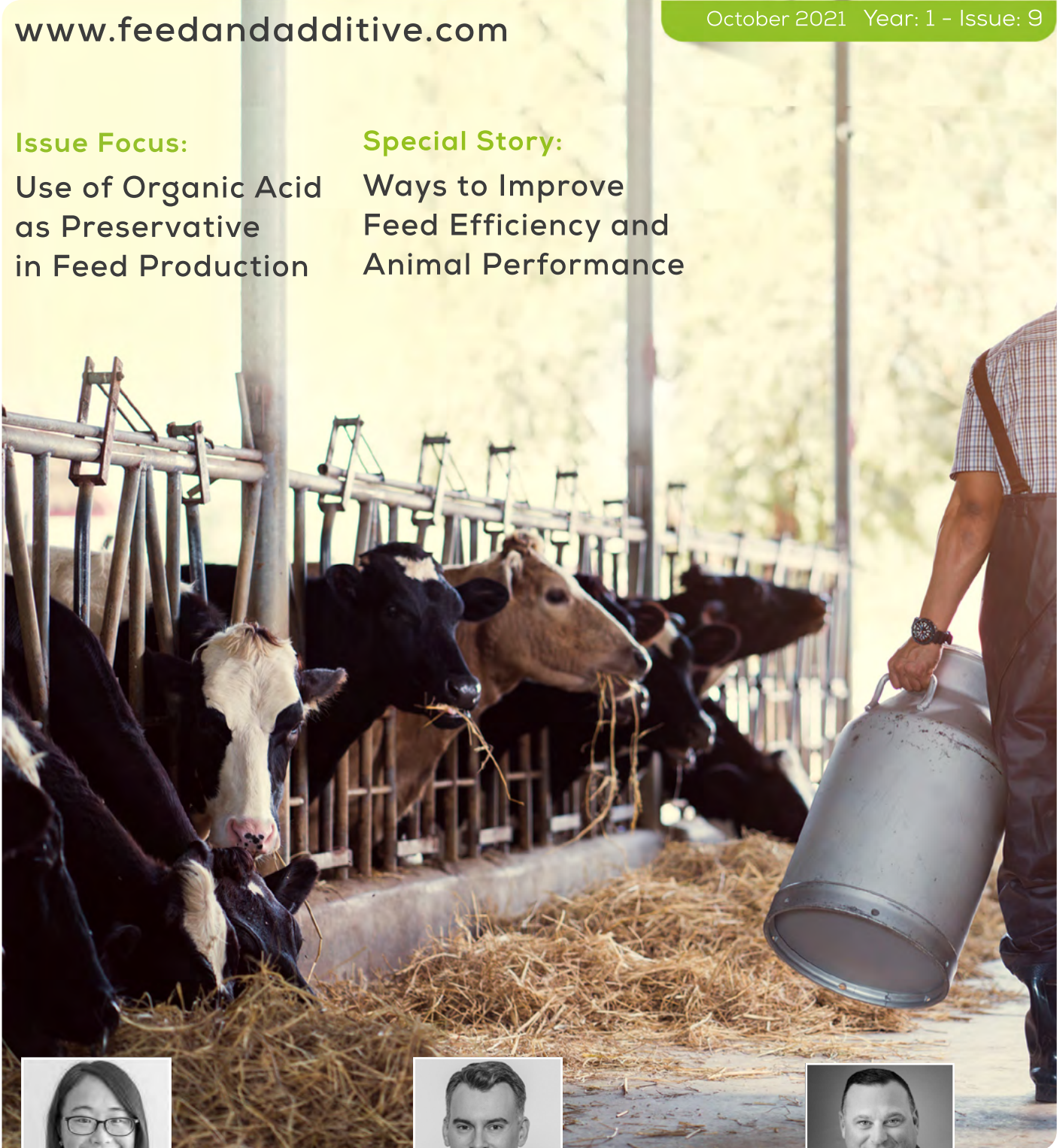
October 2021 Year: 1 - Issue: 9

## Issue Focus:

Use of Organic Acid  
as Preservative  
in Feed Production

## Special Story:

Ways to Improve  
Feed Efficiency and  
Animal Performance



**Eunice Lee, Pancosma**  
Intestinal wellness through  
MCFAs and their derivatives



**Antoine Meuter, Agrifirm**  
Strategic late-finishing nutrition  
for sustainable pig performance



**Dr. Luke Miller, Alltech**  
Debunking the myths behind  
mycotoxins: A vet's view

Feed & Additive Magazine is in front of its readers with a full October issue. First of all, on behalf of my teammates, I sincerely thank the representatives of the entire animal nutrition industry for their increased interest and contribution to our magazine.

In October issue, together with valuable representatives of the industry, we discussed two important topics: "Use of Organic Acid as Preservative in Feed Production" and "Ways to Improve Feed Efficiency and Animal Performance".

Animal nutrition is one of the most important ways to reach safe food. It would not be an exaggeration to say that a healthy and well-fed animal is the key to providing the consumer with healthy and quality animal food. Organic acids, which is the first topic we cover this month, comes into play at this point. Organic acids contribute to the production of healthy and high quality foods by both ensuring the safety of feed and also by protecting the health of the animal. You can find highly useful information presented by our esteemed authors by discussing organic acids from different aspects, in the following pages of our journal.

Dear readers, as you know, the rising world population and the increasing need for food has become a more important issue than ever before. Because it does not seem possible for the existing natural resources to meet the increasing needs alone without any intervention. This situation is now one of the most important problems to be solved for every food-related sector.

The livestock industry has a key role in meeting the increasing food need in the world, but, like other industries, it faces with the necessity of using existing resources in a sustainable and effective way. This means producing more with fewer resources. And for the animal nutrition industry, it means having more animal products with less feed or with the existing amount of feed.

So, is this possible? Is there a way to both meet the animal's nutritional needs and also increase the animal's production performance? Representatives of the animal nutrition industry state that it is possible to achieve this with a well-planned feed ration. You can find the details in our special story...

I hope it will be an issue that you will benefit and enjoy reading...

See you in the next issue...

# Feed Additive

INTERNATIONAL MAGAZINE FOR  
ANIMAL FEED & ADDITIVES INDUSTRY

**Publisher**

Muhammed Akatay  
[akatay@threeplusmedia.com](mailto:akatay@threeplusmedia.com)

**Responsible Manager**

Özlem Buyruk Akatay  
[ozlem@feedandadditive.com](mailto:ozlem@feedandadditive.com)

**Editor-in-Chief**

Derya Yıldız  
[derya@feedandadditive.com](mailto:derya@feedandadditive.com)

**Editors**


James Watson  
Bahadır Büyükkılıç  
[editor@feedandadditive.com](mailto:editor@feedandadditive.com)


**Graphic Design**

Three Plus Media Design Office  
[graphic@feedandadditive.com](mailto:graphic@feedandadditive.com)

**Publication Type**

Periodic (Monthly)

 [feedandadditive](#)

 [feedandadditive](#)

 [feedandadditive](#)

 [feedandadditive](#)

 **Three Plus**  
Media Ltd.

Ataturk St. Metropol Istanbul Ste.  
Block C1, No:376 Atasehir,  
Istanbul/TURKEY

Phone: +90 850 220 5064

E-Mail: [info@feedandadditive.com](mailto:info@feedandadditive.com)

Web: [www.feedandadditive.com](http://www.feedandadditive.com)

**Branch:**

Ste B69, East Rutherford,  
New Jersey 07073, USA

# The customer we care most about



To feed 9.7 billion people by 2050, sustainably and responsibly, and within our planet's finite resources, the time to change is now.

At DSM, we're focusing our passion and expertise on 6 key areas to support the livestock value chain and address the challenges facing our planet:

- Improving lifetime performance of farm animals
- Making efficient use of natural resources
- Reducing emissions from livestock
- Helping tackle antimicrobial resistance
- Reducing our reliance on marine resources
- Improving the quality of meat, milk, fish and eggs, while reducing food loss and waste

We strongly believe in sustainable food systems and that the livestock industry can transform itself from within to be a part of the solution. We want to play a key role in this transformation and work at species and country level, with our partners, to provide tangible and actionable solutions to create brighter lives for all.

***If not us, who? If not now, when?***  
**WE MAKE IT POSSIBLE**

Find out how DSM can help transform animal nutrition and health sustainably at [www.dsm.com/wemakeitpossible](http://www.dsm.com/wemakeitpossible)

# C O N T E N T S

## ISSUE FOCUS

26

### USE OF ORGANIC ACID AS PRESERVATIVE IN FEED PRODUCTION



- 28** THE USE OF ORGANIC ACIDS IN MANAGING MICROBIAL DEGRADATION AND PRESERVING FEED QUALITY  
**Dr Edwin Chow, Ph.D.**, *Global Scientific and Technical Manager, Feed Preservation, Adisseo*
- 32** HEALTH AND PERFORMANCE - GO FOR THE MAX  
**Dr Elisabeth Holl**, *Senior Technical Sales Manager, Dr. Eckel Animal Nutrition GmbH & Co. KG*
- 34** INTESTINAL WELLNESS THROUGH MCFAS AND THEIR DERIVATIVES  
**Eunice Lee**, *Product Manager - Organic Acids, Pancosma*
- 38** THE RISE OF NATURAL MICROBIAL PRESERVATION  
**Elena Fraccaroli**, *Technical Service Manager, Kemin Nutrisurance EMEA*  
**Patrice Gault**, *Technical Service Manager & Sales Manager, Kemin Nutrisurance EMEA*

## ARTICLES

- 64** SAFE FEED IS A GUARANTEE OF GOOD RESULTS  
**Néstor Serra Gómez-Nicolau**, *Technical Manager, Adiveter S.L.*
- 68** DEBUNKING THE MYTHS BEHIND MYCOTOXINS: A VET'S VIEW  
**Dr. Luke Miller, DVM**, *Dairy Technical Support Specialist, Alltech*

## REPORTS



Global Pig Industry and Trends

72

# CONTENTS

## SPECIAL STORY

IS THERE ANY SAFE COPPER SOURCE AVAILABLE FOR PIGS' GROWTH PROMOTION?	40
<b>Alessandra Monteiro</b> , <i>R&amp;D, Animine</i> & <b>Jennifer Maurin</b> , <i>Marketing, Animine</i>	
THE FIBER REVOLUTION - WHAT'S THE DEAL WITH FIBER?	44
<b>Diego Navarro, PhD</b> , <i>Swine Nutritionist, Hamlet Protein</i>	
NEW DOUBLE-ENCAPSULATION TECHNOLOGY PREVENTS HEALTH CHALLENGES IN BROILER FARMS	47
<b>Dr. Stephanie Ladirat</b> , <i>R&amp;D Director, NUQO Feed Additives</i>	
INSECT INGREDIENT TO DRIVE PERFORMANCE AND BOOST HEALTH IN SHRIMP NUTRITION	50
<b>Andrew Richardson</b> , <i>Aqua Nutrition Manager t, InnovaFeed</i> <b>Maye Walraven</b> , <i>Head of Business Development, InnovaFeed</i>	
"INCREASING FEED EFFICIENCY IS A METHOD TO INCREASE FARM PROFITABILITY"	56
<b>Mostafa Medhat</b> , <i>Senior Director of Products and Technology Applications, Si-Ware Systems</i>	
STRATEGIC LATE-FINISHING NUTRITION FOR SUSTAINABLE PIG PERFORMANCE	60
<b>Antoine Meuter</b> , <i>Product Manager Monogastric, Royal Agrifirm Group</i>	
IMPROVING FEED EFFICIENCY WITH VIVACTIV®	63
<b>Jean Pascard</b> , <i>Ruminant Product Manager, CCPA Group</i>	

## NEWS

8	AB Linas Agro Group to acquire Agro Logistic Service
11	Agrifirm and CRV to jointly conduct research into methane
12	Alltech Coppens Aqua Centre opens next-generation research facility
14	Si-Ware, Dairyland Labs partner for in-field dairy feed analysis solution
16	DSM receives approval from Brazilian and Chilean authorities for Bovaer
19	Growing yeast from spruce trees!
21	Wisium extends Polish footprint through ADM's Premix acquisition
23	Leonardo DiCaprio invests in Mosa Meat and Aleph Farms
25	AB Vista, Avivagen sign 8-year supply deal

## Trouw Nutrition opens Poultry Nutrition and Health Unit

Trouw Nutrition opened the latest addition to its Poultry Research Centre, the Poultry Nutrition and Health Unit.

**T**rouw Nutrition, the animal nutrition division of Nutreco, celebrated the virtual grand opening of the Poultry Nutrition and Health Unit, in Castilla la-Mancha, Spain, on 14 September 2021. The event convened customers, stakeholders from research and development, academia and poultry farming to virtually tour the new unit and learn about strategies to reduce the use of antibiotics in poultry production.

The latest addition to the Trouw Nutrition Poultry Research Centre, the Poultry Nutrition and Health Unit, features four study rooms equipped to conduct different studies simultaneously. Researchers can replicate climate and environmental conditions such as humidity, temperature and stocking density to simulate production environments around the globe.

Each study room in the facility



can accommodate 48 pens that can be adjusted to reflect different stocking densities. Seven water reservoirs per room allow researchers to randomize different water treatments. Digestibility and bioavailability cages facilitate precision nutrition research, including how tailoring ingredients can influence feed intake, nutrient bioavailability, and feed conversion ratios.

Microbiological technologies and data analysis support research at the facility. For example, scientists can combine molecular biology techniques such as PCR with traditional culture meth-

ods and then conduct additional analyses in context with flock performance data. The resulting insights assist researchers in standardizing animal models that improve understanding of poultry health concerns including malabsorption syndrome, Salmonella, Campylobacter, and dysbacteriosis. The facility is equipped to manage studies ranging from routine trials evaluating animal performance and carcass quality for meat processing to highly complex research reflecting challenging intestinal conditions and diverse production schemes.

## Nor-Feed inaugurates new factory in France

Leading French botanicals company Nor-Feed inaugurated new production plant in France. With the 2,500 square-meter new plant, the company's annual feed supply will quadruple to 50 million tons.

**N**or-Feed's new plant in Chemillé, Anjou region, the hub of aromatic and medicinal plants in France, will strengthen its position for supplying botanicals to domestic and international markets. The facility's inauguration on September

7th – with the presence of more than 100 people from different countries – marks a new chapter in the Nor-Feed history.

The 2,500 square meters new plant is fully automated and will quadruple Nor-Feed's annual production,

which will be able to supply 50 million tons of feed. After the ceremony, the participants had the chance to visit the facilities, where they could see and know more about the new and improved features. One of them is the new patented extraction technology to exploit new botanical sources and make their active compounds bio-available, without using solvent-dependent technologies to complete the extraction.

The facility also runs on renewable energy side by side with electricity. The products have been eco-designed, from manufacturing down to their use, and will use co-products from the agricultural industry.

All these factors contribute to the ambition of



replacing synthetic products in animal feed. The company is now engaged in a BCorp certification process to cement its commitment to a more sustainable way of doing business in the years to come.

## Bühler, Givaudan, and Migros establish pilot plant for cultured meat

Bühler, Givaudan, and Migros have joined forces to establish a pilot plant, The Cultured Food Innovation Hub, for cultured meat production. The facility in Zurich will start operations in 2022.

Three companies, Bühler, Givaudan, and Migros, have formed a new entity, The Cultured Food Innovation Hub, in Kemptthal near Zurich, to accelerate the development and market penetration of cellular agriculture products. There are many arguments supporting the mass suitability of cultured meat: meat without slaughter or factory farming, a significantly better climate balance, no use of antibiotics, and ensured food security.

The Cultured Food Innovation Hub will be a self-sustained, stand-alone company wholly owned by Givaudan, Bühler, and Migros, located in The Valley in Kemptthal, a hotbed of innovation and technology just outside of Zurich. The new entity will provide facilities and knowledge to accelerate



other companies on their cultured meat, cultured fish and seafood, and precision fermentation journeys. The Cultured Food Innovation Hub will be equipped with a product development lab as well as cell culture and bio-fermentation capabilities to help start-ups develop and go to market with the right product.

The significant increase in demand in recent years for plant-based foods all around the world

has shown consumers' broad concern for the environment, as well as their expectation of producers for healthful foods that are ethical and sustainable. In a world facing great challenges from climate change, combined with a population expected to exceed 10 billion people by 2050, the need for sustainable food cultivation and sourcing is critical.

The Cultured Food Innovation Hub will go live in 2022.

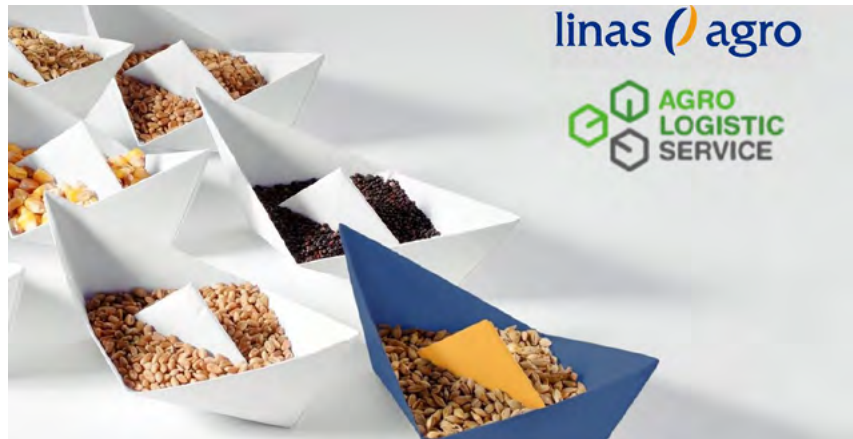
## AB Linas Agro Group to acquire Agro Logistic Service

AB Linas Agro Group, the largest agribusiness and food production group in the Baltic States, seeks to acquire UAB Agro Logistic Service, a trading company specializing in raw materials and additives for fodder production.

**A**B Linas Agro Group has signed share purchase and sale agreement with the aim to acquire 100 of shares of UAB Agro Logistic Service.

UAB Agro Logistic Service is a trading company that successfully trades in Western European markets. It is a strategic partner of KG Group companies in raw materials for fodder trading business.

“A year ago, we started the process of acquiring companies operating under the name of KG Group and completed it on July 15 this year. After the completion of the transaction, we decided to acquire UAB Agro Logistic Service, a trading company specializing in raw materials and additives for fodder production,



as it is a permanent partner of KG Group, has excellent export channels and a wide range of customers. Last year, UAB Agro Logistic Service was not on sale because it is owned by different shareholders,” said Mažvydas Šileika, Finance Director of AB Linas Agro Group.

As AB Linas Agro, a subsidiary of AB Linas Agro Group, is also engaged in feedstuff trading, the transaction must be approved by the Competition Council of the Republic of Lithuania. The details of the transaction were not disclosed by the agreement of the parties.

## Calysta announces \$39 million investment for FeedKind production

**C**alysta, one of leading alternative protein producers, has completed a \$39 million financing round, led by bp ventures, to support global scale-up of production of Calysta's FeedKind® protein.

The expansion of the Series D-1 funding round will support scoping and pre-development of the company's next manufacturing site, outside Asia. Calysta is currently working towards completion of the world's first commercial FeedKind production facility in China via Calysseo,



Calysta's 50/50 JV with Adisseo. It is set to come online late 2022. It also operates an R&D facility in the UK.

Joining bp ventures in the round were Adisseo, AquaSpark and WTI, as well as Calysta's other existing investors.

Calysta's technology produces sustainable single-cell protein, which is produced through a proprietary, commercially validated gas fermentation process using naturally occurring, non-GM microbes that use methane as their energy source.



## Famsun signs agreement to support agri-food industry in Madagascar

Famsun, one of the world's leading feed milling equipment suppliers, signed framework agreement to support agri-food industry development in Madagascar.

Famsun Co., Ltd and Embassy of the Republic of Madagascar had signed a strategic cooperation framework agreement to promote agri-food industry development, economic growth, and people's livelihood improvement in Madagascar.

The agreement was signed by Greg Liu, Director and President of Famsun International, and H.E. Robinson Jean Louis, am-

bassador of Madagascar to China on the 2021 China Overseas Investment Fair (Yangzhou) & Yangzhou Conference for collaborative Projects of Belt and Road Initiatives on June 17, 2021.

According to Famsun, the company has been active in Africa for more than 15 years. It helps to improve local food security through delivering the continent feed plants, poultry farms, rice mills, oilseed

processing plants and grain storage terminals. Famsun's manufacturing base in Egypt and offices in Africa also employ local talents and make contribution to local economies. In Madagascar, Famsun started to participate in the construction of local food system by partnering with one of the country's largest conglomerates – the STMP Group – to build a state-of-the-art animal feed mill in 2010.



**PATENTED STRUCTURE. PROVEN EFFICIENCY  
USE PURE ORGANIC TRACE MINERALS**



The B-TRAXIM range of essential mineral solutions is based on glycine, and relies on a unique transversal approach, combining technology, chemistry and nutrition. Scientifically validated and supported by numerous publications, B-TRAXIM products have proven to be highly stable and effective in a variety of species and conditions, while establishing themselves as a reference in the field of organic trace minerals.

## ADM to buy majority stake in pet-food business P4 Companies

ADM reached an agreement to acquire a 75% ownership stake in PetDine, Pedigree Ovens, The Pound Bakery and NutraDine (P4 Companies), premier providers of private label pet treats and supplements.

Archer Daniels Midland Company (ADM), a global leader in human and animal nutrition, announced that it reached an agreement to acquire a 75% ownership stake in PetDine, Pedigree Ovens, The Pound Bakery and NutraDine (P4 Companies), premier providers of private label pet treats and supplements. The transaction values the four enterprises in their entirety at approximately \$600 million, and ADM will acquire 75% of the equity, subject to customary adjustments.

With more than 300 employ-

ees, P4 Companies provides a complete range of highly customized pet treat and supplement products to more than 650 customers in 15 countries. Their offerings include baked treats, semi-moist treats, long goods, blends, unique proteins, soft chews, liquids and powders, many of which are developed to meet the demand for clean labels. P4 has delivered strong revenue and profit growth in recent years, and has invested in new product lines as well as expanded its production capacity.

ADM will also acquire P4's



300,000+ square feet of state-of-the-art production and innovation facilities in Illinois and Colorado. In addition, the agreement includes a put/call option under which the parties could agree for ADM to purchase the remaining 25 percent at an agreed-upon market price in the coming years.

## US-EU feed industries welcome global methane pledge

The American Feed Industry Association (AFIA) and the European Compound Feed Manufacturers' Federation (FEFAC) joined together in support of the United States-European Union Global Methane Pledge, which calls for the use of scientific innovation to cut methane emissions by 30% below 2020 levels by 2030.

U.S. President Joe Biden made the announcement on Sept. 17 during the Major Economic Forum, a virtual meeting attended by leaders from across the globe including European Commission President Ursula von der Leyen, United Kingdom's Prime Minister Boris Johnson, Mexican President Andrés Manuel López Obrador and South Korean President Moon Jae-in.

"The U.S.-E.U. pledge announced last week is a

positive step in the right direction. It gives regulators on both sides of the Atlantic the opportunity to modernize their existing regulatory requirements to incorporate innovative feed ingredients and implement strategies that are proven to significantly minimize methane emissions from enteric fermentation. This, together with other mitigation strategies, such as improved farming and grazing techniques, animal genetics and animal husbandry practices, hold the key to further reduce the impact of dairy and beef production globally and thereby contribute to the success of the U.S.-E.U. pledge," AFIA President and CEO Constance Cullman and FEFAC President Asbjørn Børsting said in a joint statement regarding the announcement.

## Agrifirm and CRV to jointly conduct research into methane

Royal Agrifirm Group and CRV have teamed up for joint research project to measure the methane emission of individual cows. It is expected that methane production per cow can be reduced by up to one percent per year.

The cooperative organisations Royal Agrifirm Group and CRV will start up a joint project designed to measure the methane emission of individual cows in actual practice. The purpose is to gain greater insight into the differences between animals and rations. This knowledge will be used to develop new products that enable livestock farmers to control methane emissions. The researchers will focus on various aspects, such as feed advice, methane efficiency breeding values and improved methods for esti-

imating methane emissions at the cow and farm level.

The methane emissions will be determined with the aid of so-called GreenFeeds, whereby the measuring equipment is built into a feed concentrate station. This equipment analyses the breath's composition each time a cow visits the feed concentrate station. For frequent visits this provides a reliable measurement of methane production. The GreenFeeds will be installed on one of the CRV feed efficiency practice farms in



the Netherlands. CRV is already collecting data here, for example about the feed intake of individual cows. With this, the connection can be made between feed intake and methane emission.

## Ruud Tijssens elected as new chairman of IFIF

The International Feed Industry Federation (IFIF) announced that Ruud Tijssens, Group Director Public & Cooperative Affairs, Royal Agrifirm Group, was elected as IFIF's new Chairman for 2022-2023 by delegates at IFIF's 34th General Assembly held on 21 September 2021.

Outgoing IFIF Chairman Dr. Daniel Bercovici, who led the Federation over the last four years, handed over the IFIF Chairmanship at the General Assembly, where he welcomed the new Chairman: "I warmly congratulate Ruud Tijssens on his election as Chairman of IFIF. We are at a critical phase of implementing IFIF's strategy in the face of important global challenges and opportunities in the feed and food chain and I believe Ruud is well placed to successfully lead the Federation to contribute to the growth of a sustainable feed industry worldwide."

Ruud Tijssens thanked Daniel Bercovici for "his outstanding leadership of IFIF over the last four



years under which IFIF experienced strong growth in strategic projects and deeper relationships with international stakeholders while attracting a range of new members from across the globe." He also thanked "all IFIF Members for their contributions to our success, which strengthens IFIF as the united voice of the global feed industry to promote and support sustainable, safe, nutritious and affordable food for a growing world population."

## Alltech Coppens Aqua Centre opens next-generation research facility

Alltech Coppens opened a new and specialised research facility for digestibility and growth trials that is applicable for trout, catfish and many other species.

Alltech Coppens hosted an official opening for the expansion of its world-class research facility, Alltech Coppens Aqua Centre (ACAC), on September 29. Attendants of the virtual event had the unique opportunity to step inside and get a virtual tour of the research centre expansion.

The digestibility research facility of the ACAC has been increased by 50%, which will expand the company's capacity for product development and aquaculture industry solutions.

"The unique feature of this expansion is that we are now able to

conduct growth and digestibility trials at the same time," said Ronald Faber, CEO and global aquaculture lead of Alltech Coppens.

"Also, this system can create the perfect circumstances for species like trout, eel and also catfish."

"We are constantly developing and innovating our feed range. The application of our new next-generation digestibility system will bring our knowledge of fish nutrition to the next level by adhering to our 4 Pillars of fish nutrition: "Palatability, Performance, Pollution Control and Planet," said Philip Lyons, Global



Manager Aquaculture Research.

Alltech Coppens worked with ZEBECARE, a company that has focused on the design and construction of complete aquatic research facilities for over 30 years, to develop this revolutionary new ACAC 7 trial system, which will combine growth and digestibility trials for catfish.

## Hamlet Protein sponsors Piglet Conference in China

Hamlet Protein, multinational producer of soy-based protein ingredients for young animals sponsored the China Sow and Piglet Conference in Qingdao. The event was well attended by nutrition-

ists from leading swine producers in the country and provided an excellent opportunity to discuss challenges and opportunities in today's swine market.

Eugene Li, Technical Manager APAC for Hamlet Protein, presented on soy protein use in young animal nutrition, in front of an 800 audience. Citing research from China Agricultural University and other renowned international institutions he zoomed in on oxidative stress in weaning piglets and protein requirements in starter and pre-starter feeds.



Dr. Yu Feng, Regional Director APAC of Hamlet Protein, commented: "As China has opened up for national travel and allows for the hosting of tradeshows and seminars, the sponsorship of the Sow and

Piglet Conference allows us to show our commitment to the Chinese pork industry and strengthen our relationship with our customers."

"Hamlet Protein is part of a global company. We are proud of our partnership with this event. The conference allows us to share knowledge and insights acquired around the world with Chinese producers, so we can learn from each other and jointly improve our nutritional solutions every day," concluded Dr. Feng.

## Kansas State, Elanco form strategic alliance to improve animal health

K-State University and Elanco have joined forces for a 5-year strategic alliance agreement for joint research and innovation to improve health of companion animal and livestock.

**K**ansas State University and Elanco Animal Health Incorporated are combining efforts to tackle innovation for companion animal and livestock health.

A five-year strategic alliance agreement between the university and Elanco will allow for collaborative research and intellectual property licensing for commercialization activities. Researchers will focus on activities supporting sustainable practices in livestock production and pet health; vector-borne and emerging disease prevention and treatment; and advanced understanding of the microbiome in animals. Elanco's research and development model includes attracting leading innovators as a partner of choice.

They have chosen K-State as a primary key veterinary partner.

One of the key objectives of the partnership is to establish novel approaches to increase sustainable practices, reducing the carbon footprint of livestock production, with the ultimate goal of providing innovative solutions to veterinarians and producers to maintain healthy animals using safe and efficient solutions.

Elanco will collaborate with K-State faculty, embed scientists in K-State laboratories and utilize specialized research resources to engage in fundamental and applied collaborative research. Through the partnership, Elanco will support K-State graduate students, fellows and faculty and



facilitate an exchange of expertise through researcher exchange programs.

The collaboration allows research that is at the forefront of innovation for the monitoring of new diseases to tailor research programs and provide product solutions, as well as development of innovative approaches to existing vector-borne diseases by leveraging common strengths.

## VEOS Group opens new plant in Spain

**B**elgium-based VEOS Group, one of the specialized global leaders in the animal protein market, announced that the company's new plant in Spain, VEOS Iberica, is fully operational. The new plant in Monzon town of Huesca region is the most modern plant of the group and is designed for further expansion.

"As a center of circular economy, we embedded the latest environmental technologies. We use less



energy and re-use heat and water wherever possible," the company said in a statement regarding the opening.

The construction of the plant, which started in September 2020, was completed in 12 months.

Established in 1974, VEOS Group produces animal proteins such as plasma, hemoglobin, egg powder and collagens for the food, feed, pet food and parapharmaceutical industry.

## Arla digs into potential of Regenerative Dairy Farming

Arla Foods will explore regenerative dairy farming practices on six pilot farms in the UK and create data-driven proof points of their impact on nature and climate.

Dairy cooperative Arla Foods is taking two tangible, farmer-led steps to gain more data and knowledge of how dairy farming can help improve soil biology, carbon capture, water quality and biodiversity via regenerative farming methods.

The first step is to establish a pilot programme created in partnership with regenerative farming experts from FAI farms and other expert organisations. In total, 24 selected pilot farmers across five countries (of which six are in the UK) will be trained and coached to implement various regenerative methods, and their learnings combined with data collection will build knowledge of how re-

generative methods can be applied to different dairy farming systems and how they impact climate and nature.

The second step is a commitment from the cooperative's 916 organic farmers, who are responsible for an annual production of 1,000 million kg of organic milk, the world's largest organic milk pool. All of Arla's 114 organic farmers in the UK are part of this commitment.

Starting this year, they will self-assess and register their farm's biodiversity activities once every year to generate data. In addition to this, they will collect soil samples, which will be analysed by a third party laboratory to



establish a baseline for their soil carbon. Furthermore, the organic farmers will guarantee that a number of soil health and biodiversity measures are activated on their farms. They will get access to a lever catalogue including information about how to measure and manage improvements. From 2022, they will also self-assess soil health indicators e.g. testing soil smell, spading ease and earthworm counts.

## Si-Ware, Dairyland Labs partner for in-field dairy feed analysis solution

A new partnership between Si-Ware Systems and Dairyland Laboratories will bring together the power of Si-Ware's NeoSpectra technology and Dairyland's feed testing expertise, enabling on-demand results, quicker decisions, and improved feed quality assurance.

Si-Ware Systems Inc., creator of NeoSpectra material analysis solutions built on single-chip FT-NIR spectrometers, yesterday announced a partnership with Dairyland Laboratories, Inc., a leading agricultural feed and forage testing laboratory with customers across the U.S. and in over 20 countries.

The partnership will utilize the power of Si-Ware's NeoSpectra technology and Dairyland's feed testing expertise, enabling on-demand results, quicker decisions, and improved feed quality assurance.

The partnership marks an exciting era in agriculture technology and in-field analysis. Dairy-

land's feed testing and NIR expertise, paired with NeoSpectra Scanners, will allow users to capture and review feed composition on-demand to empower in-field decision-making and variation control. Customers can accurately analyze moisture in real time, detect trends and changes in quality, and screen quality of incoming ingredients. The in-field solution enables users to analyze more samples in less time, adjust to feed changes quickly, and optimize harvest timing.

Dairyland's NIR support and data integrations will be made available on Si-Ware's NeoSpectra LabStore via the Dairyland Feed Analysis app. The NeoSpectra LabStore is a secure place to discover and download test models that are developed by FT-NIR technology experts such as laboratories, researchers, universities, and companies. NeoSpectra portable analyzer users access the LabStore to download the models they need to perform in-field



analysis in industries such as agriculture, food, life sciences, and others.

The Dairyland and Si-Ware partnership seeks to address the in-field burdens of feed variation while maximizing feed nutrient content and animal productivity for the hundreds of thousands of dairy farms and feed mills globally.

The Dairyland partnership, which was announced on the first day of the 2021 World Dairy Expo, is Si-Ware's first lab partner in the U.S.

## Pathways to Dairy Net Zero climate initiative launched

Forty leading organizations, including 11 of the 20 largest dairy companies in the world, are among first to support new global "Pathways to Dairy Net Zero" climate initiative.

**P**athways to Dairy Net Zero, a ground-breaking new climate initiative, was launched during Climate Week and just prior to the United Nations (UN) Food Systems Summit. Forty leading organizations, including 11 of the 20 largest dairy companies in the world, have already declared their support for the effort. Collectively, these supporters represent approximately 30 percent of total milk production worldwide.

The new climate initiative demonstrates the global dairy sector's commitment to reducing greenhouse gas (GHG) emissions while continuing to produce nutritious foods for six billion people and provide for the livelihoods of one billion people.

"Pathways to Dairy Net Zero will accelerate climate efforts already underway and drive further necessary action to reduce dairy's emissions over the next decades. The dairy sector has a lot to offer to



lead this transition," said Hein Schumacher, Chief Executive Officer of Royal FrieslandCampina and Chairman of Global Dairy Platform.

"Mengniu is proud to join the global dairy sector in uniting behind this effort, the first of its kind in agriculture, because we must all do our part to meet this worldwide climate challenge," said Minfang (Jeffrey) Lu, Chief Executive Officer and Executive Director of China Mengniu Dairy Company.

## DSM receives full regulatory approval from Brazilian and Chilean authorities for Bovaer

DSM has received first full market authorizations for methane-reducing feed additive Bovaer® for beef and dairy in Brazil and Chile.

Royal DSM, a global science-based company active in nutrition, health and sustainable living, has received full regulatory approval from the Brazilian and Chilean authorities to commercialize Bovaer®, its novel methane-reducing feed additive for ruminants. These first market authorizations, covering beef, dairy, sheep and goats, mark a significant milestone for DSM.

Intense collaboration among scientists and external partners across the globe has made Bovaer® a reality. That endeavor, known as Project Clean Cow, encompassed

over 10 years, 45 on-farm trials in 13 countries across 4 continents, and more than 48 peer-reviewed studies published in independent scientific journals. Following the first regulatory approvals, DSM can now start introducing its breakthrough innovation to the market.

The need to provide enough animal protein for a growing population, while reducing the environmental costs of farming requires smart science and innovative solutions. To address this challenge, DSM's Animal Nutrition and Health business last year



launched its strategic initiative We Make it Possible. Its mission is to lead a robust and achievable transformation worldwide in sustainable animal protein production, and to accelerate solutions that will foster a brighter future. Market introduction of Bovaer® is a major step in delivering on this strategic initiative.

## FAO: Aquaculture is key to meet increasing food demand

Aquaculture is playing a critical role in global food production, but innovation and equity are required to ensure inclusive and sustainable growth, said Qu Dongyu, the Director-General of the Food and Agriculture Organization of the United Nations (FAO).

On the opening day of the Global Conference on Aquaculture Millenium+20 in Shanghai, the Director-General highlighted aquaculture as the fastest growing agri-food sector globally saying there

is huge potential for further expansion in Asia, Africa, Latin America and the Caribbean.

“Aquaculture production will continue to grow,



but the benefits of this growth must be equitable and fairly distributed,” Qu Dongyu, stressed, while noting the need to further develop “the human, social, cultural and economic dimensions of aquaculture”.

The conference, which adopted the theme “Aquaculture for Food and Sustainable Development”, is the fourth to be held and is organized by FAO and



China's Ministry of Agriculture and Rural Affairs, together with the Network of Aquaculture Centres in Asia-Pacific (NACA).

Her Royal Highness Princess Maha Chakri Sirindhorn of the Kingdom of Thailand who is FAO Special Goodwill Ambassador for Zero Hunger for Asia and the Pacific, is the Guest of Honour at the

two-day event with representatives from the private and public sectors, academia and civil society.

The Shanghai Declaration, which was adopted at the conference, is a call to action that will shape the future of aquaculture and seek to optimize the sector's contribution to global agri-food systems in line with the UN's 2030 Agenda for Sustainable Development.

## EU authorisation of insect proteins “a major milestone”

The International Platform of Insects for Food and Feed (IPIFF), the umbrella association of the European insect sector, welcomed the recent authorisation of insect processed animal proteins (PAPs) in poultry and pig nutrition together with relevant agri-food stakeholders active at European level. In a webinar organised, IPIFF President Adriana Casillas labelled this achievement as ‘one of the major milestones of the IPIFF associa-

tion since its establishment’.

An overview of the regulatory background and implications of this authorisation was presented by Fabien Schneegans, who underlined that safety and science had been the main drivers of the reform. “This authorisation is fully aligned with recent opinions delivered by the European Food Safety Authority and entails stringent control measures at national level”, explained Schneegans.



**Adriana Casillas**  
IPIFF President

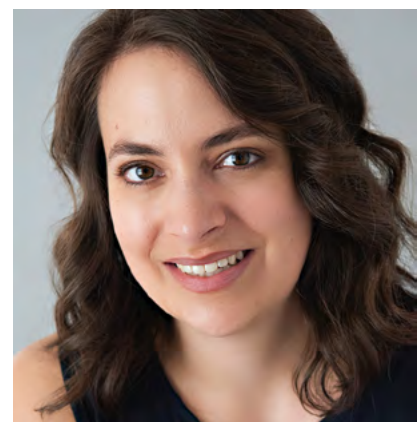
## Devan Paulus Compart joins Papillon as Technical Services Manager

Papillon Agricultural Company has hired Dr. Devan Paulus Compart as a Technical Services Manager. In this role, she will provide technical support for all Papillon products with a focus on prebiotic and probiotic technologies.

As Technical Services Manager, Paulus Compart will work on new product development and research projects to help Papillon advance dairy and beef nutrition and support producer profitability.

Paulus Compart has a decade of experience in the ruminant feed industry including most recently as Evonik's North America Ruminant Business Development Manager. In addition, Paulus Compart was the Ruminant Feed Additive R&D and Technical Service Lead for five years at Land O' Lakes.

Devan received her bachelor's degree in animal science from the University of California, Davis. Her master's and PhD are both in animal science from the University of Minnesota. She is



the co-founder and leader of Ag Women Grow, a program that supports career growth for women in the agriculture industry.

## Meatable and DSM to jointly develop cultivated meat

Meatable has entered into joint development agreement with Royal DSM to develop affordable growth media for cultivated meat.

**M**eatable, the cultivated meat startup, has entered into a joint development agreement with Dutch multinational Royal DSM, a global purpose-led, science-based company active in nutrition, health and sustainable living, to co-develop growth media for cultivated meat. Growth media is a nutrient-rich liquid which contains the essential nutrients such as carbohydrates, proteins, salts, vitamins, and growth factors that cells need to grow.

Growth media is currently estimated to account for 50-90% of the production cost of cultured meat. If pivotal technological and cost breakthroughs are achieved, cultured meat could be one solution that helps support diversified, sustainable, and healthy diets for a growing world population – and will have a trillion-dollar market potential.



In addition to focusing on the cost-effective production of growth media, DSM and Meatable will focus on the development of meat-like taste and texture of the final product, which are important factors influencing the purchase decision of consumers.

DSM Venturing, the venture capital arm of Royal DSM, was a participant in the consortium of funders of Meatable's recent raise of \$47 million in venture capital. Meatable aims to pro-

duce cultivated meat for which animal health and welfare are respected, fewer GHG emissions are released, and significantly less land and water are required. Cultivated meat replicates the natural process of fat and muscle growth, in proportions that emulate traditional cuts of meat. The end product will provide the full experience of eating actual meat, with the same texture, taste, and nutritional benefits, without harm to animals or the planet.

## NEOGEN acquires CAPInnoVet, Inc.

**N**EOGEN Corporation announced that it has acquired Atlanta-based CAPInnoVet, Inc., a companion animal health company that provides pet medications to the veterinary market.

CAPInnoVet was founded in 2014 as a key provider of differentiated companion animal health products, providing better access to high-quality and high-value pet medications.

NEOGEN's acquisition of CAPInnoVet will pro-

vide entry into the fast-growing \$12B+ retail parasiticide market. CAPInnoVet will integrate into NEOGEN's Animal Safety business segment, which includes veterinary instruments, pharmaceuticals, vaccines, and diagnostic products.

“The acquisition of CAPInnoVet provides NEOGEN a strategic pathway into the parasiticide market and naturally aligns within our Animal Safety business segment,” said Doug Jones, NEOGEN's

Chief Commercial Officer. “We are excited for the team at CAPInnoVet to join the NEOGEN family.”

“We are very excited to be joining the NEOGEN team. Becoming a part of NEOGEN will allow us to not only further advance our vision of providing high-quality pet medications at a significant value to pet owners but also join a company that has similar values,” said Rudy Hauser, CAPInnoVet co-founder and Chief Executive Officer. “I would like to thank the CAPInnoVet team for their commitment and dedication to making this company a success. We are extremely appreciative of their contributions; we



certainly would not have been this successful without them, and for that, we are deeply grateful.”

Terms of the agreement were not disclosed.

## Growing yeast from spruce trees!

A fruitful collaboration between industry and research has for the first time successfully achieved a large-scale production of yeast from local, sustainable resources in Norway.

**I**n Norway, an important milestone has been reached by the partners in the centre for research-based innovation, Foods of Norway: a successful industrial scale-up of 1,600 kg of yeast produced from sugars from Norwegian spruce trees. Production was a joint effort by Lallemand Animal Nutrition, Borregaard and the Norwegian University of Life Sciences (NMBU), all partners in Foods of Norway at NMBU.

Yeast made from Norwegian spruce trees is a high-quality feed ingredient that can replace imported protein.

Sugar from Norwegian spruce trees was produced by biorefinery company Borregaard, and this was used to grow the yeast at the Lallemand production site in Estonia. The processes could be scaled up thanks to the extensive work done by scientists at NMBU and Lallemand, coordinated by



Foods of Norway. The yeast will be used in large-scale feeding trials with pigs and Atlantic salmon, in collaboration with leading feed companies in Foods of Norway.

“We are entering an exciting phase where we will be evaluating yeast in diets for salmon in seawater and for piglets under farm conditions”, says Professor Margareth Øverland, the head of Foods of Norway.

“Our work in Foods of Norway follows the entire value chain from the tree biomass to the final meat and fish products. The larger-scale trials will provide important information on how these

novel feeds will affect the growth, health and product quality of the animals as well as the production cost and sustainability of using these ingredients”, she says.

Professor Svein Jarle Horn, who heads the Foods of Norway team responsible for yeast fermentation research at NMBU, says: “It is very exciting and unique that laboratory results can be directly applied and scaled up by the industry. The research and development performed in Foods of Norway has clearly shown how biotechnology can be used to develop novel sustainable feed ingredients”.

## Climate-neutral beef and dairy could reach store shelves by 2050

According to a newly-published white paper, "Pathway to Climate Neutrality for U.S. Beef and Dairy Cattle Production"; the cattle sectors can reach climate neutrality, also referred to as net zero warming, by 2050 by reducing methane emissions in the coming decades by 18-32 percent.

A newly-published white paper, "Pathway to Climate Neutrality for U.S. Beef and Dairy Cattle Production" by Dr. Sara E. Place, chief sustainability officer for Elanco Animal Health and Frank M. Mitloehner, professor and director of the CLEAR Center at University of California, Davis, reviews the latest science on the climate change impacts of U.S. cattle production, and arrives at concrete, actionable conclusions.

"With the strain of hunger on our growing population, nutrient-dense foods like beef and dairy are important to have on the literal and figurative table," said Dr. Place. "But because cattle are natural recyclers – consuming



plants that we either don't want to eat or can't eat – their place in the climate conversation is an important one."

Dr. Place detailed her findings during the Goals and Partnerships for a Sustainable Food System panel at 2021 Canadian Roundtable for Sustainable Beef Annual Meeting.

"Talking about measuring emis-

sions from an animal is different from, say, a tailpipe, whose measurement and control is straightforward," said Dr. Place. "With livestock, we're operating with a moving process that has daily variables. In that environment, measurement and benchmarking are key components to moving forward. We can see the path; we just have to get people to it," she added.

## Scoular unveils Encompass: new brand for its global fishmeal business

Scoular, one of the largest and most diverse fishmeal and fish oil marketing companies globally, launched a new brand for its growing fishmeal business: Encompass™.

"Scoular has long been a leading global fishmeal partner that connects suppliers and customers with a full spectrum of fishmeal products and services," said Steve Dahlblom, Scoular's Product Group Manager for Marine Meals. "The brand Encompass represents the customized solutions, consistent quality

and reliability that our global suppliers and customers trust Scoular to deliver without disruption."

Scoular offers a year-round supply of marine proteins from more than 40 countries worldwide, including access to a large supply of sustainable products. Scoular has been involved in fishmeal globally for decades. The company is the largest importer of fishmeal in the United States, has a significant presence in Mexico and plans for aggressive global growth.

Growth in the aquaculture and pet food industries has increased the demand for fishmeal, which delivers highly digestible protein and valuable omega-3s from a variety of species, qualities and countries. To help meet this demand, Omaha-based Scoular is accelerating the growth of its fishmeal business by:

- Investing with two partners in a \$12 million fishmeal processing facility in Warrenton, Oregon, utilizing local fish processing trimmings to serve pet food and aquaculture manufacturers. The facility, the first fishmeal production investment for Scoular in the United States, is expected to open in summer 2022.

- Launching a fishmeal facility in Myanmar in October 2021. It will provide high-quality, consistent and quick delivery to markets across Asia. The facility is a key part of Scoular's recent expansion



in the Asia-Pacific region, including an expanded regional headquarters in Singapore.

- Recently hiring Chad Gauger as General Manager for High Nutritional Value Proteins. Gauger has 26 years of experience, including serving as Cargill's Managing Director of Aquaculture Nutrition SE Asia and Global Risk Management Director for Animal Nutrition.

## Wisium extends Polish footprint through ADM's Premix acquisition

ADM has acquired part of premix manufacturer Mixscience Polska. This acquisition will be a step forward in Wisium's expansion in Poland and central Europe, the global brand for the premix and services business of ADM.

ADM, one of global leader in human and animal nutrition, announced the acquisition of part of BNA Nutrition Animale sp. z o.o. - Mixscience Polska, specifically its commercial team and premix client list in Poland.

This acquisition will be a step forward in Wisium's expansion in Poland and central Europe, the global brand for the premix and services business of ADM.

Over the last few years, Wisium has been driving a rapid international expansion, strengthening its position as a global premix and services player. Focusing on

innovation, quality and a high service level, Wisium is offering a wide range of tailor-made nutrition solutions to the market, taking into account the evolving market needs and challenges.

The Polish market is one of the biggest markets for animal feed production in Europe with a 22 million tons annual demand. The feed sector covers three main species: poultry, swine and ruminant and it has shown a significant increase in the last few years. The broiler meat production is a very dynamic market and is driving the overall growth in the sector, with significant export figures.



The high production standards and performances place Poland as a key player on the European market and it is showing a good potential for business development in central Europe for Wisium, positioned as a leader in Western Europe.

## GFI invests in plant-based pet food ingredients

GFI, Canadian plant-based food and ingredients company, announced the launch of plant-based pet food ingredients business unit through the acquisition of a pet food ingredients production facility.

**G**lobal Food and Ingredients Inc. announced the acquisition of a state-of-the-art plant-based pet food ingredients production facility in Bowden, Alberta, and the creation of GFI's new plant-based pet food ingredients business unit.

The Bowden facility produces unique blends of milled red lentils, green lentils, chickpeas, pinto beans, yellow peas and green peas to produce specific nutritional profiles for pet food manufacturers. These ingredients offer a nutritious input into both dog and cat food, providing manufacturers with a healthy, environmentally sustainable plant-based protein source that serves as an alternative to animal-based ingredients. These ingredients also deliver economic



benefits by reducing the overall production cost of pet food for GFI's customers. In addition, the Bowden facility is designed to extract valuable ingredients from the by-products at GFI's other facilities, greatly reducing waste through the extraction and segregation of by-products into pet food ingredients and other feed ingredients.

According to the American Pet Products Association (APPA), sales of pet food and treats in the

United States were USD 42 billion in 2020 and expected to reach USD 44.1 billion in 2021. The 2021-2022 APPA National Pet Owners Survey Statistics showed that 70% of American households own a pet, up from 58% in 1988, and that 69 million American households own dogs and 45.3 million own cats. Lentil, bean, pea and chickpea ingredients are a key component of many grain-free dog and cat food brands in North America.

## NEOGEN partners with Hendrix Genetics to improve genetic performance in Africa

NEOGEN and Hendrix Genetics will collaborate as part of Sustainable Access to Poultry Parent Stock in Africa (SAPPSA) program.

**N**EOGEN Corporation announced that they have partnered with Hendrix Genetics, a multi-species animal breeding, genetics, and technology company.

Through this partnership, NEOGEN will support the implementation of genomic selection into Hendrix's Sustainable Access to Poultry Parent Stock in Africa (SAPPSA) program. This addition will help

accelerate the company's existing recurrent test program by genotyping the elite animals across the breeding program, ensuring the SASSO breeds they cultivate are adapted to the local needs and environmental pressures of Sub-Saharan Africa, including heat, feed, various diseases, and different housing systems.

"We are pleased to join Hendrix Genetics in their

mission to help secure the supply of high-quality parent stock to African smallholder farmers," said Marylinn Munson, Vice President of Genomics at NEOGEN. "By helping to incorporate genotyping into Hendrix Genetics' excellent breeding program, we can ensure that the correct birds for the environment are chosen, and we are able to support the sustainable development of farming practices while helping educate on the best practices for nutrition, housing, and poultry biosecurity. The SAPPSA project positively impacts the lives of millions of people, and NEOGEN is thrilled to be a part of building a more sustainable future for us all."

The SAPPSA project was initiated to provide African farmers with sustainable genetic solutions in order to offer them a pathway out of poverty. In 2018,



the project received a multi-year grant from the Bill & Melinda Gates Foundation with the objective to secure access to poultry parent stock, improve dual-purpose breeds for African smallholder farmers, and grow African Poultry Multiplication Initiatives (APMI) across the continent.

## Leonardo DiCaprio invests in Mosa Meat and Aleph Farms

World-famous American actor and producer Leonardo DiCaprio has invested in Mosa Meat and Aleph Farms to advance development of sustainable cultivated beef.

**A**leph Farms and Mosa Meat, two companies leading the emerging field of cultivated meat, announced an investment from environmental activist and Academy Award winning actor, Leonardo DiCaprio. Both companies have demonstrated the ability to grow beef directly from animal cells, with the unveiling of the first cultivated hamburger by Mosa Meat in 2013 and the first cultivated steak and ribeye by Aleph Farms in 2018 and 2021 respectively.

With global meat consumption projected to grow 40-70% by 2050, cultivated meat offers a solution to greatly reduce the current negative impacts of industrial beef production. Additionally,

cultivated meat will enable diners to enjoy the qualities of the meat they love, eliminating the need for any major behavioral change. Analysts have projected the cultivated meat market could reach \$25 billion by 2030, as part of the broader protein transformation.

According to an independent Life Cycle Analysis study, cultivated beef production is projected to reduce climate impact by 92%, air pollution by 93%, use 95% less land and 78% less water when compared to industrial beef production. Cultivated beef production offers the opportunity to use the spare land for re-wilding habitats which would naturally reduce emissions or for producing more food for people.



Moreover, the automated process through which cultivated meat is produced, and the sterile environment of its manufacturing, will eliminate the use of antibiotics and greatly reduce the risk for pathogens, contaminants, and foodborne illnesses associated with concentrated and intensive animal farming.

## Paul Bestford appointed Chief Procurement Officer at Nutreco

As of October 1, Paul Bestford joined Nutreco as Chief Procurement Officer (CPO) to lead the company's procurement function. Paul joins the company from Burberry where he led the Global Procurement Function.

Paul has a track record of delivering competitive advantage in procurement through innovation, agility and cost across diverse

sectors. His career has included leadership roles at Novartis, British Airways, Ernst & Young, John Lewis Partnership and KPMG. In addition, his contribution to the profession has been recognized with a Fellowship of the Chartered Institute of Purchasing & Supply. The new role of CPO will allow Nutreco to fully use the scale of the business.



## Vilomix acquires majority stake in TEGASA premix company

Vilomix Holding A/S, a subsidiary of the Danish Agro group, acquired the majority stake in the Spanish premix company TEGASA.

As part of the development of the Vilomix Group's vitamin and mineral activities, Vilomix Holding A/S – a part of Danish Agro group – acquired the majority shareholding in TEGASA (Técnica Ganadera S.L.), a Spanish premix company, effective 2 September 2021.

TEGASA was founded in 1965, since then it has been owned by the founding family and some employees. TEGASA has a nationwide sales organisation on the Spanish market, producing vitamin and mineral mixes (premix) and supplementary feeds/vitamin supplements for pigs, cattle and poultry. TEGASA has a strong brand on the Spanish



market, and operates internationally as well.

Turnover in 2020 was approximately EUR 12 million, and the company has a workforce of about 30. The head office is in Barcelona and the factory is located in Valls, Tarragona. The factory is fully automated with its

own laboratory, and production processes are quality-certified according to FAMI-QS and following ISO 22000 quality standards. The guiding philosophy of TEGASA is strong technical support for customers along with strong product concepts developed both internally and externally.



## AB Vista, Avivagen sign 8-year supply deal

AB Vista and Avivagen Inc. entered into an agreement for the supply of OxC-beta™. With the eight-year deal, AB Vista will become exclusive distributor of OxCbeta™ for use with poultry, swine, ruminants and aquaculture in the United States, Brazil and Thailand.

Leading global animal nutrition technology company AB Vista and Avivagen Inc. announced they have entered into a transformative supply agreement that is expected to expand the adoption and use of OxC-beta™ in a number of high-value feed production markets worldwide. The landmark eight-year deal will see AB Vista become the exclusive distribution partner for OxC-beta™ for poultry, swine, ruminants (dairy and beef) and aqua-

culture uses in the United States, Brazil and Thailand.

AB Vista is a global animal nutrition technology company supplying feed additives, nutrition expertise and analytical services to animal feed and protein producers.

As a part of the agreement AB Vista and Avivagen will also collaborate on future development efforts, including advancing opportunities for OxC-beta™ use for aquaculture purposes (such



as shrimp production). Aquaculture represents a new category for OxC-beta™ use, following considerable success with poultry, swine and ruminants in markets worldwide.

## Vietnam delegation visits BIOMIN research facilities in Tulln

Leading animal nutrition company BIOMIN welcomed a ministerial delegation from Vietnam at the BIOMIN Research Center in Tulln, Lower Austria.

Together with Martin Eichinger, Minister for International Relations in the Government of Lower Austria, several executives of BIOMIN and DSM Austria welcomed a high-ranking delegation led by Vietnam's Minister of Agriculture and Rural development Minister Le Minh Hoan for bilateral business talks.

The delegation toured the BIOMIN Research Center laboratory facilities which are staffed by more than 100 scientists and researchers. Safety precautions and Covid-19 related measures including the Austrian '3G' rule (tested, vaccinated or recovered) were respected.

BIOMIN's presence in Vietnam stretches back to 1995, and today the company has two state-of-the-art feeding production sites, and operates an



agricultural aquaculture research center as well as a diagnostic laboratory for animal health.

BIOMIN, which was acquired by Royal DSM in 2020, employs more than one thousand people globally, including several hundred staff in Austria and about 80 people in Vietnam.

# USE OF ORGANIC ACID AS PRESERVATIVE IN FEED PRODUCTION





■ **The use of organic acids in managing microbial degradation and preserving feed quality**

Dr Edwin Chow, Ph.D.  
Adisseo

■ **Health and performance - GO FOR THE MAX**

Dr Elisabeth Holl  
Dr. Eckel Animal Nutrition GmbH & Co. KG

■ **Intestinal wellness through MCFAs and their derivatives**

Eunice Lee  
Pancosma

■ **The rise of natural microbial preservation**

Elena Fraccaroli & Patrice Gault  
Kemin Nutrisurance EMEA



## The use of organic acids in managing microbial degradation and preserving feed quality

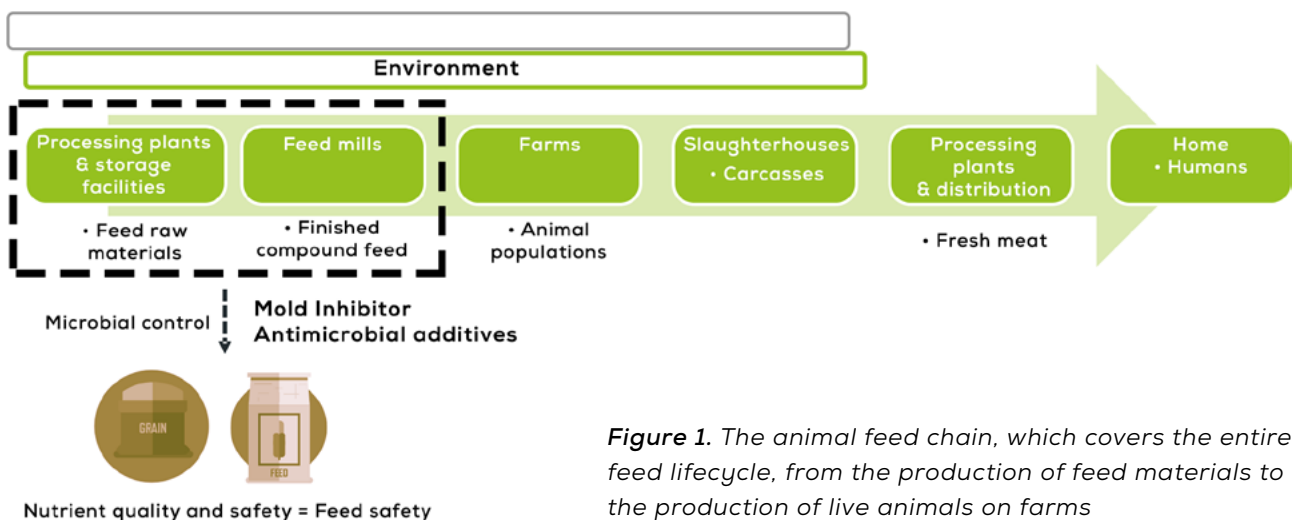
**Dr Edwin Chow, Ph.D.**  
*Global Scientific and Technical Manager, Feed Preservation  
 Adisseo*

“Organic acids are a crucial element of any livestock diet, as they not only help to preserve valuable nutrients and protect the diet from microbial degradation, but also ensure optimal animal health, performance and carcass quality.”

**M**icrobial degradation is a continual process that begins when feed ingredients are used, continues during production and storage, and only ends once the feed is consumed (see Figure 1). These key milestones in the life of the feed are where nutrient quality and safety can decline. Acting during these milestones ensures high-quality, safe feed.

Organic acids are a crucial element of any livestock diet, as they not only help to preserve valuable nutrients and protect the diet from microbial degradation, but also ensure optimal animal health,

performance and carcass quality. Organic acids are defined as organic compounds with acidic properties associated with their carboxyl group ‘-COOH’. It is crucial to understand the different chemical properties and actions of these compounds in order to choose the optimal solution for a specific challenge. Organic acids are capable of reducing pH in feed. It is well known that each group of microorganisms has an optimum pH range for growth. If the environmental pH is outside this range, their growth is disturbed. In addition, organic acids have the ability to cross the cell membranes of bacteria.



*Figure 1. The animal feed chain, which covers the entire feed lifecycle, from the production of feed materials to the production of live animals on farms*

Once inside the cell, they will dissociate and disturb metabolism. As a result, proliferation of the pathogenic microorganisms is reduced, resulting in lower pathogen counts in the intestinal tract. Thanks to these two modes of action of organic acids, growth of pathogenic bacteria in the feed can be reduced, therefore diminishing digestive disturbances in the intestinal tract.

### **MOLD-NIL® - A COMBINED SOLUTION FOR MICROBIAL CONTAMINATION AND MILL EFFICIENCY CHALLENGES**

Organic acids are a key research field as they offer important antimicrobial properties. Combined with feed mill techniques, they already play an essential role in feed preservation. Weak organic acids are safe to handle (especially when they are buffered), compared to inorganic acids. In addition to their power to preserve feed, it has been shown that organic acid blends can support feed mill efficiency. As such, there are many sources and forms of organic acid blend solutions available on the market, and they are becoming more of a specialty business. Consequently, Adisseo has invested and innovated significantly in its organic acid blend product line, Mold-Nil®. It is Adisseo's #1 priority to guarantee safe and effective feed additives, and to provide valuable solutions to the global feed industry.

Mold-Nil® is a diverse portfolio of organic acid blend systems for grain and complete feed in both dry and liquid forms. Depending on the Mold-Nil® product, it contains synergistic mixes of propionic acid and other organic acids and their salts. The liquid portfolio even includes an emulsifier to ensure optimal homogeneity in the grain or feed matrix. These combinations produce a safe and stable solution that is more efficient than single-component organic acids.

### **I. MOLD-NIL® - A SOLUTION FOR RAW MATERIAL AND FEED**



Over the years, Adisseo has conducted numerous trials to show that Mold-Nil® Liquid not only inhibits growth of microorganisms in feedstuffs, but it also reduces them during storage. Furthermore, Mold-Nil® Liquid has been evaluated as a low-corrosive product, making it safe to use and compatible with feed mill equipment and facilities. Recently, a trial in an Indonesian feed mill was conducted with freshly harvested corn to test the adequate preservation effect of Mold-Nil® Liquid on grain storage and its corrosivity to silo material and equipment.

#### **• Corrosion results**

Mold-Nil® Liquid is essentially less corrosive, with a pH value of ~6.0. This is achieved through buffering and the inclusion of an emulsifier. Via a simple



Table 1. Preservative effect of Mold-Nil® Liquid on corn

Source	Untreated (Control)	Mold-Nil® Liquid (1kg/T)
<b>Week 0</b>		
Average Moisture	14.2	14.0
Average Mold Counts (cfu/g)	3.5x10 <sup>3</sup>	3.5x10 <sup>3</sup>
Crude Protein (%)	8.98	8.98
<b>Week 4</b>		
Average Moisture	13.97	13.80
Average Mold Counts (cfu/g)	3.7x10 <sup>4</sup>	2.6x10 <sup>3</sup>
Crude Protein (%)	8.57	8.81
		

corrosion test, it can be easily shown that Mold-Nil® Liquid is less corrosive, especially compared to unbuffered liquid mold inhibitors (Product A). Comparing the corrosion of stainless steel at 65 °C by measuring weight loss, Product A induced much higher weight loss (~5.4%) than Mold-Nil® Liquid (~2.9%).

### • Corn preservation results

Mold growth concerns in corn have been mainly attributed to the potential formation of mycotoxins and their negative effects on animal performance. Often overlooked is the potential negative impact of storage on the nutritive value of corn, i.e., crude protein content. After one month, Mold-Nil® Liquid, versus a negative control, prevented the loss of ~1.9% crude protein and was able to further control the contamination of mold and mycotoxins during storage. In contrast, the untreated control with 14% initial moisture content was moldy after a short period of time. As shown in Table 1, corn without a Mold-Nil® Liquid treatment lost 4.2% crude protein due to fungal growth, which is of economic significance due to reduced processing and nutritional quality of the corn.

## II. MOLD-NIL® - A SOLUTION FOR FEED MILL EFFICIENCY

Mold-Nil® Liquid has been adopted in the feed industry due to its beneficial effect as a mold inhibitor.

More recently, an improved Mold-Nil® Liquid has shown to reduce the moisture variability in feed raw materials as well as during processing, which offers benefits to feed manufacturers looking to produce safe and economically viable feed. With the improved Mold-Nil® Liquid at 1.0kg/T, the feed mill energy usage was decreased by 4.3% and the tons/hour was increased by an average of 7.3%. The pellet durability index and starch gelatinization were increased along with an improved feed moisture retention of 0.6%.

### SOLUTION APPLICATION AND SERVICES

At Adisseo, we strongly stand by our liquid programs and are dedicated to ensuring optimal use of our liquid solutions along with proper product application and dosing, which we know is crucial. We offer a total solution, and are committed to providing customized equipment, product application advice and laboratory services from microbiology-related tests to physical and chemical tests, to lab scale simulation trials and many other services. This is part of our strategic approach that differentiates us among competitors. Our objective is “to offer our customers convenience”.

#### About Dr Edwin Chow, Ph.D.

*Specializes in Feed Quality and Safety for product ranges antioxidants, antimicrobials, mold inhibitors, surfactants and emulsions and pellet binders.*

*Dr Edwin received his undergraduate and Ph.D. in Chemistry at the National University of Singapore (NUS). Dr Edwin currently holds the adjunct professor in the department of food science and technology, NUS. Dr Edwin has won numerous honors and awards and has authored over many articles, presented over invited lectures and international conferences as well as over 10 patents issued, pending or licensed.*



Easy,  
flexible,  
effective:  
**discover  
our liquid  
solutions**

# Adisseo gives you the right blocks to preserve your feed!

**Absolute convenience: that's what we aim for with our feed preservation program.**

It features a whole range of powder and liquid solutions, that are flexible, easy to use and very effective. That way, Adisseo makes sure your feed stays the way it should be: palatable, nutritious and full of great additives. Your chicken will love it!

**Discover our powder and liquid solutions:  
visit [adisseo.com](http://adisseo.com)**



**ADISSEO**  
A Bluestar Company



## HEALTH AND PERFORMANCE - GO FOR THE MAX

**Dr Elisabeth Holl**

*Senior Technical Sales Manager*

*Dr. Eckel Animal Nutrition GmbH & Co. KG, Germany*

“Butyric acid is the essential »magic stuff« for high-performance healthy broilers. PreAcid 75G uniquely combines supplemented butyrate with a sustained release pattern in the small intestine and the GlucoFence complex that stimulates endogenous butyrate production in the large intestine...”

Establishing and maintaining a healthy gut is crucial for improving welfare and reducing antibiotic use in poultry production. Numerous studies describe the positive effects of butyric acid in particular. However, there is always the question as to the form in which the butyrate should be supplemented. So what exactly is going on in the gut?

Free butyric acid is metabolised at the beginning of the intestinal tract in the acidic environment of the gizzard and proventricle. The result is a higher concentration of butyric acid in the crop and gizzard, leading to higher proteolytic activity. However, in the distal part of the gut, butyric acid will strengthen the epithelial barrier, reduce inflammation and limit the invasion of pathogens like *E. coli* and *Salmonella*. To utilise the full beneficial potential of butyric acid, it therefore has to reach colon and caecum as well as the small intestine. This is why supplemented butyrate is often used in a protected form.

### ENTER THE PREBIOTICS

Very promising approaches are methods to stimulate the endogenous production of butyrate in the

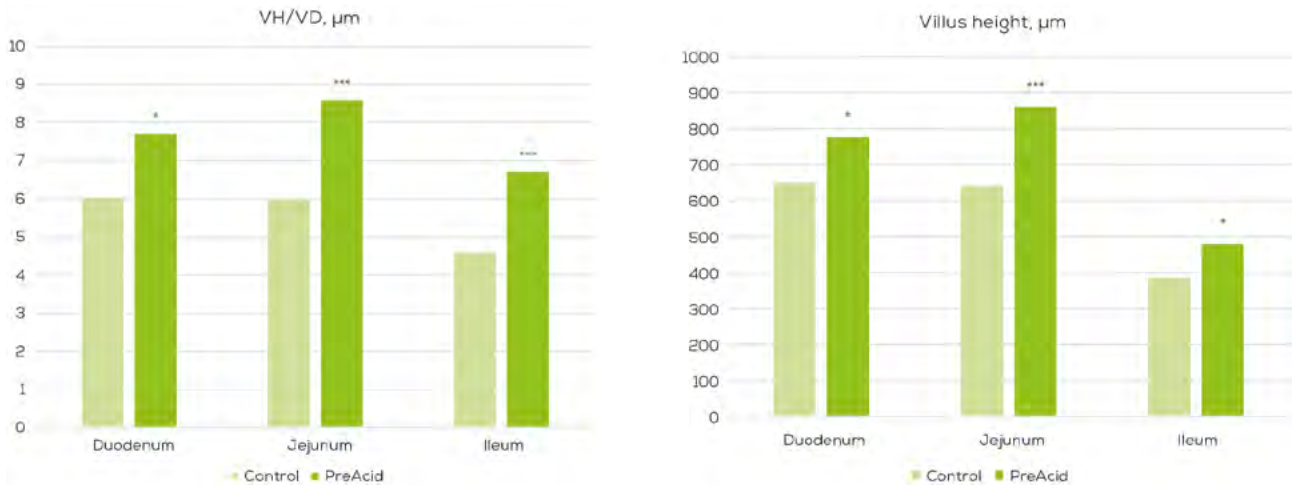
lower part of the intestine. The strategy is to make substrates—known as prebiotics—available to specific micro-organisms, generating conversion products essential for the growth of the digestive system.

Prebiotics are generally carbohydrates like fructo-oligosaccharides. They provide a useful energy source for beneficial bacteria. A different approach is the use of gluconic acid which is structurally related to sorbitol, a slowly fermentable sugar. It is not, or hardly, absorbed in the small intestine of monogastric animals and thus serves as an energy source for the valuable lactobacilli and bifidobacteria in the hindgut. Due to the microbial fermentation of gluconic acid, lactate and acetate are formed as by-products. These are then converted to butyric acid by acid-utilising bacteria in the large intestine and the caecum.

### PREACID 75G: COMBINATION FOR MAXIMUM EFFECT

By combining the prebiotic gluconic acid with matrix protected butyrate, the new formula of PreAcid 75G takes a two-pronged strategy to improve gut health in broilers. The GlucoFence Com-





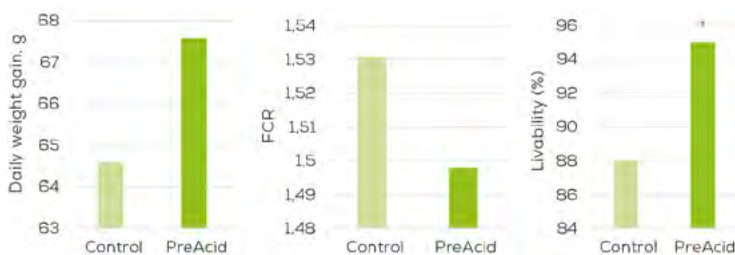
**Fig. 1:** Villus height and villus height to crypt depth ratio (VH/VD) in the intestine of 42-day-old broilers challenged with *E. coli* and *S. enteritidis* (\*  $p < 0.05$ , \*\*\*  $p < 0.001$ )

plex was specifically developed to provide butyrate with a sustained release in the small intestine and at the same time stimulate the endogenous production of butyric acid in the hindgut. This has practical and economic benefits for the broiler producer and the animal as shown in a scientific broiler trial. The supplementation of PreAcid 75G in broilers (Cobb) challenged with *E. coli* and *S. enteritidis* resulted in significantly increased villus height and improved villus height to crypt depth ratio, showing the benefits of delivering the maximum amount of butyric acid in the gut (Fig. 1). Compare this with AGPs and their detrimental effect on the intestinal villi structure. PreAcid's GlucoFence complex is the ideal combination for maximum effect.

A healthy gut with an improved epithelial structure will aid in digestion and adsorption explaining the higher final weight, better feed conversion ratio and improved livability of the challenged broilers (Fig. 2).

**IT'S ALL IN THE BLEND**

Butyric acid is the essential »magic stuff« for high-performance healthy broilers. PreAcid 75G uniquely combines supplemented butyrate with a sustained release pattern in the small intestine and the GlucoFence complex that stimulates endogenous butyrate production in the large intestine. Thus, it maximises the available butyric acid in the intestinal tract. This means best results in broiler gut health and productivity.



**Fig. 2:** Effect of the supplementation of PreAcid on performance parameters of 42-day-old broilers challenged with *E. coli* and *S. Enteritidis* (\*  $p < 0.05$ )

**About Dr Elisabeth Holl**

Elisabeth Holl is a trained agronomist and holds a doctorate in agricultural engineering. She has been with Dr. Eckel for more than 20 years and knows the company inside out. Thanks to her great competence and broad knowledge, Dr. Holl is the contact person for a number of our products and always an invaluable support for customers, clients and partners.



## INTESTINAL WELLNESS THROUGH MCFAs AND THEIR DERIVATIVES

**Eunice Lee**

*Product Manager – Organic Acids  
Pancosma*

“Enhancing animal performance while using fewer antibiotics on farm requires a comprehensive strategy, from biosecurity to feed hygiene. Animal gut wellness is crucial for growth, building up resilience to disease and focusing energy on better development. MCFAs and their derivatives play a key role in the AGP alternative solution.”

### **A** RECOGNIZED AGP ALTERNATIVE

Antibiotic growth promoters, or AGPs, have driven high productivity and efficiency in modern livestock production by successfully targeting a certain spectrum of bacteria (Niewold, 2007; Jackman et al, 2020). However, high dependency on AGPs generates major disease control risks for both livestock and human health. Since the 2006 European Union AGP ban, withdrawing AGP from routine production and finding alternatives has become a worldwide target for sustainable industry development. AGP withdrawal significantly increases the incidence of certain diseases, dramatically influencing animal growth performance and efficiency. Today, researching optimal alternatives is an industry priority.

Many different feed additives such as probiotics, prebiotics, plant extracts, yeasts, and organic acids have been studied as part of the feed additive alternative program. Within organic acids, medium chain fatty acids (MCFAs) and their derivatives are known for their strong antimicrobial properties, especially against gram positive bacteria (Baltic et al

2017). MCFAs are saturated carboxylic acids, from C6 to C12, and are found in coconut oil and palm kernel oil in the form of triglycerides. Since many products containing MCFAs and their derivatives are available on the market, extensive studies have been carried out to assess the real benefits to animals. Lan and Kim 2018 showed that sow excreta microbiota could be improved—thus improving piglet performance—by adding a blend of organic acids and MCFAs to a sow’s diet. Similarly, Nguyen et al 2018 demonstrated that supplementation with these blends has positive effects on the faecal microbiota composition, immune response and growth performance of broilers.

### **ANTIMICROBIAL EFFECT: FATTY ACID VS MONOGLYCERIDE**

The antimicrobial activity of MCFAs has been studied extensively since it was first discovered in human mother milk (Isaacs et al, 1986). Although the components in mother milk are not naturally antimicrobial, once the triglycerides in milk are digested in the gastrointestinal tract they free fatty acids and monoglycerides generating antimicrobi-

al activity (Isaacs, 2005). MCFAs have been widely studied in the form of free fatty acids and monoglycerides to determine their antibacterial activities in vitro. Lauric acid (LA) is considered a potent MCFA with multiple antimicrobial (including antibacterial, antifungal and antiviral) activities (Desbois and Smith, 2009).

The most commonly-known antimicrobial mode of action of MCFAs and their derivatives is disrupting the bacterial cell membrane, thus inhibiting bacterial growth (Nagase et al., 2017). The glycerol backbone in monoglyceride lauric acid (GML) appears to grant stronger hydrophilic properties than its fatty acid form which shows a lower minimum inhibition concentration (MIC) against some gram positive bacteria in vitro, such as *Streptococcus* (Batovska et al 2009). However, this is not the case for every gram positive bacteria. This same study shows that LA and GML have an equal inhibition concentration of *C. diptheriae*, while LA has a stronger inhibitory activity against *L. monocytogenes* (both *C. diptheriae* and *L. monocytogenes* are gram positive bacteria that cause disease in humans). The study of Ruzin and Novick (2000) found that GML and LA have identical inhibitory activity against *Staphylococcus aureus*. Lauric acid is thought to be par-

tially responsible for the inhibitory activity of GML against *S. aureus*. They also found that similar concentrations of LA and GML suppress the induction of  $\beta$ -lactamase activity and block the expression of toxic shock syndrome toxin 1 (TSST-1) from *S. aureus*. Furthermore, LA and GML appear to produce a synergistic effect against *Streptococcus pyogenes* at different mixture ratios: the combination exhibits stronger inhibitory activities than either single ingredient (LA:GML=2:1, MIC: 20 $\mu$ g/ml; LA, MIC: 120 $\mu$ g/ml; GML, MIC: 30 $\mu$ g/ml) (Batovska et al., 2009). Both LA and GML demonstrate anti-viral properties against different enveloped viruses (Thormar et al., 1987; Hornung et al., 1994; Bartolotta et al., 2000; Li et al., 2009).

#### MITIGATING PATHOGENS IN FEED

Based on in vitro antimicrobial findings, we can use organic acids as feed preservatives, and also as the first barrier for pathogen infection via the oral route.

Feed biosecurity awareness has grown steadily in recent years. Studies show that while animal by-product feed materials represent a major viral transmission risk, so do plant-based feed materials, especially soy-based ingredients (Dee et al., 2017). Today's livestock industry depends heavily on global trading in





raw materials, increasing the chances for viral transmission from continent to continent. Since the 2013 outbreak of porcine epidemic diarrhea virus (PEDv) in the US, further investigations have shown that contaminated feed and feed ingredients are potential sources of epidemic s (Dee et al., 2017).

A collaborative study led by Dr. Scott Dee from Pipestone Applied Research, Dr. Megan C. Niederwerder at Kansas State University, Dr. Aaron Singrey and Dr. Eric Nelson at South Dakota State University—and with the participation of Pancosma / ADM—shows that MCFAs are potential agents for mitigating transmission of porcine reproductive and respiratory syndrome virus (PRRSv), PEDv and Senecavirus A (SVA) to piglets from contaminated feed. MCFAs also helped challenged piglets significantly improve their average daily gain (Dee et al., 2020).

### GUT MORPHOLOGY AND IMMUNE MODULATION

MCFAs and their derivatives not only modulate gut microflora by reducing unwanted pathogenic bacteria, also demonstrate an influence on gut morphology (Liu, 2015). Dierick et al (2004) shows that MCFA supplementation to young piglets resulted in longer villi in the small intestine with a lower crypt depth.

MCFAs also demonstrate a role in immune modulation (Kortekass, 2013), especially during inflammation (Liu, 2015). The study of Kono et al

(2004) shows that adding MCFA triglycerides to rat feed helps protect their intestine by increasing IgA secretion and modulating the inflammatory immune response when challenged with endotoxin, LPS. Lee and Kang (2017) also found that MCFA supplementation to miniature pigs challenged with cyclophosphamide helped reduce intestinal inflammation and oxidative stress while strengthening the gut barrier function.

### THE HIDDEN COST

Pathogenic challenge in animals generates high costs in terms of protein and energy. It has been roughly quantified that the lysine cost of the innate and acquired immune response was equal to a loss of 0.031 g average daily gain per kg bodyweight (Sandberg et al., 2007). Subclinical infection, if underestimated and neglected, can impact animals' overall growth performance. Research shows that performance drops when AGPs are removed from their diet (WHO, 2003), because the incidence of disease is likely to increase, and animals require more protein and energy to deal with pathogens.

Enhancing animal performance while using fewer antibiotics on farm requires a comprehensive strategy, from biosecurity to feed hygiene. Animal gut wellness is crucial for growth, building up resilience to disease and focusing energy on better development. MCFAs and their derivatives play a key role in the AGP alternative solution. They function not only as what used to be known as an antimicrobial ingredient, but have other potential properties that promote animal wellness such as improving gut morphology, enhancing immune response and mitigating pathogens in feed.

#### **About Eunice Lee**

*Eunice Lee did get her animal science Master's degree at Wageningen University (NL) with a specialization in animal nutrition.*

*She has been working in the feed additive industry for 8 years as an expert in animal nutrition and brings currently her knowledges to Organic Acids range within Pancosma global leader in feed additives.*



# Life science to improve animal health and performance



At Phileo, we believe in microorganisms and fermentation technologies to make a difference for a more sustainable future. By mastering microbiota and immunity, we offer our partners beneficial probiotics and functional ingredients to improve animal health and performance through nutrition.

**Act with nature for animal care.**



**Phileo**  
by Lesaffre



**Elena Fraccaroli**  
*Technical Service Manager*  
*Kemin Nutrisurance EMEA*



**Patrice Gault**  
*Technical Service Manager & Sales Manager*  
*Kemin Nutrisurance EMEA*

## THE RISE OF NATURAL MICROBIAL PRESERVATION

“In the context of widespread premiumization and humanization trends of pet food market, natural alternatives for preservation are increasingly common. Natural solutions allow preservation of the nutritional and sensory qualities, while keeping the food intact and safe throughout its shelf-life.”

The natural pet food trend is constantly expanding all over the world. Nowadays the Super Premium market segment is closely linked to natural claims. Natural microbial preservation is therefore a key element to meet the quality expectations of attentive pet parents and to guarantee food stability, so to protect our pets' health.

### WHY PRESERVATION IS SO IMPORTANT?

The term preservative is often associated with something artificial or even detrimental, but this is often misunderstood. Microbial preservatives are in fact substances, mainly organic acids, added to prevent food spoilage due to microorganism (mold, yeast, bacteria) proliferation. So, not only are they useful, but there are also many options for completely natural and efficient pet food preservation.

They are essential to ensure that a high quality food reaches a healthy, furry friend's bowl safely and to meet pet parents' expectations.

In the context of widespread premiumization and humanization trends of pet food market, natural alternatives for preservation are increasingly common. This is particularly noticeable in treats and snacks, as the humanization trend is particularly advanced. Due to their features, these kinds of products must have irreproachable quality, which is why the attention to stability must be always high. Natural solutions allow preservation of the nutritional and sensory qualities, while keeping the food intact and safe throughout its shelf-life.

Also in the case of complete or complementary

dry pet food, preservatives can play a role not only in safety, but also in improving palatability. By drying the petfood less (reducing the energy costs), the moisture level increases and this improves the palatability, especially in dog food. But from a certain level of residual moisture, the risk of microbiological degradation increases, which can be mitigated by addition of microbial control ingredients.

Not surprisingly, even the raw materials used in pet food require adequate stabilization, in order to maintain their quality and nutrition through to the finished product. For this, there are natural and differentiated solutions for each stage of the supply chain. Certain raw materials (like some fat/oils) are also used directly on the pet food product's surface and they don't have a controlled heat treatment able to control pathogens before final end product packaging.

#### MARKET OPPORTUNITY FOR NATURAL PRESERVATION

As the industry leader in providing antioxidant solutions, Kemin also has effective microbial control options to support pet food companies and their ingredient suppliers (Crude raw materials, fresh meat, slurries, palatants, processed animal proteins, fats and oils...) who are increasingly facing food safety challenges to maintain the quality, nutrition, and palatability of pet food.

Kemin has a broad portfolio of formulated dry

and liquid natural safety solutions, with PrevION™ and RENTERRA™ brands, a wide range of specific products available for each different stages of the supply chain.

#### CHOOSING A NATURAL PRESERVATIVE SUPPLIER

As the pet food market continues to focus on trends such as humanization, which can be very challenging from a food safety perspective, it's important to build a comprehensive shelf-life stabilization program using stable, high quality ingredients and approaching the finished product with specific preservation protocols.

Pet food formulations are introducing novel ingredients and technologies, especially regarding treats and snacks. This makes it necessary to carefully investigate the state of conservation of products in collaboration with the preservative supplier, to identify the best strategy in terms of preservative choice and application points.

Kemin provides natural preservative solutions that help ensure microbial and quality protection throughout the entire pet food shelf-life, starting from the very beginning of the supply chain. Kemin's wide range of tailored customer support includes product technical support, product application and customer laboratory services to ensure effective natural microbial preservation program implementation.

##### **About Elena Fraccaroli**

*Elena Fraccaroli is graduated in Veterinary Medicine at the University of Padua (Italy). After working for a few years as an anesthetist in a veterinary clinic, she entered the world of pet food production in the technical team of an Italian manufacturing company. Now she works for Kemin Nutrisurance Europe as Technical Service Manager, dealing with a wide range of Kemin's product specifically dedicated to pet food, such as palatants, functional ingredients, and preservative options. She provides solutions for the best palatability and safety of finished products, developing customized protocols to test the available choices. Elena also provides Kemin's customers with trainings on palatant, food preservation and functional ingredients.*

##### **About Patrice Gault**

*Dr Patrice Gault obtained his PhD in Food Science from the National Institute for Agronomic Research (France); during more than 20 years, he worked as Product Development Manager in several petfood industry leaders in Europe, gaining extensive experience in ingredients, formulation, nutrition, palatability and food safety. He joined Kemin Nutrisurance EMEA 6 years ago and works as Account & Technical Manager.*



**Alessandra Monteiro**  
R&D, Animine



**Jennifer Maurin**  
Marketing, Animine

## IS THERE ANY SAFE COPPER SOURCE AVAILABLE FOR PIGS' GROWTH PROMOTION?

"The supplementation of antibacterial copper source (monovalent copper) with lowered hepatic accumulation is less inducing toxicity risks for animals and in the end will protect performance and genetic potentials. Benefiting from the positive effect of copper while maintaining risk of toxicity very low opens new frontiers for the industry from growing to finishing phases."

Copper (Cu) at high dietary levels has been used for a long time as a growth promoter. Several hypotheses on the mode of action have been proposed (pre or post absorption effect), this article will review them. A particular attention will be raised on liver accumulation that does not seem to be connected to performance. Finally, although sulfates form is the most commonly used, different forms exist and can bring improvement to the practice of the use of sulfates targeting precision feeding.

### THE PRE-ABSORPTION MECHANISM OF COPPER

The antimicrobial effect has been recognized since Ancient Egypt, where Cu was used to sterilize chest wounds and drinking water. In the pig, this anti-

microbial effect would occur once dietary Cu passes through the stomach, dissociated into Cu ion, and reaches the intestine in its ionic form.

Results from several scientific studies (including a recent study from Wageningen University) suggest that prior to absorption, high levels of Cu reduce bacterial populations, resulting in a positive modulation of the intestinal microbiota. This regulation affects the intestinal health and reduces the incidence of diarrhea in piglets. Besides this, the modulation of microbiota has an effect on the dietary utilization and metabolism of energy and protein, which may render available more energy and nutrients for the animal (reducing nutrients competition between microflora and host).



In the small intestine, for example, bacteria can produce the bile salt hydrolase (BSH) enzyme, which is involved in bile acids deconjugation. A reduction of this bacterial enzymatic activity has been reported as effective to enhance feed efficiency and body weight gain in monogastric animals in favor of the host. As Cu is one of the main BSH inhibitors, the modulation of this microbial activity is a good illustration of one of the mechanisms by which Cu improves growth performance in piglets.

### LIMIT OF THE HYPOTHESIS OF POST ABSORPTION EFFECT OF COPPER

Once Cu is in the intestine, the Cu(II) form must be reduced at enterocytes membrane level to the Cu(I) form, so it can be absorbed. Then, it is bound to chaperone proteins and/or metallothionein (MT) to avoid cellular toxicity. Cu is then exported via the portal venous system to the liver, which is the central regulatory organ of copper homeostasis. On its entry to the hepatocyte, Cu is again rapidly taken up by cytosolic ligands (MT and glutathione). The main role of MT is the sequestration of any intracellular excess of Cu in response to supra-physiological Cu exposure, which can be potentially toxic. Cu excess is then removed from the liver through biliary excretion.

As around 80% of the absorbed Cu is excreted in the bile, a post absorption antimicrobial activity of Cu has been raised by some authors. Nevertheless,

Cu in the bile is in the form of nonabsorbable-stable copper chelates not displaying antibacterial effects.

Also, biliary Cu recycling can be considered negligible in quantity and being mostly excreted in feces. The Cu excreted by the bile (considering the Cu concentration and the bile flow during 28 days) represents less than 0.1% of total Cu intake, biliary Cu excretion cannot exert any relevant antimicrobial impact on microbiota.

### LIVER COPPER ACCUMULATION DOES NOT PREDICT PERFORMANCE

The storage of Cu in the liver is a consequence of Cu intake and not the cause of its growth promoter effect. The long-term feeding of high Cu levels leads to an excess of Cu in the organism, which can cause cellular damage through the formation of free radicals and can induce oxidative and inflammatory processes.

A recent study conducted in Thailand (at the BARC research station) has shown that piglets fed 150ppm of Cu (from monovalent copper) had a liver content accumulation divided by 10 times compared to a group fed 250ppm of Cu sulfates. Nevertheless, performance parameters of both groups (FI, FCR, ADG...) were strictly similar, demonstrating that liver Cu accumulation is not a relevant biomarker to predict potential growth performance improvements (see figure 1).

Figure 1

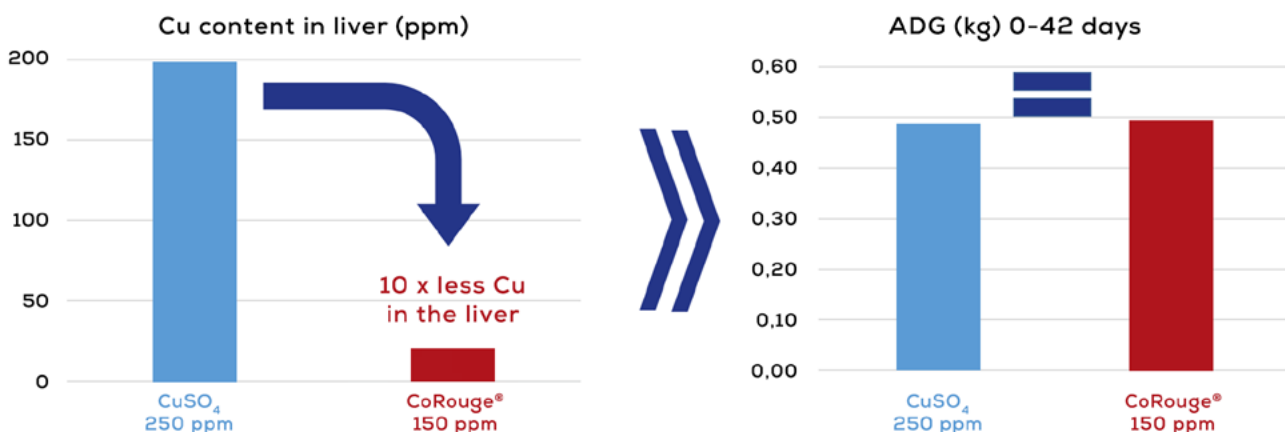
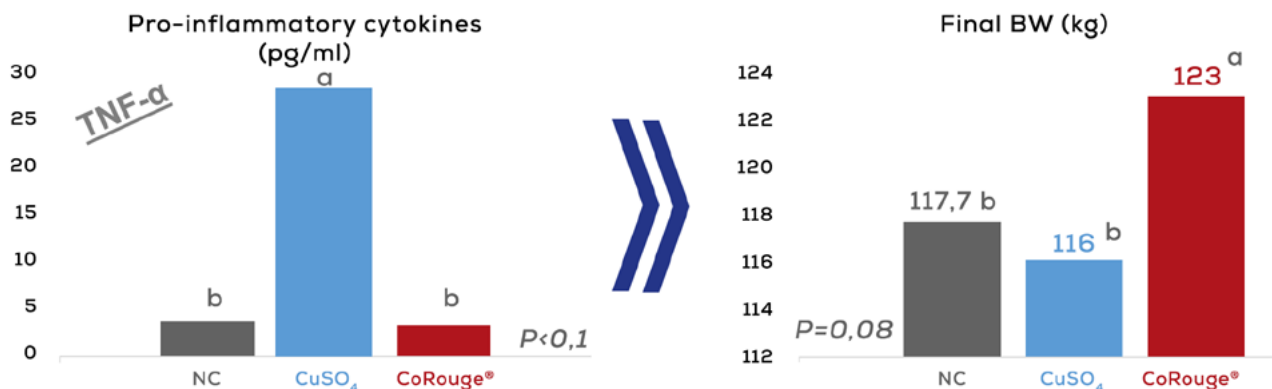


Figure 2



### LIVER CU ACCUMULATION AND ITS NEGATIVE SIDE EFFECTS ON FATTENERS

The chronic accumulation of Cu in liver negatively interfere with the organ functions and initiate oxidative damage. Oxidation pathways are the first steps to inflammation causing lesions and consuming energy from the host, at the expense of performance.

The University of Illinois in collaboration with Animine French company studied the impact of Cu toxicity on long term performance. Feeding 250ppm of sulfates (vs. 250ppm of monovalent copper) all along the feeding phases led to the generation of hepatic oxidative stress markers such as malondialdehyde (MDA) and to the secretion of anti-inflammatory cytokines (TNF $\alpha$  and IL- $\beta$ , see figure 2) in blood at 63 days of age. As a result the supranutritional dose of sulfates negatively impacted performance at the end of the trial compared to

the monovalent form that less accumulated in liver.

### CONCLUSION

According to recent studies, the strongest hypothesis of Cu effects on performance is due to a pre-absorption mechanisms with positive impacts on microbiota modulation resulting in the improvement of gut health. The copper accumulation in the liver is a normal consequence of exposure to high Cu levels that cannot predict performance.

The supplementation of antibacterial copper source (monovalent copper) with lowered hepatic accumulation is less inducing toxicity risks for animals and in the end will protect performance and genetic potentials. Benefiting from the positive effect of copper while maintaining risk of toxicity very low opens new frontiers for the industry from growing to finishing phases.



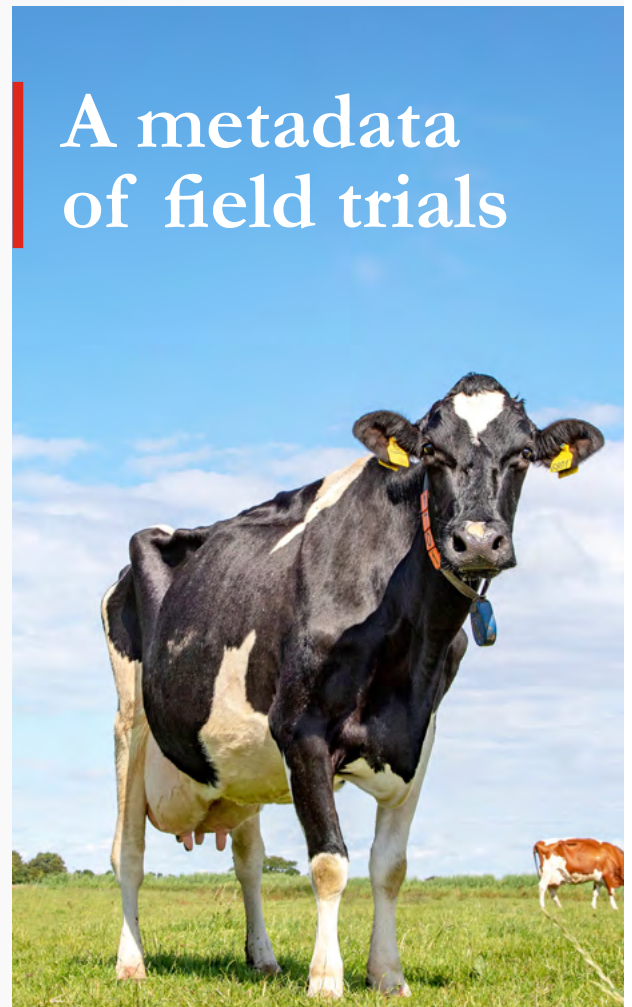
# Let the cows speak to you

Here you find the convincing results from different beta trials testing KESSENT® M or KESSENT MF during 2020 in different European farms.

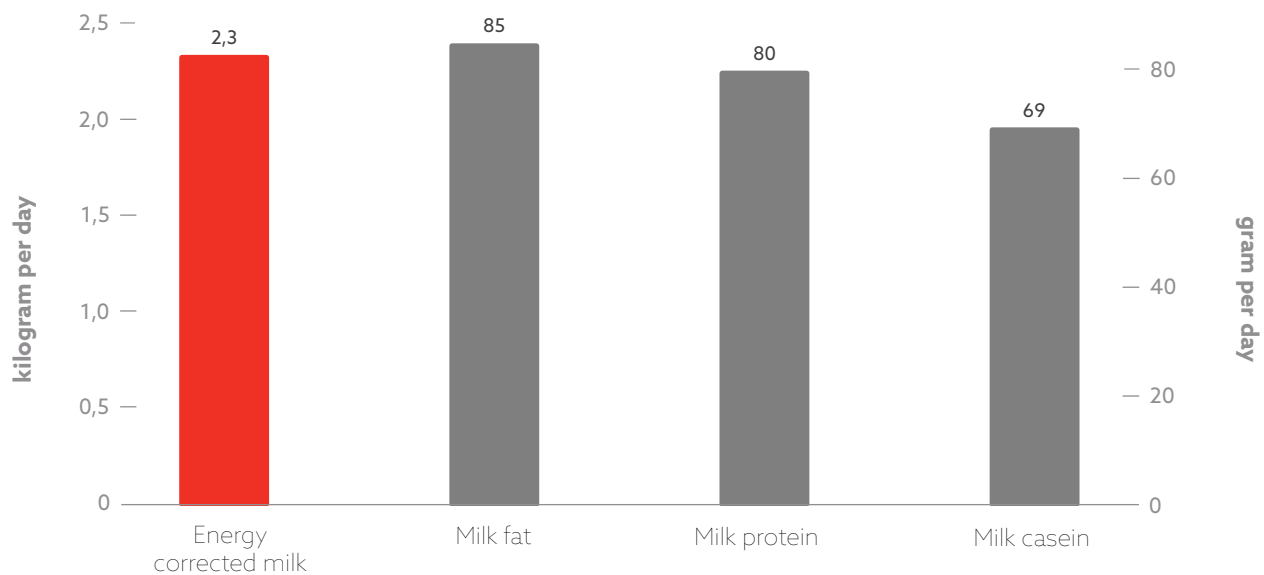
The objective of the field trials was to measure the field response of our rumen protected Methionine, with milk production, feed intake, fat milk yield and milk protein yield as productive parameters.

We compared a diet balanced for Methionine by using one of the products from KESSENT range with the same diet but without any rumen protected Methionine. The Lysine needs were covered in both treatments (with and without KESSENT).

The results are expressed as the improvement per cow and day when balancing for Methionine with KESSENT as followed: kg in case of energy corrected milk, or g in the case of milk protein, fat, and casein.



## A metadata of field trials



- Data obtained from > 7,000 lactating dairy cows and 19 dairy farms in all EMENA region
- Methionine requirements (PDI 2018/CNCP v6.55) covered with KESSENT products

For more information, scan the QR code or visit the website:  
[info.kemin.com/amino-acid-balancing-for-sustainable-efficient-farming](https://info.kemin.com/amino-acid-balancing-for-sustainable-efficient-farming)





## THE FIBER REVOLUTION

### WHAT'S THE DEAL WITH FIBER?

**Diego Navarro, PhD**  
*Swine Nutritionist*  
*Hamlet Protein*

"Fiber will play an increasingly important role in animal nutrition and a sustainable animal production system. There are many potential synergies to be explored with fiber, such as its use with enzymes and probiotics. The goal is not to completely break fiber down into simple carbohydrates using various enzymes, but rather to hydrolyze specific linkages in its structure to make certain substrates more accessible to both the animal and its microbiota."

#### **WHAT IS FIBER AND WHERE DOES IT COME FROM?**

Fiber has traditionally been viewed as a negative component of the diet, particularly in early nursery. This perception stems from uncertainty surrounding the role of fiber in nutrition and health. The uncertainty is a consequence of an incomplete understanding of what fiber is, how it should be measured, and what happens to it in the body. Advancements in fiber analysis has enabled nutritionist to effectively incorporate high-fiber ingredients into monogastric diets to improve or maintain production performance.

Dietary fiber is ubiquitous and practically unavoidable in animal feed but some ingredients are more fibrous than others. Cereal grains, oilseed meals, and ethanol byproducts contain varying concentrations of fiber. Not only do their fiber contents vary, the types of fiber are also different. For example, the structure of arabinoxylans in wheat are more branched than the structure of arabinoxylans present in corn. Fiber is defined as indigestible car-

bohydrates or lignin from plant material that have physiological effects on humans and animals. It is considered indigestible because fiber cannot be broken down by enzymes produced by the body. However, digestibility trials indicate that some fiber fractions do in fact disappear from the digestive tract. This is because certain fiber fractions may be fermented by the gut microbiota.

#### **PROS AND CONS OF DIETARY FIBER**

Fiber reduces the available energy in the feed because fermentation is a less efficient source of energy for the animal. In addition, high levels of dietary fiber has been shown to reduce digestibility of energy, protein, and minerals in monogastric animals. These must be considered when formulating high-fiber byproducts (e.g. distillers dried grains, wheat middlings, sugar beet pulp, soy hulls, rice bran, etc.) into the diet. However, these ingredients may also contain factors that reduce performance, such as mycotoxins in distillers dried grains or  $\beta$ -conglycinin in soy hulls, that can easily be overlooked.

We can use high-fiber ingredients to effectively limit feed intake in gestation, improve laxation in lactation, or simply to reduce the cost of the diet. Fiber supplementation in the nursery is used to address health challenges and improve stool consistency, but it is not a “plug and play” solution. There are a multitude of factors that contribute to post-weaning diarrhea and accurate diagnosis should be the first step in solving the problem before any intervention. Fiber should be viewed as an essential tool in a toolbox, not a cure. Does that mean that fiber should only be used in health challenged scenarios? No, insoluble fibers stimulate movement of digesta through the intestinal tract to prevent stasis and proliferation of pathogenic bacteria. Prebiotic carbohydrates may improve performance by aiding the maturation of the gut. The key is to know what fibers you are working with because not all will give you the same result.

How do we measure the effectiveness of fiber supplementation? Similar to evaluating other feed technologies, first we define our metrics for success using variables that are easy to measure. If the objective is to reduce post-weaning diarrhea and improve health status, does it make sense to conduct fecal scoring or monitor the number of fallofts and

mortality? If we are feeding sows, is it simpler to measure feed intake or sow condition scores? The challenge is effectively measuring these metrics that are practical on the barn level. If evaluating return on investment, it is important to consider the other components of the diet. If a fiber solution contains prebiotic carbohydrates and increases production of butyric acid, it may be possible to remove feed additives with similar modes of action.

### **FIBER’S ROLE IN THE SUSTAINABILITY OF ANIMAL AGRICULTURE**

Constantly changing regulations in animal agriculture closes the door for many feed technologies while opening it for others. The use of pharmacological levels of zinc oxide has been proven successful in addressing post-weaning diarrhea, which led to its worldwide adoption after strict regulations were put in place to limit the use of antibiotics. However, the use of pharmacological levels of zinc oxide is now starting to be phased out in many regions which prompted the search for alternatives. Many are lowering crude protein in early nursery diets and investigating other feed technologies. We must be proactive, rather than reactive, when it comes to nutrition by improving gut health to produce a robust herd.





Fiber will play an increasingly important role in animal nutrition and a sustainable animal production system. There are many potential synergies to be explored with fiber, such as its use with enzymes and probiotics. The goal is not to completely break fiber down into simple carbohydrates using various enzymes, but rather to hydrolyze specific linkages in its structure to make certain substrates more accessible to both the animal and its microbiota. These substrates may serve as smaller links of prebiotic carbohydrates that are cleaved from larger carbohydrate structures or even certain nutrients that were encapsulated within the fiber matrix.

Fiber application may also have potential implications on the environmental impact of swine production. High levels of dietary fiber may shift nitrogen excretion from urea in the urine to am-

"Fiber should be viewed as an essential tool in a toolbox, not a cure. Does that mean that fiber should only be used in health challenged scenarios? No, insoluble fibers stimulate movement of digesta through the intestinal tract to prevent stasis and proliferation of pathogenic bacteria. Prebiotic carbohydrates may improve performance by aiding the maturation of the gut. The key is to know what fibers you are working with because not all will give you the same result."

monium in the feces. Ammonium in the feces is a more stable form of nitrogen, reducing the amount of nitrogen released into the atmosphere as ammonia and improving the value of manure as fertilizer. High concentrations of ammonia in the barn will negatively affect animal performance and can cause health issues in humans. Trapping the nitrogen in the manure will result in healthier animals and a safer working environment.

HP FiberBoost is an enzyme-treated functional fiber solution that combines the physiological benefits of insoluble fiber and the stimulating effect of prebiotic carbohydrates on gut health. Specific enzymes hydrolyze sections of the carbohydrate structure to reduce viscosity while maintaining the desired physical characteristics of fiber. This targeted cleaving enhances the concentration of prebiotic carbohydrate fractions that stimulate beneficial bacteria in the hindgut to produce significant amounts of butyric acid.

#### **About Diego Navarro**

*Diego Navarro is a monogastric nutritionist who provides technical and nutritional consulting throughout North and Central America. He also oversees swine research studies within this region and collaborates with the Hamlet Protein global technical team to provide the best solutions to business partners.*

*Diego Navarro has previously worked with United Animal Health as Research Scientist.*

*He holds a PhD from University of Illinois at Urbana-Champaign.*



## NEW DOUBLE-ENCAPSULATION TECHNOLOGY PREVENTS HEALTH CHALLENGES IN BROILER FARMS

**Dr. Stephanie Ladirat**  
*R&D Director*  
*NUOO Feed Additives*

“The double-encapsulation technology, based on a unique formulation of phytogenics, phycogenics and organic acids, offers an opportunity to support gut health of animals and trigger more consistent performance, especially in adverse conditions, thanks to its unique ‘sequenced release’ of ingredients in the intestinal tract.”

### **G**UT HEALTH: THE NEW PARADIGM IN FOOD ANIMAL PRODUCTION

With the continuous increase in the world population and the consequent demand for animal protein worldwide, the search for new strategies to optimize the efficiency of food production has become a major focus. With respect to agricultural animals, optimization of animal health is a key component of improving production efficiency. During the last decade, there has been new emphasis placed on the gut of the animal and in particular gastrointestinal health as gut health can influence animal development, health and susceptibility to disease, and nutrient metabolism. Optimal gut health is of vital importance to the performance of production animals. *Understanding the interactions between these diverse physiological features emphasizes the extent of areas encompassed by gut health and the ability to regulate animal production* (Kogut, 2016). Furthermore, public concerns about the industry’s dependency on the use of growth-promoting antibiotics (AGPs) have resulted in the ban of AGPs in several geographies, pushing nutritionist to look for new potential technologies to improve animal health

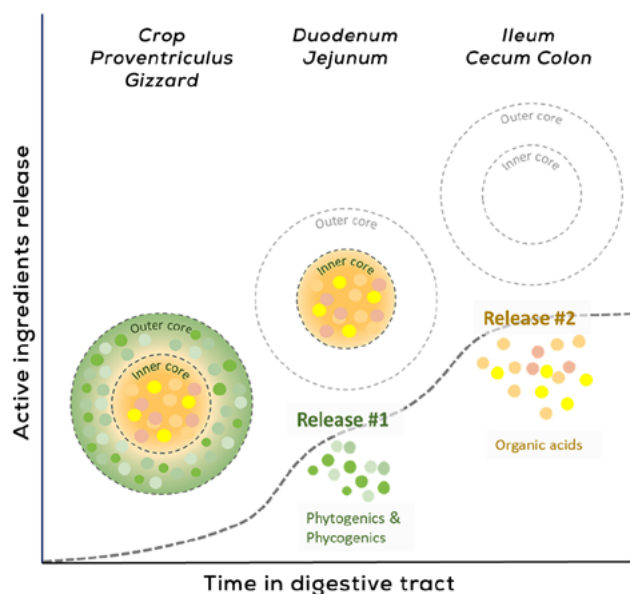
and nutrient absorption. Thus, current research is focused on alternatives to antibiotics for sustainable food animal production. Various technologies have been evaluated, with different molecules and more or less advance release technologies.

### **A DOUBLE-ENCAPSULATION TECHNOLOGY FOR SEQUENCED RELEASE OF ACTIVE INGREDIENTS**

Various types of feed additives have been evaluated, for their effect on gut health, such as phytogenics, organic acids, pre/pro/post-biotics... These solutions have generally some positive effects on gut health as they can exhibit positive impact on microflora, immunity, gut integrity... In the meantime, the form of these products can vary a lot, from simple powders or mixes, to more sophisticated formulations. Some molecules may not require any kind of protection while others might be degraded before they even reach their target in the gut of animals. The variability in product forms and uncontrolled release then results in poor or inconsistent results or eventually higher dose and costs for producers. As a matter of fact, scientists need to work on new active

molecules but also new technologies that guarantee the accurate and exact release in the animals.

Recently, a biotech company developed a new technology, based on an exclusive formulation and a new double encapsulation approach (NUQO). With expertise in micro-encapsulation technologies and also the right facilities and infrastructures to prototype, scale up and produce such solutions, the company worked on one advanced concept: This new approach relies on one exclusive and original formulation with, on one hand a combination of phytogenics and phyco-genics (active molecules from plants and algae) with proven effect on digestibility and immunity, and on the other hand a core of organic acids, with proven stabilizing effects on gut microflora. Furthermore, the new product relies on a double encapsulation to enable, not just a slow release, but an accurate and precise controlled released of ingredients in the gut health. Thanks to this double-encapsulation, active compounds are released specifically between the duodenum up to the colon, with fractionated or sequenced release of the different ingredients, so that every compound gets released on spot to enhance digestive functions and control gut microflora.



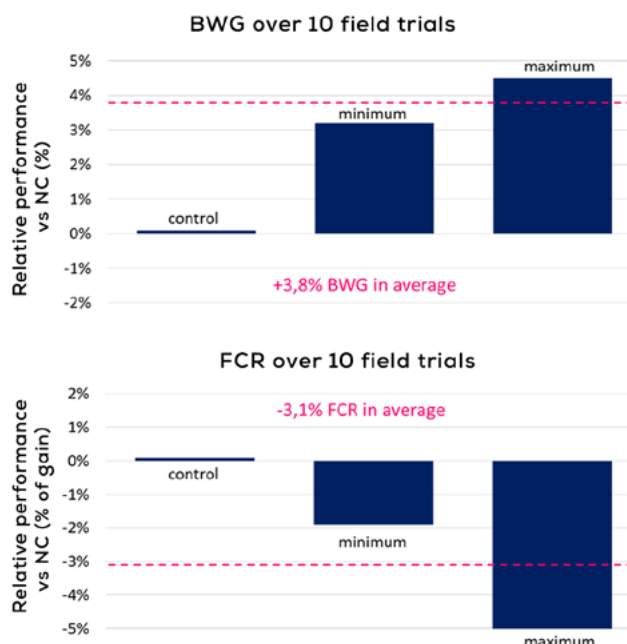
## MAINTAIN AND SUPPORT PERFORMANCE IN 'THE REAL LIFE'

This technology is designed to not only boost performance in standard conditions but also to

secure performance in challenged conditions for monogastrics. Indeed, based on this exclusive formulation and double-encapsulation technology, this new concept is designed to address 3 main objectives:

- Support digestive functions (digestion & absorption)
- Trigger antioxidant effect and immune modulation
- Ensure pathogen control (Clostridium, E.coli, Salmonella)

Numerous field trials have proven and quantified the positive effects of this new technology on poultry performance and profitability in modern poultry meat production. Several trials, in Asia, Europe and North America, have showed a significant increase of performance. In some recent trials performed in Europe, it has been tested at 400 g/ton of feed in broilers. The technology triggered a better growth due to better intestinal health (BWG +3.8 % on average), a better feed conversion ratio (FCR -3.1 % on average), but also less enteric problems, better control of Gram+ and Gram- bacteria (coli bacteriosis, clostridium, salmonella etc.). Additionally, the product increased dry-matter content of feces resulting in dry litter, and consequently in lower occurrence of footpad dermatosis, and finally a reduction of ammonia.







### PREVENT HEALTH CHALLENGES AND ENSURE CONSISTENT PERFORMANCE

This new technology is primarily designed as a tool for nutritionists to prevent the drop of performance in case of health challenges or adverse conditions. Indeed, various trials have shown how this double encapsulation technology could prevent performance decrease in case of challenge or lead to more consistent results over the time. It supports better growth and feed efficacy but also foremost a better health status of animals.

As an example, two trials performed in North America highlighted the effect of the new technology to better support performance and improve gut health during a coccidiosis challenge, in comparison with classic solutions such as phytogenics. Despite different impacts of the *Eimeria* strains (*E. acervulina*, *E. Maxima* and *E. tenella*) on lesion scores between the two trials, a consistent efficacy of the technology was observed on growth, feed efficiency and lesion score. In both trials, the positive impact on lesion scores due to *E. tenella* was significant, indicating the direct consequences of the targeted release of the active ingredients along the gut.

Of course, such solution does not represent a 'silver bullet' but should be part of a holistic approach to reduce risk of health challenges and its detrimental effect on performance and profitability of animals. As such, this double-encapsulation technolo-

gy, based on a unique formulation of phytogenics, phycogenics and organic acids, offers an opportunity to support gut health of animals and trigger more consistent performance, especially in adverse conditions, thanks to its unique 'sequenced release' of ingredients in the intestinal tract.

### CONCLUSION

The progress of research during the last decade has highlighted the direct relationship between animal performance and 'gut health', but also the complexity of this topic, that encompasses a number of physiological and functional disciplines, including nutrient digestion and absorption, host metabolism, energy generation, gut integrity, immunology, among others. In addition, scientists are now requested to work on alternatives to traditional molecules to develop a more sustainable food animal production. Such a complex environment requires some advanced solutions, combining the right molecules and as well the right 'delivery mode', that will guarantee the efficacy, or let's rather say the 'optimal and consistent' efficacy, that will help farmers to maintain health and performance of animals, even during adverse conditions. Emerging solutions based on a dual approach, combine an exclusive formulation, with a core of organic acids and sustainable ingredients such as phycogenics and phytogenics, together with an innovative double-encapsulation mode for a sequenced and accurate release of active molecules, for more consistent performance and higher return on investment for farmers.



**Andrew Richardson**  
*Aqua Nutrition Manager  
InnoVaFeed, France*



**Maye Walraven**  
*Head of Business Development  
InnoVaFeed, France*

## INSECT INGREDIENT TO DRIVE PERFORMANCE AND BOOST HEALTH IN SHRIMP NUTRITION

An advanced growth of the shrimp industry increases feed demand, whilst the industry faces feed limitations and a need for performance gains. In this article, we describe how InnoVaFeed is exploiting the intrinsic benefits of insects to drive an increase in both growth performance and health resistance in the shrimp with a new high-performance feed ingredient, NovaGain™, especially designed for shrimp feed.

With its average global year-on-year growth between 5-10%, the shrimp industry, based mostly in Southeast Asia and Ecuador, has shown tremendous growth over the past decade. It has also shown its resilience throughout the recent pandemic with production remaining stable. As the world's population climbs towards 8 billion, our food production systems are faced with the challenge of producing more output, with less input. Animal feed is no different; its production is compounded by competition between various animal feed industries for common feed ingredients. This strong growth and competition are putting pressure on the availability of conventional ingredients which rely on limited supply of non-renewable natural resources. In this context, pushing

production systems to be more efficient and shifting towards a circular production model, will be the hallmarks of a sustainable growth in shrimp aquaculture.

In this article, we describe how InnoVaFeed is exploiting the intrinsic benefits of insects to drive an increase in both growth performance and health resistance in the shrimp with a new high-performance feed ingredient, NovaGain™, especially designed for shrimp feed.

### NOVEL PERFORMANCE INGREDIENT TO BOOST SHRIMP PRODUCTION

The insect farming industry is a rapidly growing segment of the animal feed industry. It seeks to upcycle low value co-products of the agro-industry, converting

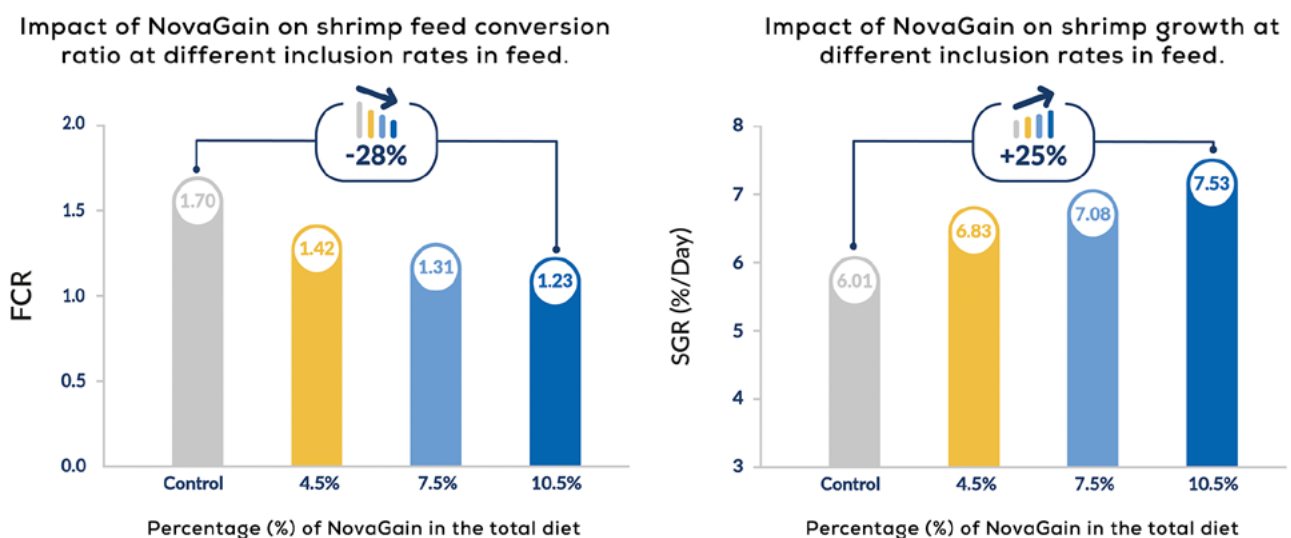
them into high-value animal protein and oil sources for the feed industry. Increasingly used in the Northern European aquaculture industry as a replacement for high quality fish meal in salmonid diets, insect protein meal is establishing itself as a key novel ingredient in the pursuit of sustainable growth for aquaculture. In particular, the black soldier fly (BSF - *Hermetia illucens*) meal is not only a natural bio-concentrate of nutrients, but also a new source for molecules such as chitin, antimicrobial proteins, and fatty acids - which have functional properties that are able to boost growth performance and increase health resistance of animals.

After 3 years of product development and running multiple (>10) trials in partnerships with independent research centres around the world on several shrimp species, InnovaFeed is launching NovaGain which leverages BSF's unique properties whilst tailoring them specifically for the shrimp. This product has demonstrated gains in growth performance, both in feed conversion ratio (FCR) and specific growth rate (SGR) for the shrimp, as seen in the results of the latest trial (Figure 1). InnovaFeed believes that this bioactive meal, which combines nutritional and functional benefits, has the potential to become a game-changing novel ingredient at inclusion rates of 5-10% in feed ingredients to boost shrimp production, in particular, *Litopenaeus vannamei*.

### SUPPORTING HEALTH AND WELFARE TO DRIVE DOWN LOSSES AND INCREASE YIELDS

Beyond supporting better harvest output, this bioactive meal could also be part of the solution to address some of the common diseases which pose considerable challenges to global shrimp production capacity today. There are two diseases in particular – white spot syndrome virus (WSSV) and acute hepatopancreatic necrosis disease (APHND) otherwise commonly referred to as early mortality syndrome (EMS), both which could be reduced with the dietary inclusion of NovaGain.

As aforementioned, ingredients derived from BSF, are rich in compounds that can support the innate immune response of shrimp. Chitin is a natural compound which in the wild shrimp consume regularly when they feed on moulted exoskeletons. The chitin in the exoskeleton of BSF acts as an immunostimulant (Wang et al, 2005), by modulating the diversity of the gut bacteria. Lauric acid is a short chain fatty acid, that is also a known antimicrobial agent (Lieberman et al, 2006). Finally, antimicrobial peptides act as a strong defence mechanism to help insects survive in harsh conditions in the wild and have proven protective effects against these spe-



**Figure 1.** An improved growth performance was demonstrated when NovaGain™ was added in the diets, regardless of the inclusion level tested. FCR was significantly higher in the control diet than in the 7.5% and 10.5% NovaGain™ diets. SGR of shrimp fed treatment diets significantly improved with increasing dietary inclusion; an increase of up to 25.29% compared to shrimp fed the control diet.

cific diseases in the shrimp. These molecules can provide a multitude of defensive actions for the shrimp from breaking down bacteria (Gasco et al, 2018) to guarding against WSSV (Xiao et al, 2020).

Building on these unique properties, InnoVaFeed have derived the true value of this insect derived meal by capitalising on these functional elements, and being more than simply a novel source of nutrition. NovaGain positively impacts the survival of the shrimp when challenged against both WSSV and APHND (Figure 2). An increased resistance to WSSV is shown with a dietary inclusion rate starting from 4.5% and is shown across each diet containing this insect ingredient. Evidence for increased resistance to APHND, is also shown at an inclusion rate of 10.5% in the total diet.

Shrimp health is important for farmers to increase yields, but it also addresses more recent constraints of the industry – such as improving animal welfare conditions and managing a reputational risk due to disease related losses.

**GENERATING VALUE FROM FARM TO FORK**

By combining the benefits of growth and health performance for the shrimp, our product can generate economic value for farmers. This value is derived directly from feeding efficiency improvements and indirectly through growth rate improvements and a reduction of risk due to health concerns. The

ingredient can also be used to reduce the amount of fish meal in shrimp diets at more than a 1:1 ratio – which also means an increased percentage of the diets can be reformulated with considerably cheaper plant-based meals whilst maintaining the health benefits of the diet for the shrimp.

Value is also generated by diets containing this feed ingredient through an improvement in final shrimp product quality. This insect derived meal has been shown to contain lower levels of heavy metal pollutants and polychlorinated biphenyls (PCBs), thus improving shrimp product quality. Furthermore, as drivers such as traceability and feed sustainability are increasingly sought after by leading labels, accreditations and discerning consumers, NovaGain provides a strong communication platform for shrimp farmers and their clients with regards to product differentiation.

**CLEAR MARKET DIFFERENTIATION**

Novel ingredients such as NovaGain can not only alleviate some pressure on conventional feed ingredients, but their use can be directly translated into commercial messaging through direct B2C labels – such as the “vive l’insecte” label in France. This is true of B2B style communications as well, for instance when launching efforts to reduce FIFO (Fish-in Fish-out) in line with international certification standards such as that of the Aquaculture Stewardship Council (ASC). The key to this style of messaging hinges on quantifying impact with data driven evidence, which

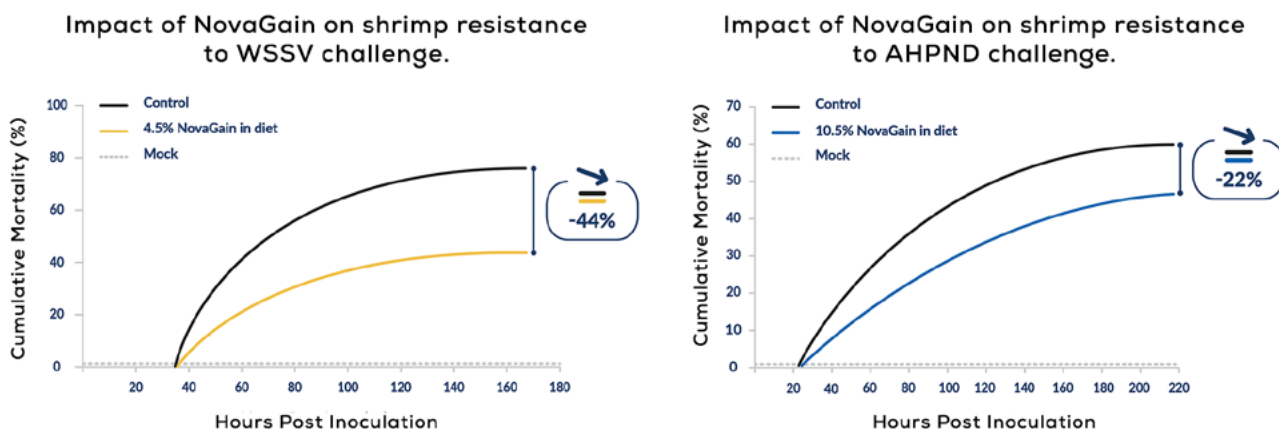
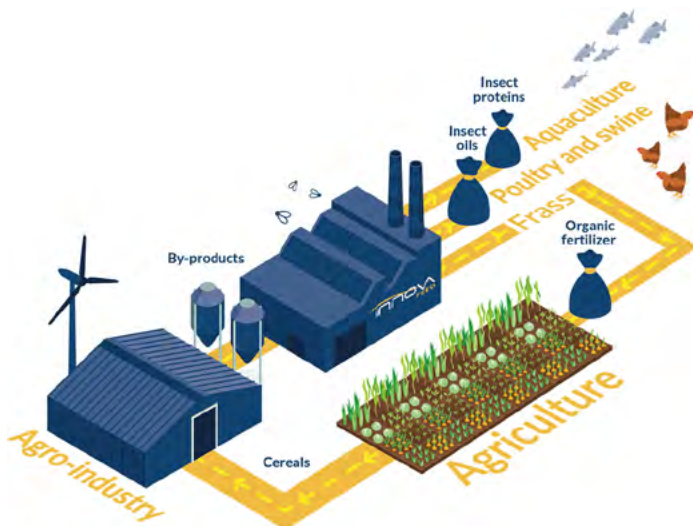
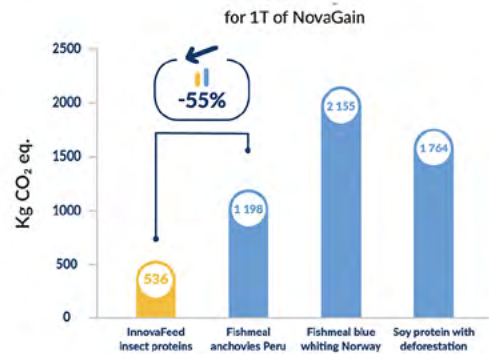


Figure 2. Cumulative mortality of *L. vannamei* fed diets containing NovaGain™ when challenged against WSSV and APHND respectively, showing health performance gains.



**Figure 3.** InnovaFeeds' circular model drives the competitiveness of NovaGain. An independent LCA (life-cycle assessment) shows the positive role feed choices can have on CO<sub>2</sub> impact.

### Impact of NovaGain on climate change vs conventional ingredients.



ensures that communication is clear and effective.

The model that InnovaFeed has developed – one of circularity and co-localisation utilising only GMP+ certified co-products from existing industrial processes as the only feedstock – unlocks the potential of the insect farming industry. By integrating the insect meal industry into existing infrastructures, InnovaFeed reduces the carbon footprint of their processes by 80%. Standout innovations include sourcing 60% of the energy from heated exhaust vents at a local renewable energy plant and using wet co-products directly piped to the insect rearing facility. A detailed analysis of the process and scientific write up of the independently gathered results has been reported by Phan Van Phi et al., (2020).

InnovaFeed, one of the largest insect meal producers in the world, currently operates two facilities in the north of France, and has global ambitions. In late 2020, it announced a partnership with ADM to build another record-breaking plant in Decatur, Illinois, USA. This plant will be co-located with the largest corn processor in the world and is projected to have a yearly capacity of 60,000 tonnes of BSF protein products. ADM Decatur's corn-based by products will be locally upcycled to feed insects and will be directly conveyed through infrastructures connecting both companies. This production model will also allow InnovaFeed to use 27MW of residual energy recovered from the ADM

process, which previously was not recovered.

Through a focus on industrial scale volumes, automation, co-product upcycling and quality products, InnovaFeed is set to have a strong impact on shrimp aquaculture and on global agriculture more broadly.

### References

- Gasco, Laura & Finke, Mark & Huis, Arnold. 2018. *Can diets containing insects promote animal health?. Journal of Insects as Food and Feed.* 4. 1-4. 10.3920/JIFF2018.x001.
- Chloé Phan Van Phi & Maye Walraven & Marine Bézagu & Maxime Lefranc & Clément Ray, 2020. *Industrial Symbiosis in Insect Production—A Sustainable Eco-Efficient and Circular Business Model Sustainability, MDPI, Open Access Journal, vol. 12(24), pages 1-1, December.*
- Lieberman, S.; Enig, M.G.; Preuss, H.G. *A review of monolaurin and lauric acid: natural virucidal and bactericidal agents. Alternative & Complementary Therapies* 2006, 12, 310-314.
- Wang, S.H., Chen, J.C. 2005. *The protective effect of chitin and chitosan against Vibrio alginolyticus in white shrimp Litopenaeus vannamei. Fish Shellfish Immunology* 19, 191-204.
- Xiao, B., Fu, Q., Niu, S., Zhu, P., He, J., Li, C. 2020. *Penaeidins restrict white spot syndrome virus infection by antagonizing the envelope proteins to block viral entry. Emerging microbes & infections* 9, 390-412.

## Black Soldier Fly meal improves survivability, yields and feed conversion ratios in shrimp diets

According to some shrimp-feed trial results announced by Nutrition Technologies; shrimp fed with diets using the BSF meal, had better results and was more cost effective than traditional diets.

Nutrition Technologies announced the results of their recent shrimp-feed trial using Black Soldier Fly Meal (“BSF meal”) to replace Anchovy Premium Fishmeal in whiteleg shrimp diets. The trial found that shrimp fed with diets using the BSF meal, had better results and was more cost effective than traditional diets. This demonstrates clear potential for commercially-farmed insects to replace traditional animal feed ingredients, such as fishmeal, which are commonly seen as unsustainable.

In recent years, the global fishmeal supply has stagnated due to the strict quotas now in place to maintain critical ocean fish stocks. This, combined with rising demand for livestock and seafood, has left the animal feed industry facing a significant deficit in high-grade proteins as ingredients in feed. The insect protein sector has gathered increasing attention over the past few years. The sector has seen investments totaling nearly US\$1bn to date, to accelerate the replacement of fishmeal with insect meals such as BSF meal.

Insect meal is increasingly seen as more sustainable than competing fishmeal sources, as insects can be raised on food waste and has a far lower impact on the environment. This is particularly the case

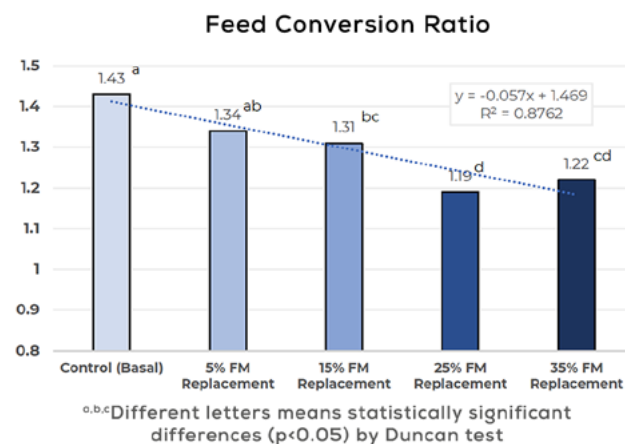
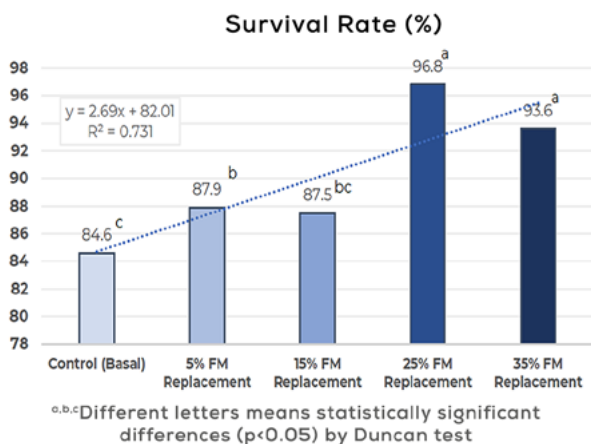


Uncooked Whiteleg Shrimp

with BSF meal produced in the tropics, which requires far less energy than BSF meal produced in temperate climates.

Nutrition Technologies’ recent trial was conducted at the ShrimpVet research center in Vietnam from July 2021 to September 2021, using 1,400 whiteleg shrimp. The purpose of this trial was to find the optimum inclusion rate of BSF meal, to replace Anchovy Premium Fishmeal with minimal impact to cost.

Main results from the *In vivo* performance trial.



All the trial treatments using BSF meal had more desirable results than the control. The best result came from a diet which had a 25% fishmeal replacement inclusion (a total 6.6% BSF meal). This led to a 14% higher survival rate, 17% higher live yield and a better feed conversion rate of 20%, when compared to the control diet. The inclusion of Nutrition Technologies' BSF meal in this treatment increased the total cost of the diet by 3.3%, but due to the improved performance, resulted in an overall shrimp feed that was 14.4% better value for money.

The BSF meal used in this trial (Hi.Protein®) was made in Nutrition Technologies' new industrial production facility in Iskandar Puteri, Johor, Malaysia. The insects were reared on 100% fruit and vegetable food wastes, which otherwise would have been disposed of in landfills. The insects were reared and



**Rafael Hermes**

*Animal Nutrition Director  
Nutrition Technologies*

processed in just over a week.

"By replacing one-quarter of fishmeal with black soldier fly meal in shrimp diets, we could observe the greatest performance gain which represents a 24:1 ROI over commercial feeds", said Rafael Hermes, Animal Nutrition Director at Nutrition Technologies.

"There's a big gap for products and solutions in the aquaculture market that represents big opportunities to fulfil, and that is exactly where our insect meal fits in", declared Nick Piggott, Co-CEO

of Nutrition Technologies.

Tom Berry, Co-CEO at Nutrition Technologies explained that "it is important to take into consideration what all these results mean to the new insect-sector as a whole - the excellent FCR and survival rates show that insect meal is not just an alternative protein, but a better protein in terms of performance and environmental benefits".

Global intelligence, localised. Result,

# SERIOUS PROCESSING POWER

In your quest for profitable, sustainable production draw on our global resources and leading-edge science. They provide you with relevant insights to help you make complex decisions with confidence. We're just a phone call or an email away.

ABVista

The most important additive is intelligence



“For farmers, increasing feed efficiency not only helps to maintain and promote animal health but it is also a method to increase farm profitability. With feed prices running high, increasing feed efficiency means reducing feed intake costs and/or increasing animal yield with the same amount of feed.”



## “INCREASING FEED EFFICIENCY IS A METHOD TO INCREASE FARM PROFITABILITY”

Mostafa Medhat, Senior Director of Products and Technology Applications,  
Si-Ware Systems

The growing world population and, along with this, the increasing need for food have become a much more important issue today than ever before. Because it does not seem possible for existing natural resources to meet this alone without any intervention. This is now a major problem that needs to be solved for every industry.

The livestock industry has a key role in meeting the increasing food need in the world, but it, like other industries, faces the necessity of using existing resources in a sustainable and efficient way. This means producing more with fewer resources... In other words, obtaining more animal products with less feed... Is this possible? Representatives of the

animal nutrition industry state that it is possible to achieve this with a well-planned feed ration.

We had an interesting interview with Mostafa Medhat, Senior Director of Products and Technology Applications at Si-Ware Systems, creator of NeoSpectra material analysis solutions built on single-chip FT-NIR spectrometers. Si-Ware has recently partnered with Dairyland Laboratories Inc. to create a solution for dairy feed analysis to support feed efficiency and animal performance.

Saying that increasing feed efficiency is an important profitability method for farms, Medhat explains further details in our interview:



**Mr. Medhat, what is feed efficiency in farm animals and how is it measured?**

When looking at dairy cows, for example, feed efficiency is a simple measure to determine the relative ability of cows to turn feed nutrients into milk or milk components. In the simplest terms, it is the pounds of milk produced per pound of dry matter, or feed, consumed. An animal that produces either greater body mass with the same feed intake or the same body mass with less feed intake would be considered more efficient.

When measuring feed efficiency, it is sometimes confused with feed intake. In other words, for many years it was assumed that feed efficiency was determined by if animals ate “well”, “more” or “all” of feed. Today, feed efficiency in farm animals can be measured in various ways. Simply, it is the measurement of feed intake and weight gain (Feed conversion efficiency (FCE) = Feed intake / weight gain). Examples include Actual Dry Matter Intake (DMI), or the amount of feed a cow consumes per day on a moisture-free basis, or Residual Feed Intake (RFI), which is calculated as the difference between actual consumption and the amount of food an animal is

expected to eat based on its mean live weight and rate of weight gain.

**So, what are the factors affecting feed efficiency?**

There are many factors affecting feed efficiency and these are either direct or indirect. Two examples of direct factors include feed availability and feed quality. Feed availability means giving the animal enough feed to fill the stomach, while feed quality is related to the feed formula and characteristics of the feedstuff and raw materials used in feed production.

In terms of feed quality, residual feed intake tends to be associated with the digestibility of dry matter (DM) and crude protein (CP). Researchers have found that digestibility of DM and of CP was significantly greater for the low RFI, or highly efficient, steers compared to the high RFI, or less efficient, steers. Generally, researchers have found that feed additives could be used to increase digestibility and palatability which could impact feed efficiency.

Other indirect factors impacting feed efficiency include the animal’s age, weight, heat stress, animal comfort, and hydration.





"Feed efficiency is also the tool to measure how much "good feed" should be used for the maximum yield. It is important to consider that increasing feed efficiency will minimize both feed refusal and feed waste; therefore, reducing costs and increasing profitability."

#### **What is the relationship between feed efficiency and animal performance?**

When looking at eating as a key term in feed efficiency and bolstering animal performance, it is more important to focus on the efficiency and not necessarily the quantity eaten. In addition, the amount of feed intake and the desired efficiency depends upon the final animal product. In other words, if the animal is targeted for milk production or meat. Maximizing feed efficiency for animals based upon the direct and indirect factors, and their intended output, should have a positive impact on their performance because they will be consuming the optimal intake and nutrients.

#### **How can the feed efficiency of different farm animals (ruminant, pig, poultry, aquaculture) be increased?**

In general, feed efficiency for all farm animals falls in one of two directions: 1) Increase animal yield (e.g., milk, body mass, manure, etc.) with the same dry matter intake (DMI), or 2) decrease DMI for the same animal yield.

#### ***To achieve increased farm animal efficiency, the following improvements could be made:***

- a) Improve the feed formula.
- b) Improve the farm environment and decrease animal stress.
- c) Deploy monitoring tools for diet-related diseases (i.e., ketosis, acidosis); and
- d) Utilize monitoring tools for animal gain and yield.

Often one way to improve the feed formula and monitor feed composition is to capture and send in feed samples to the laboratory for testing. This is a critical step to ensure feed quality and proper nutrient composition for farm animals to be able to increase efficiency.

For the first time, Si-Ware is working to bring feed formula (dry and wet) testing to the field in partnership with Dairyland Laboratories. The new dairy feed testing method created by Dairyland, paired with Si-Ware's NeoSpectra Scanners, will empower users to analyze moisture in real-time, detect trends and changes in quality, and screen ingredient quality. Users will be

able to analyze more samples in less time and adjust to feed changes quickly to increase feed efficiency.

**What impact does increasing feed efficiency have on animal performance and farm profitability?**

For farmers, increasing feed efficiency not only helps to maintain and promote animal health but it is also a method to increase farm profitability. With feed prices running high, increasing feed efficiency means reducing feed intake costs and/or increasing animal yield with the same amount of feed.

Feed efficiency helps farmers maintain healthy animals and in turn, improve the quality of animal products, which means stronger pricing for every animal product and output. Feed efficiency is also the tool to measure how much “good feed” should be used for the maximum yield. It is important to consider that increasing feed efficiency will minimize both feed refusal and feed waste; therefore, reducing costs and increasing profitability.

**How should feed rations be formulated for better performance? What should be considered while preparing the feed formulation?**

Feed formulation is the means to determine rations and volumes of ingredients and additives to blend to meet the known nutrient requirements of targeted species and achieve production goals at an optimized cost. Feed consists of several ingredients, which are grouped into ingredients providing energy including fats, oils, and carbohydrates; proteins (amino acids); vitamins; and minerals. Often, cereal grains such as corn, wheat, and barley, plus added fats are used primarily to provide energy to farm animals. It is critical to utilize scientific research and experiments to fully

understand the nutrient requirements for a specific species based on that species’ purpose.

Therefore, when formulating feed with a goal to improve the formula, the feed formula must be calculated based on the simplest forms of chemical groups. For example, protein into amino acids, fats/oils into fatty acids, ash into minerals, etc. The quality and types of these simple forms of chemical groups depends on the source material and production condition of the raw material.

**How can farmers and feed processors ensure that their feed formula and composition is accurate and optimal?**

The strongest approach is to determine the accurate formula, which requires accurate analysis of the feed ingredients. However, capturing accurate analysis of feed ingredients is historically fairly expensive and time-consuming.

In partnering with Dairyland Laboratories, Si-Ware Systems aims to help alleviate this burden for users and make in-field feed formula and composition a reality. Si-Ware's NeoSpectra FT-NIR technology offers various measurement parameters including dry matter, protein, fiber, starch, & fat, in a wide range of feed types like corn/grass silage, hay, soybean meal, grains, and more with near-lab accuracy. The NeoSpectra hardware and analysis models are built to allow users to analyze all samples, whether homogenous or nonhomogeneous, without time-consuming sample preparation. This enables users to instantly make decisions to maximize their existing feed mix (and reduce feed waste), and in turn, increase feed efficiency for dairy cattle.

**About Mostafa Medhat**

*Mostafa Medhat joined Si-Ware from the start as the company's first engineer, leading the R&D team to develop the world's first single-chip FT spectrometer. With more than 17 years of experience in the semiconductor industry, his background includes Optics, MEMS, Spectroscopy and Data Analytics. He has also worked with Si-Ware partners to develop different products that serve the Agriculture, Food, Beauty, and Personal Care Products industries.*

*Medhat obtained his B.Sc. and M.Sc. degrees in electrical engineering from Ain Shams University, Cairo in collaboration with Interuniversity Microelectronics Centre (IMEC) in Leuven, Belgium. He also holds an MBA in project management and is currently a DBA candidate at the International Business Academy of Switzerland (IBAS). He holds more than 15 patents and patent applications, has authored/co-authored more than 30 publications, and has contributed to a book.*



## STRATEGIC LATE-FINISHING NUTRITION FOR SUSTAINABLE PIG PERFORMANCE

**Antoine Meuter**  
*Product Manager Monogastric  
 Royal Agrifirm Group*

The genetic progress is constantly pushing for more and heavier pigs. However, by nature, pigs get less efficient as they get bigger. Adopting the right nutritional strategy in late finishing can help the animals cope with stress, minimize waste and keep performance momentum.

**L**ATE FINISHING, A FAIR INVESTMENT  
 The swine productivity under commercial conditions is far below the animal's genetic potential. This difference is called 'growth gap' and is a multifactorial challenge. The related stress can negatively impact the profitability of a swine farm. Major stressors are increased intake leading to feed competition, limited pig space, metabolic heat production and last but not least physiologic stress of the puberty. On top of this, mature finishing pigs are transitioning from primarily lean muscle deposition to a less efficient combination of lean and fat deposition. Meanwhile, finishing feed represents about half the feed usage on a farrow-to-finish operation. So striving for the best economical return pays off most in the least efficient phase of the production cycle.

### COPING WITH STRESS IS KEY TO SUCCESS

The adverse effects of stress on an animal are mediated through the endocrine, nervous and immune systems. The mechanisms by which specific hormones and cytokines are activated to reduce feed intake, muscle protein deposition, immune competence and increase fatness are now being understood.

Although the physiological stress and environmental conditions of intensive farming can hardly be altered, influencing the ability of pigs to cope with this stress via nutrition is feasible. Relevant feeding strategies can play a key role to positively modulate the microbiome, restore the oxidative balance and reduce inflammation. A meta-analysis and large-scale commercial applications have shown that Ambitine®, as a multidimensional solution, can help unlock the growth potential in finishing pigs.

### GOOD GUT FEELING TO DRIVE MICROBIOME EXPRESSION

To cope with stress, it all begins in the gut. Erratic feed intake caused by increased feeder competition or other environmental stressors can lead to gut atrophy. Atrophy impacts the gut's ability to absorb nutrients, forcing a decline in digestive efficiency. Modulating the balance and driving the expression of the microbiome through relevant use of functional ingredients can regulate serotonin biosynthesis and influence nutrient digestibility. The multi-component, plant-based ingredients in Ambitine® push back on the threat of reduced efficiency by stimulating digestive secretions to support gut

Figure 1. Effect of ambitine supplementation on VFA production in caecum and colon

	Control	Ambitine		Control	Ambitine
Caecum	Mg/kg	Mg/kg	Caecum	Mg/kg	Mg/kg
Acetic acid	3455	3232	Acetic acid	2194	2697
Propionic acid	4593	7302	Propionic acid	5664	6890
Butyric acid	713	853	Butyric acid	555	644

functions. A recent study has indeed shown that Ambitine® boosts intestinal integrity by increasing diversity of beneficial gut bacteria and increasing endogenous production of volatile fatty acids such as butyric acid (See Fig 1).

#### PROTECTING THE PIG WITHOUT COMPROMISING PRODUCTIVITY

Secondly, restoring the balance between pro-oxidants and antioxidants while reducing inflammation are detrimental to keep up the momentum of feed efficiency in fattening pigs. In the last weeks before market, pigs fed Ambitine® supple-

mentation experienced an improved daily weight of +4,2% and reduced feed conversion of 2,6% on average. The Ambitine® technology aims at compensating this potential performance decline not only by supporting gut function but also by increasing resilience towards external stressors. This stress resilience was recently highlighted in a Chinese study where parameters such as oxidative stress and inflammation were measured. On the one hand, the Ambitine® treatment improved the liver antioxidant capacity with increase in levels of antioxidant enzymes such as superoxide dismutase, glutathione peroxidase, catalase and malondialde-

**agrimprove**  
*we farm ideas*

# Ambitine®

## ▶ LATE FINISHER PERFORMANCE

- Resilience to late finishing stress
- Superior growth in the last weeks before market
- Optimized production cost

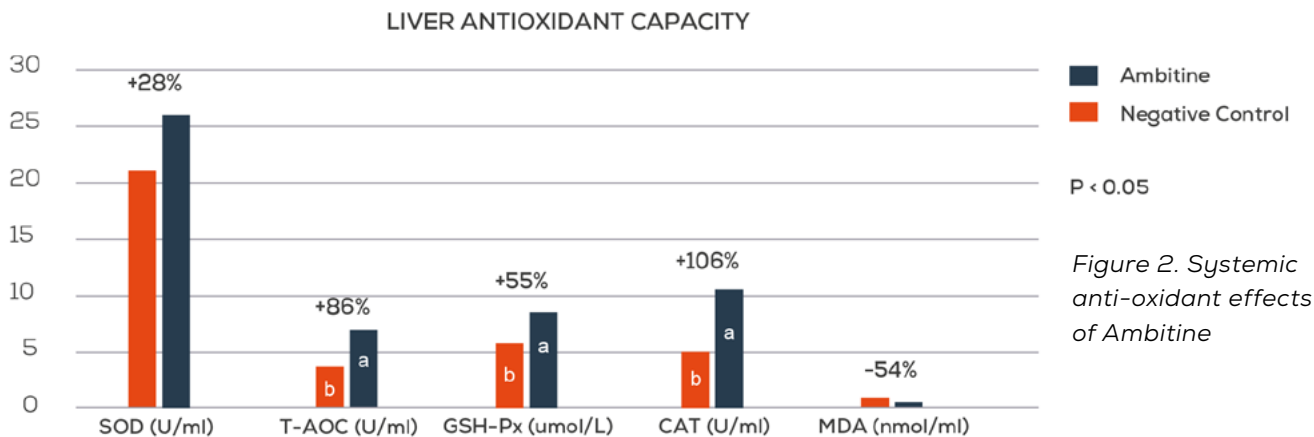


Figure 2. Systemic anti-oxidant effects of Ambitine

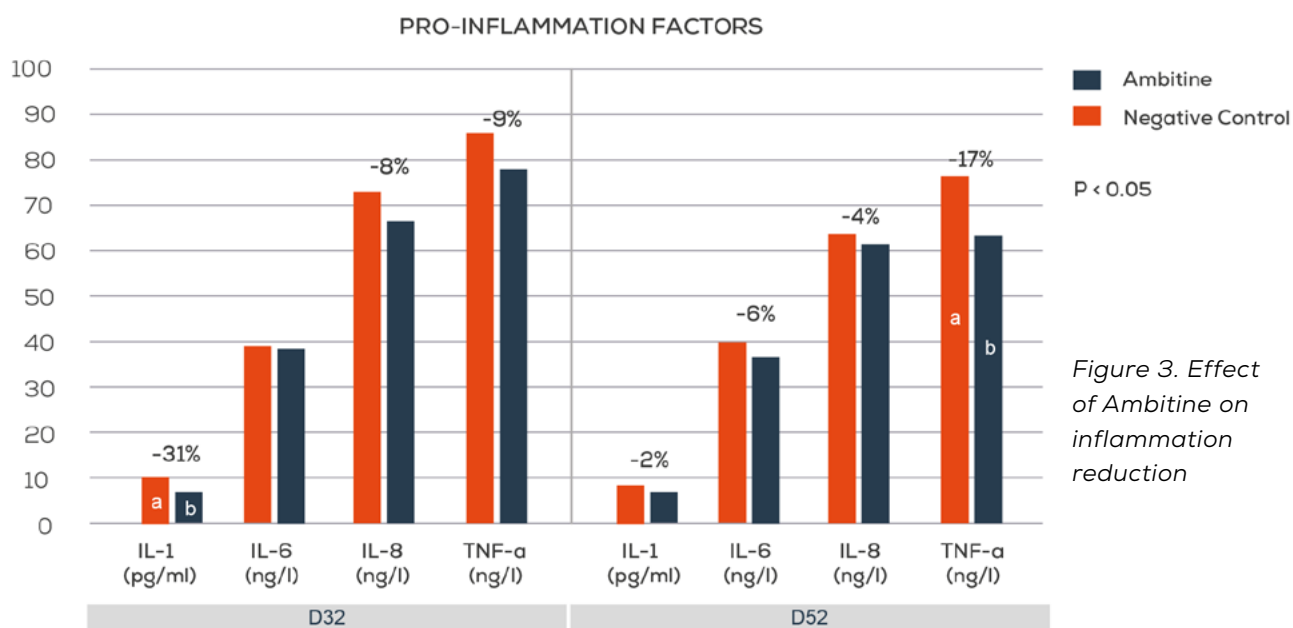


Figure 3. Effect of Ambitine on inflammation reduction

hyde (See Fig 2). And on the other hand, the immune response to stress was optimized in finishing pigs treated with the Ambitine® as the concentration of key pro-inflammatory markers was lower compared to a control diet (See Fig 3).

Significant improvements in understanding the mechanisms of the stress response provide an opportunity to manipulate the endocrine and cytokine

systems of pigs and improve productivity in commercial environments. Pigs need holistic nutrition to respond to late finishing challenges. Selecting the right combination of active ingredients for fatter diets pays off as it can support efficiency no matter what barriers your pigs face in the last phase before market. Thus, Ambitine® as one nutritional tool can deliver multiple benefits in the late-finishing phase of pork production.

**About Antoine Meuter**

Antoine Meuter is graduated as an agricultural engineer specialized in livestock productions and animal nutrition in 2004. He has been working in marketing and sales positions within the feed additives business for 16 years. After 11 eleven years spent in regional and global product management for gut health and vitamin product portfolios within a Dutch multi-national, he recently joined another Dutch leading feed company, Royal Agrifirm Group, as Global Product Manager Monogastrics for the Agrimprove functional additives range.



## IMPROVING FEED EFFICIENCY WITH VIVACTIV®

**Jean Pascard**  
Ruminant Product Manager  
CCPA Group

Improving feed efficiency without affecting performance through feed supplementation is an effective way to limit the feed cost per liter of milk produced. Vivactiv® has been developed for more than 20 years by the CCPA group in partnership with French and international research institutes. Vivactiv® can be incorporated into compound or mineral feeds or directly into the ration.

The Vivactiv® range is a range of natural feed solutions based on phytogetic and mineral raw materials. It has been developed in partnership with the INRAE research institute in France and the IGM institute in Spain and has been the subject of numerous publications on the mode of action as well as the zootechnical results.

***Vivactiv® acts on the entire digestive tract to improve digestion efficiency.***

- Stimulation of salivation
- Increase of energy and proteins produced by the rumen flora
- Increase in bypass proteins
- Increased intestinal digestion through stimulation of pancreatic enzymes

On average, the energy yield is improved by 5% and the nitrogen yield by 10%. Thus, it is possible to reduce the intake of the ration for an identical level of milk production. It also allows to

favor lower quality and more economical sources of raw materials.

Depending on the level of production and the amount of complementary nitrogen, Vivactiv® saves 5 to 11g of protein per kilo of dry matter ingested. This means an average saving of 120 kg of soybean meal over a lactation. This saving in protein also leads to a reduction in nitrogen emissions. On average, Vivactiv® reduces ammonia emissions by 10%.

In a herd of 130 cows, Vivactiv® reduces the use of soybean meal by 15.4T and ammonia emissions by 350 kg per year. The economic gain is about 12000 € per year, Vivactiv® cost deducted.



Improving feed efficiency leads to a double benefit. First, financial (lower feed costs), and second, environmental (lower waste). Vivactiv® contributes to two major and growing global concerns.



## SAFE FEED IS A GUARANTEE OF GOOD RESULTS

**Néstor Serra Gómez-Nicolau**  
*Technical Manager*  
 Adiveter S.L.

Feed needs to be protected against the risks of bacterial contamination which can cause a loss in nutritional value and pose a threat to animal health and the food chain.

The rise in the price of the raw materials makes feed a very valuable commodity. Given that microbial contamination is the main cause of deterioration in feed, and is also very frequent, effective protection against microorganisms is clearly essential in order to maintain its high value. Failure to do this results in microbial proliferation and impairment of the nutritional value of the feed, and consequently of livestock performance, as well as posing a threat to animal health and the food chain.

### CAUSES OF FEED CONTAMINATION

*There are many causes of microbiological feed contamination, including:*

- Input of contaminated raw materials: Clearly, the quality of the raw materials on arrival at the factory depends mainly on the good practices of the supplier. However, it is equally clear that some raw materials are more susceptible to microbial contamination than others. They are usually classified into three groups according to this risk.

- **HIGH RISK:** Soy meal, soybean husk, fishmeal, flour and cotton seed, wheat bran, rapeseed meal, etc.

- **MEDIUM TO HIGH RISK:** Cereals in grains, cereals by-products, fibrous foods, etc.

- **LOW RISK:** Carbonates, phosphates, micro-ingredients, etc.

- **Incorrect storage conditions of raw materials:** Microbial proliferation in silos can be due to incorrect or inadequate cleaning and disinfection procedures, as well as environmental conditions (temperature and humidity) which favour microbial growth in the whole silo or in specific areas (hot spots).

- **Cross-contamination:** However thoroughly cleaning is carried out, in a feed mill cross-contamination is unavoidable. The continuous circulation of feed through the manufacturing circuit results in detectable traces of the preceding batch in the batch in manufacture, which can cause cross contamination by microbial pathogens. To avoid possible intoxication of livestock, the following measures are fundamental: Use of incompatibility tables; implementation of a manufacturing order to avoid cross contamination; thorough cleansing of all parts of the manufacturing circuit, including circulation of rough materials through the circuit to eliminate adhesions in inaccessible areas to avoid possible intoxication in animals attributed to cross-contamination. The transport phase must not be forgotten



Figure 1. Effect of dust levels (cm) on the percentage of Salmonella-positive samples

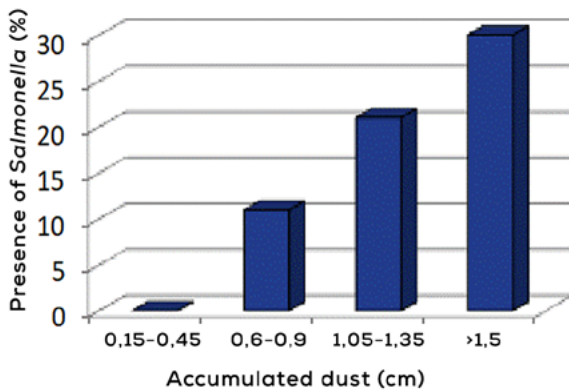
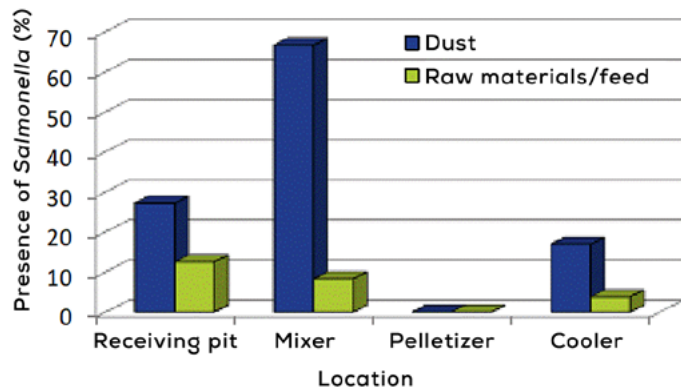


Figure 2. Percentage of dust samples and Salmonella-positive raw materials/feed according to their location



Nape, W.F. 1968. Recovery of Salmonella from material in feed mills. Pages 1-13 in Proc. of the 72<sup>nd</sup> Annual Meeting of the US Livestock Sanitary Association, New Orleans.

here either: All efforts to maintain the high microbiological quality of the feed may be lost due to poor hygiene conditions in the truck that transports the feed from the feed mill.

• **Inadequate cleaning of surfaces and equipment:**

Dust is the main source of contamination by Salmonella in feed mills (Miles, 1995), more than contamination of raw materials or feed (See Figures 1 and 2). The mixer and the receiving pit are the parts of the equipment with the highest risk of crusting or dust accumulation, so they require special attention, and frequent, thorough cleansing. Poor hy-

giene conditions in these facilities may permit entry of microbial pathogens to the feed mill, as well as proliferation of microorganisms in later stages of the manufacturing process.

• **Recontamination of feed:**

Agents external to the manufacturing process may often come into contact with feed as a result of deficiencies in the facilities. Birds, insects, rodents, pets, etc. are relatively frequent in feed mills and farms and it should be taken into account that many may be carriers of Salmonella spp. and other pathogens (See Figure 3). To avoid this risk of contamination by these external agents,

it is essential to implement a good facility maintenance plan (preventive and corrective), a good cleaning plan, and a good DDD plan (disinfection, pest control and disinfection).

In the case of pelleted feed manufacture, relying exclusively on heat treatment to prevent microbial contamination is not suffi-

MICROBIOLOGICAL PRESSURE OF VECTORS

Barber, D.A., P.B. Bahnson, R. Isaacson, C.J. Jones y R.M. Weigel. 2002. Distribution of Salmonella in swine production ecosystem. J. Food Prot. 65 (12): 1861-1868

Figure 3. Percentage of Salmonella-positive vectors

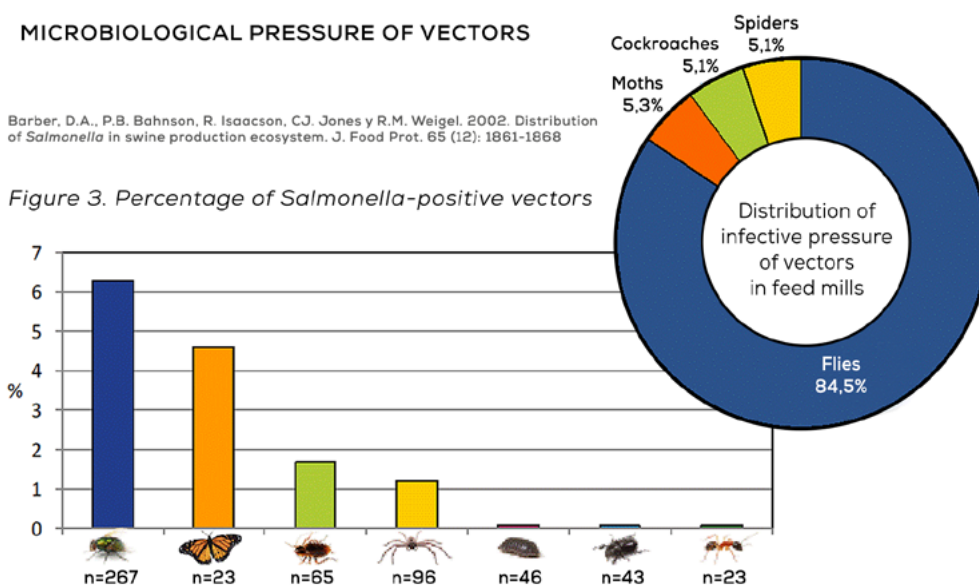
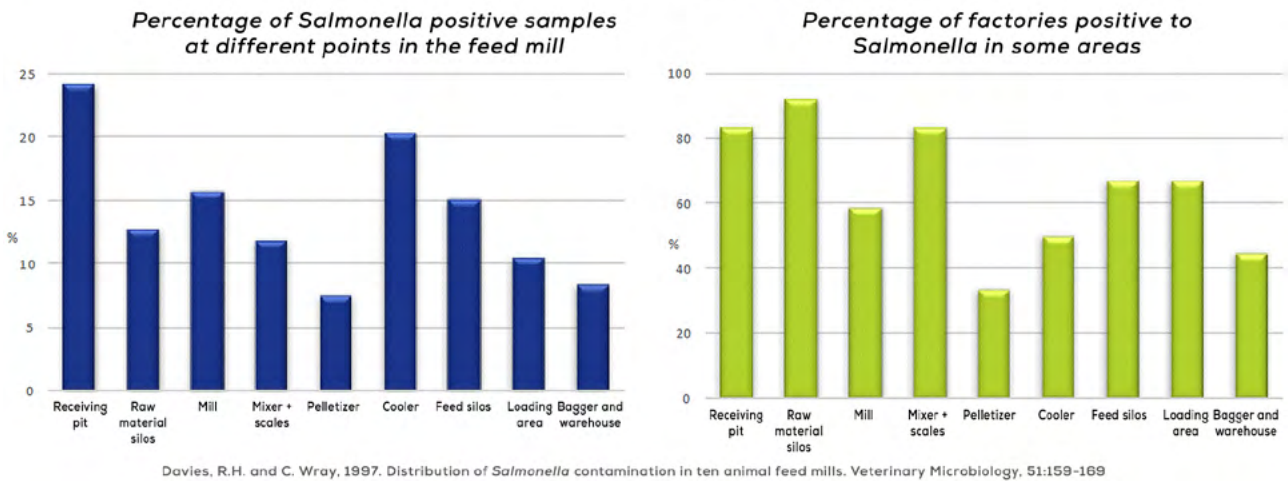


Figure 4. Effect of the thermal process through Salmonella along the feed manufacturing plant

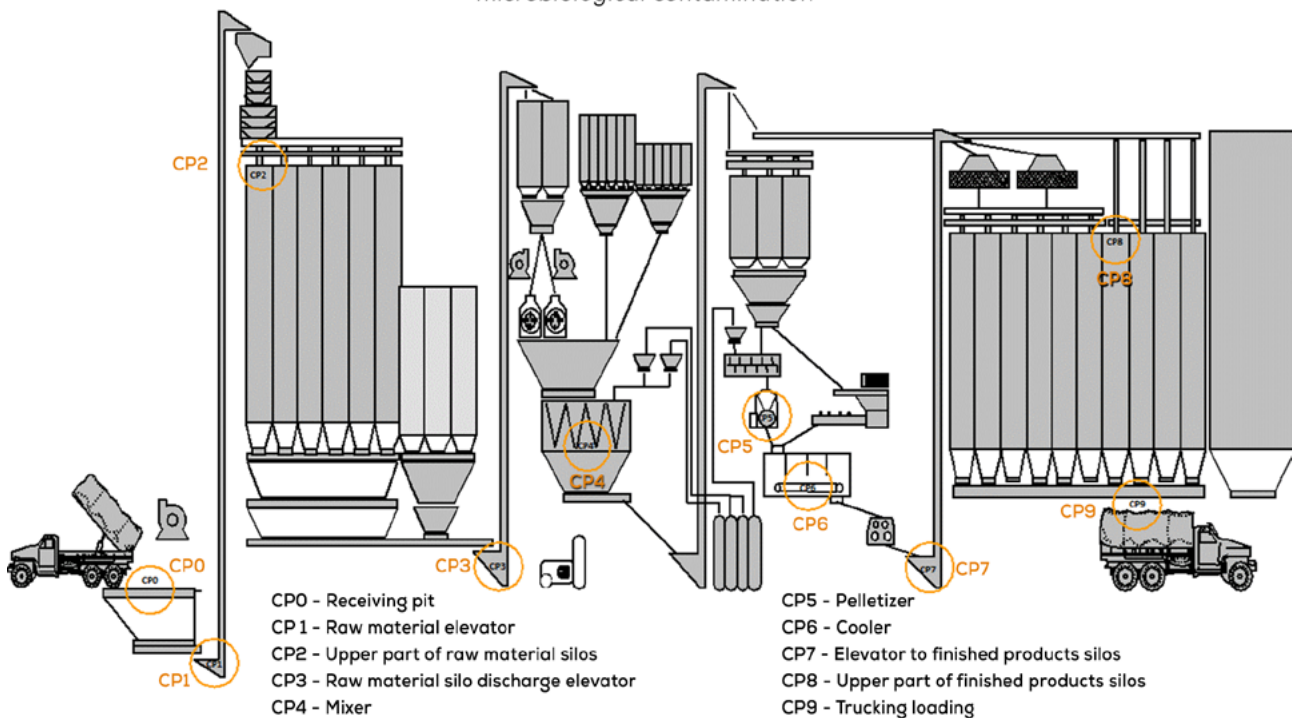


cient (See Figure 4). Although pelleting temperatures could be critical for some microorganisms, this process does not eliminate pathogens (it only decreases the quantity) because its effectiveness depends on several factors, such as temperature, humidity, time, microbial load and the resistance of the bacterial strains involved. Moreover, the feed remains totally unprotected against possible recontamination, as no residual protection is used after pelleting, so in order to deal effectively with microbial contamination, the additional use of preser-

vatives is required, preferably formaldehyde-based, as this is undoubtedly the most effective active substance suitable for use in the feed industry.

To ensure the fullest possible coverage of contamination from all the different sources mentioned above, the best dosage sites are the receiving pit and the mixer. Application at the receiving pit reduces, or may even eliminate, the initial microbial contamination which may have entered the feed mill pre-

Figure 5. Factory Control Points (CP) where surface samples are recommended for the control of microbiological contamination



ises. Application in the mixer reduces or eliminates microbial contamination that may have proliferated during storage of raw materials (microclimates which favour microbial growth are frequently formed in certain parts of the silo) and which typically result in the formation of crusts on the blades and walls of the mixer. This dust and crusting in the mixer is precisely where Salmonella is detected in a high number of samples, as reflected in Figures 1 and 2.

It must be also taken into account that the dosage itself is just as important as the product applied, as an underdose, or incorrect spraying will not allow the product to impregnate the feed mass adequately, and the product will consequently not have the desired effect. The calibration and continuous maintenance of the dosing equipment is therefore indispensable in order to guarantee the success of the treatment.

### CONCLUSIONS

- Maintenance of good hygiene conditions in the feed is fundamental for good animal health, and is

the main factor which contributes to optimum performance.

- There are many causes of microbiological contamination of feed: entry of contaminated raw materials, poor conservation of raw materials, cross contamination, poor cleaning, recontamination of feed, etc.

- Heat treatment is ineffective in dealing with microbial contamination and does not offer residual protection against possible recontamination after pelleting, which requires application of preservatives.

- Formaldehyde is the most highly recommended of all active substances used as preservatives in animal feed, for its high level of effectiveness.

- The application site, type of spraying, calibration and maintenance of the dosing equipment are all as important as the product used itself in guaranteeing the effectiveness of a treatment.

- Continuous monitoring of microbiological hazards in the feed mill is essential, through surface sampling and implementation of preventive and corrective measures, which decrease and try to prevent microbiological contamination (See figure 5).

# Feed Additive

INTERNATIONAL MAGAZINE FOR ANIMAL FEED & ADDITIVES INDUSTRY

RECENT NEWS

ARTICLES

RESEARCHES

INTERVIEWS

MARKET REPORTS



**FOLLOW US  
FOR RECENT NEWS  
IN ANIMAL FEED INDUSTRY**

- About Animal Nutrition Industry
- Feed Additives Industry
- Animal Health Industry
- Feed Technologies Industry
- Feed Safety
- Feed Raw Materials Market

and more...

**FREE NEWSLETTER**

**Click to Sign-Up**



feedandadditive

[www.feedandadditive.com](http://www.feedandadditive.com)



## DEBUNKING THE MYTHS BEHIND MYCOTOXINS: A VET'S VIEW

**Dr. Luke Miller, DVM**  
*Dairy Technical Support Specialist*  
Alltech

“Although there has been significant progress in the area of mycotoxin control, it is still pretty much impossible to entirely eliminate mycotoxins from the animal feed supply chain. Fortunately for producers, there are steps that can be taken – from when the crop is planted all the way through to the delivery of the feed to animals – that can help to mitigate the mycotoxin challenge. One of the key tools within this cycle is mycotoxin detection...”

It is a common misconception that, due to the anatomy of ruminants, mycotoxins may have a diminished effect on the health and production of cattle. The more we learn about mycotoxins, however, the more we realise that this is not the case. A modern dairy cow's intake will far outweigh any ability of its rumen environment to inactivate and denature the mycotoxins it consumes. Additionally, some mycotoxins can directly affect microbes and their environments. A rumen microbe will not have time to act before another load of mycotoxins is ingested.

Mycotoxins exist in almost every feed presented to cows. Across the last six months of Alltech 37+<sup>®</sup> mycotoxin testing, the most common ingredients and TMRs fed to dairy cows globally contained an average of 5.4 mycotoxins per sample, with 96% of samples containing two or more mycotoxins. When Alltech's risk equivalent quantity (REQ) metric is applied to these results, it reveals a higher level of mycotoxin risk to dairy cows overall, with subsequent additional impacts on health and performance.

When we analyse a ration for mycotoxins, we can look at two areas: ensiled forages and concentrates. Both of these have the potential to expose cattle to significant mycotoxin levels.

Ensiled forages are a key component of most dairy diets throughout the world. Due to the nature and composition of this commodity, ensiled forages often carry a high risk of mycotoxin contamination.

On the dairies I have worked with, I have never submitted a silage sample for mycotoxin analysis and found it to be completely void of mycotoxins. The clinical signs on the dairy may not exactly match the mycotoxin profile, but this is one of the subtle dangers of feeding mycotoxin-contaminated feed.

Field mycotoxins are a group of numerous different compounds, including — but not limited to — aflatoxin, deoxynivalenol (DON), fumonisins and zearalenone. Reduced growth rates, decreased feed efficiency, altered rumen and gut health, decreased milk production and poor reproductive performance can

all be signs of chronic intakes of these mycotoxins.

When we shift our focus to storage mycotoxins, some of the most common molds that we see are members of the *Penicillium* family. These molds produce a variety of mycotoxins, including patulin, penicillic acid and mycophenolic acid. This family of mycotoxins has a chemical structure similar to antibiotics developed to treat infections and, thus, has mainly antimicrobial and immune-suppressant actions.

For example, patulin has been found to alter the metabolism of nutrients through this exact method, where adverse effects on organic matter, protein and fibre digestion have all been noted. This change could lead to a detrimental impact on the performance and health of the animal. This is a discussion that many producers are not aware of, and it is a common-sense explanation as to why they may be having feed-efficiency issues on their operations.

I often speak with dairy producers and nutritionists about the types of feed that they are providing to their cows. The agriculture industry does not get the first choice of all the cereal grains or byproducts that cows consume; frankly, our cattle are often the last in line. This is due, in part, to the misconception that you can feed ruminants whatever falls out of the grain truck and they will not be adversely affected.

However, we also have the challenge of availability and resources. As a result of the droughts and late-season hail and wind in some regions, there are obvious concerns about this year's crop quality as harvest kicks off. Add the high commodity prices to this equation, and it is clear that we need to understand that, to meet demand, farmers are going to be emptying every silo and shipping all the grain they have available. As such, there are bound to be inconsistencies in storage ability and facilities across the country.

Mycotoxin risk can come from other sources in the ration as well, such as byproducts. When feeding large amounts of byproducts to dairy herds — a trend that can be more common during periods of high raw material prices in the US in particular — we need to understand that there can be a tremendous level of variability in the quality of these feedstuffs. Byproducts also often contain many dif-

---

"Mycotoxins can come from two sources: field toxins, which are already present in the forage, and storage toxins, which proliferate during the ensiling and storage process. Significant dangers are attached to both categories."



ferent types of mycotoxins from the Fusarium, Penicillium, Aspergillus or Claviceps families. The latter species of mold produces ergot alkaloid mycotoxins that can appear on the heads of cereal grains.

These mycotoxins can cause vasoconstriction in small arteries. The effects of ergot may be seen in the extremities of cattle, including their legs, feet and even the tips of their ears and tails. Depending on the contamination level, this can be a significant cause of lameness, with additional swelling and inflammation. We may also see a lack of heat tolerance and an inability to thermoregulate.

Production losses and random digestive upsets are two classic examples of how dairies can be affected by a hidden mycotoxin issue. Although milk production immediately draws attention, behind the scenes, there can be significant reproduction issues as well.

Mycotoxins that originate from the Fusarium family are a perfect example. It has been shown that dairy cattle fed diets containing DON, zearalenone and fumonisin mycotoxins experience reproductive issues, decreased milk production and mild liver disease. Additionally, it has been noted that, due to the production stress they experience, dairy cattle are likely more susceptible to lower levels of these mycotoxins.

***If we were to sum up some key points about mycotoxicosis in cattle, we would focus on the fact that:***

- Mycotoxins can be the primary cause of decreased milk production.
- Mycotoxins, through immunosuppression, can be the cause for increased incidences of disease.
- Symptoms of mycotoxicosis are often non-spe-

cific and can be wide-ranging.

### MANAGING THE CHALLENGE

Although there has been significant progress in the area of mycotoxin control, it is still pretty much impossible to entirely eliminate mycotoxins from the animal feed supply chain. Fortunately for producers, there are steps that can be taken — from when the crop is planted all the way through to the delivery of the feed to animals — that can help to mitigate the mycotoxin challenge. One of the key tools within this cycle is mycotoxin detection. Until the actual risk is identified and quantified, it can be very difficult to establish effective mycotoxin control programs or make successful use of in-feed ingredients, such as mycotoxin binders, that are designed to remove mycotoxins from the animal's digestive tract before they have a chance to cause serious harm.

Over the next few months, we will be completing the Alltech Harvest Analysis program across Europe, the U.S. and Canada. With the current drought conditions throughout North America and the turbulent weather — including widespread floods — being seen in Europe, the insights coming out of this year's analyses will be crucial to informing both feed and livestock producers of the necessary actions they will need to take to implement effective mycotoxin control.

If you are concerned about the quality of your own feeds or would simply like to understand more about the dynamics of the mycotoxin challenge in dairy production, please visit [knowmycotoxins.com](http://knowmycotoxins.com) or contact your local Alltech representative.

#### ***About Dr. Miller***

*Dr. Luke Miller's expertise extends to every level of a dairy operation. Prior to joining Alltech, he was the general manager for a 6,000-head, multi-site dairy in central California. During his eight years at the dairy, he managed dairy operations and a team of 45 employees, and he designed and constructed a state-of-the-art, 80-stall rotary milking barn. He also worked with local and national government agencies on grants and permitting.*

*Previously, Miller spent eight years as a large animal veterinarian, where he became the practice owner. He practiced all facets of large animal medicine and also aided in the design and implementation of dairy protocols and standard operating procedures.*

*He received a bachelor's degree in animal science and a doctoral degree in veterinary medicine from Michigan State University. Miller and his family currently reside in central California.*



# RELIABLE



**145  
COUNTRIES**



**BIGGEST STORAGE  
PROJECTS**



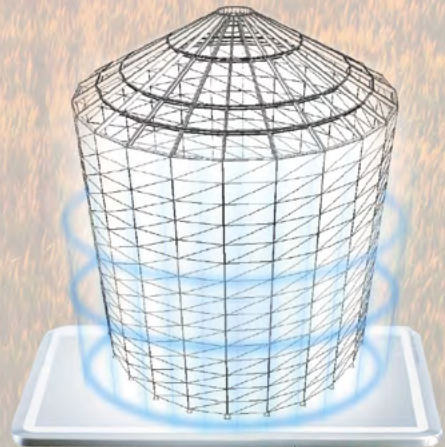
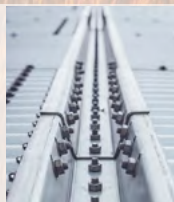
**42 MILLION  
M<sup>3</sup> BUILT**



**FLEXIBILITY  
AND ADAPTABILITY**

## Improved steel quality, bolting

Stiffeners made with HX500 LAD structural steel, increasing resistance by 45%.  
Preassembled bolting now as a standard supply.



**- YOUR PARTNER FOR STORAGE -**



## Global Pig Industry and Trends

The global pork industry draws attention as a market driven by China, the EU and the USA. These countries continue to maintain their leadership positions in terms of pig population, pork production/consumption and pig feed production, and lead global growth prospects. The global pork meat market size is projected to reach \$257,874.5 million by 2027, registering a CAGR of 3.9% from 2021 to 2027. Similar growth is expected in the pig feed market. Pig feed market is expected to register a CAGR of 4.1% during the forecast period, 2020-2025.

**By Derya Yıldız**

The global pig industry can be evaluated under two separate headings as meat and feed. According to Allied Market Research’s “Pork Meat Market (2021–2027)” report; the global pork meat market size was valued at \$236,112.7 million in

2019, and is projected to reach \$257,874.5 million by 2027, registering a CAGR of 3.9% from 2021 to 2027. Similar growth is expected in the pig feed market. According to the Swine Feed Market (2021 - 2026) report prepared by Mordor Intelligence; the





According to Food and Agricultural Organization (FAO), 50% of the global pig population is concentrated in China followed by the EU and the U.S. Such trends show that these regions will remain the highest compound feed consumers for pork production. On the pork trade side; Pacific countries like Japan, Australia, Mexico, New Zealand, and North Korea are the major pork importers, whereas China, the U.S., Canada, the European countries and Brazil are the major pork exporters.

**PIG POPULATION WORLDWIDE**

Pigs are one of the most commonly raised animals in the world. They are the primary protein source for millions of people across numerous different cultures and geographical regions. That's why they have a significant population around the world.

According to the data of the US Department of Agriculture (USDA) Foreign Agricultural Service; in 2021, there were over 752 million of pigs worldwide, increasing from around 654 million heads in the previous year. In the same period, China was home to the largest number of pigs of any country with 406

million heads, meaning that China was home to more than half of the global pig population. That year, the European Union and the United States were second and third in the list, with over 150 and 77 million heads respectively.

Brazil with 37 million heads, Canada with 14 million heads, Mexico and South Korea with 11 million each follow these countries.

**GLOBAL PORK MARKET**

Pork is the most popular and widely consumed meat source worldwide, majorly in Europe and Southeast Asia. Pork is cheaper than other meat sources which

is a major factor for its high consumption. In addition, its palatability, fat content and texture fascinate the consumer. A large middle class population,

**Swine Stocks - Selected Countries Summary**  
(in 1,000 head)

Countries	2019	2020 Apr	2020 Jul	2021 Apr	2021 Jul
China	428,070	310,410	310,410	406,500	406,500
EU	148,167	147,887	147,887	151,110	150,987
USA	75,070	78,228	78,228	77,312	77,012
Brazil	38,427	37,850	37,850	37,350	37,350
Canada	13,975	13,970	13,970	14,025	14,025
Mexico	10,700	11,050	11,050	11,500	11,500
S.Korea	11,333	11,280	11,280	11,078	11,078
Japan	9,156	9,090	9,090	9,100	9,100
Others	32,591	33,772	33,772	34,567	34,567
<b>Total</b>	<b>767,489</b>	<b>653,537</b>	<b>653,537</b>	<b>752,542</b>	<b>752,119</b>

Source: USDA

swine feed market was valued at USD 135.30 billion in 2019 and is expected to register a CAGR of 4.1% during the forecast period, 2020-2025.

growing disposable income and changing consumer preferences are levitating the pork demand.

According to the Swine Feed Market report of Mordor Intelligence; pork production and consumption are very high in the developed regions, such as North America and Europe and in the developing countries such as China and Japan. This is supported by the USDA data as well.

According to the “Livestock and Poultry: World Markets and Trade” report of the USDA; global pork production in 2021 amounted to 105 million metric tons. And China, which produced over 43 million metric tons of pork, was the leading country in the market. The European Union with 24 million metric tons and the United States with 12 million metric tons held the second and third positions, respectively. These countries were followed by Brazil, Canada, Mexico, South Korea, Japan, the Philippines and Hong Kong, respectively.

Since early 2021, China hog slaughter has been strong and carcass weights higher. Rebounding pork production at a time of weak seasonal demand has caused prices to drop rapidly, prompting liquidation of animals as Chinese producers have sought to protect margins. However, the reported culling of breeding animals, continued productivity challenges, and weaker producer margins are expected to slow China production growth later in the year.

According to the USDA report; the most commonly consumed meat in world are poultry and pork, though in the next several years poultry is expected to overtake pork in popularity. Global consumption of pork is projected to increase from 117.35 metric kilotons in 2017 to about 131 metric

Pork Production - Selected Countries Summary 1,000 Metric Tons (Carcass Weight Equivalent)					
Countries	2019	2020 Apr	2020 Jul	2021 Apr	2021 Jul
China	42,550	36,340	36,340	40,500	43,750
EU	23,956	24,150	24,267	24,500	24,800
USA	12,543	12,843	12,845	12,832	12,776
Brazil	3,975	4,125	4,125	4,250	4,280
Canada	2,000	2,130	2,130	2,130	2,225
Mexico	1,408	1,451	1,451	1,495	1,495
Korea	1,364	1,403	1,403	1,354	1,375
Japan	1,279	1,298	1,298	1,300	1,300
Philippines	1,585	1,115	1,115	1,000	1,000
Hong Kong	74	63	63	70	70
Others	11,291	11,559	11,780	12,050	12,050
<b>Total</b>	<b>102,025</b>	<b>96,698</b>	<b>96,817</b>	<b>101,481</b>	<b>105,121</b>

Source: USDA

Pork Consumption - Selected Countries Summary 1,000 Metric Tons (Carcass Weight Equivalent)					
Countries	2019	2020 Apr	2020 Jul	2021 Apr	2021 Jul
China	44,866	41,521	41,521	45,235	48,635
EU	20,425	19,621	19,751	20,120	20,365
USA	10,066	10,031	10,034	9,991	9,798
Brazil	3,116	2,949	2,949	3,002	3,007
Japan	2,714	2,724	2,724	2,730	2,730
Mexico	2,159	2,052	2,052	2,095	2,090
S. Korea	2,011	1,980	1,980	1,999	1,975
Philippines	1,806	1,281	1,281	1,349	1,424
Canada	947	874	874	885	941
Hong Kong	405	441	441	430	470
Others	12,477	12,454	12,695	13,017	13,017
<b>Total</b>	<b>100,992</b>	<b>96,169</b>	<b>96,302</b>	<b>100,853</b>	<b>104,452</b>

Source: USDA

kilotons by 2027. In the United States however, per capita consumption of red meat is expected to level off after reaching about 114 pounds.

Mordor Intelligence draws attention to the following points about the Asia-Pacific region in its report:

Asia is the leading market for pork consumption and production which accounts for about half of the world production. Owing to huge consumption of pork meat, the Asia-Pacific region is the largest market for swine feed products. South East Asia is the largest producer and exporter of pork in the world,

followed by Europe and North America. Pork meat is consumed in the region from ancient times and is the most preferred meat due to its fat content and taste. China is the major market for pork production, followed by Vietnam, Thailand, South Korea, Japan and the Philippines. Japan, South Korea and Taiwan are the saturated markets for pork consumption, while Vietnam and the Philippines are the emerging markets.

### GLOBAL PORK TRADE

According to the USDA report; global pork exports for 2021 are revised up 2 percent to 11.8 million tons on higher estimates for all major exporters. China imports continue to underpin global trade and are raised 3 percent to 5.0 million tons. Japan, Mexico and South Korea follow China in pork imports. Meanwhile, the Philippines imports are revised up 21 percent to 425,000 tons on lower tariffs and a continued ASF-induced supply deficit. Mexico imports are raised nearly 3 percent to 985,000 tons on high domestic prices, a stronger peso, and as an offset to strong exports. Japan, Mexico and South Korea follow China in pork imports.

In the global pork exports, European Union maintained its

**Pork Imports - Selected Countries Summary**  
1,000 Metric Tons (Carcass Weight Equivalent)

Countries	2019	2020 Apr	2020 Jul	2021 Apr	2021 Jul
China	2,451	5,281	5,281	4,850	5,000
Japan	1,493	1,412	1,412	1,425	1,425
Mexico	985	945	945	960	985
S. Korea	694	554	554	645	600
USA	429	410	410	438	445
Philippines	222	167	167	350	425
Hong Kong	331	378	378	360	400
Canada	242	273	273	270	275
EU	17	17	17	20	15
Brazil	2	2	2	2	2
Others	1,585	1,478	1,498	1,561	1,561
<b>Total</b>	<b>8,451</b>	<b>10,937</b>	<b>10,937</b>	<b>10,881</b>	<b>11,133</b>

Source: USDA

**Pork Exports - Selected Countries Summary**  
1,000 Metric Tons (Carcass Weight Equivalent)

Countries	2019	2020 Apr	2020 Jul	2021 Apr	2021 Jul
EU	3,548	4,546	4,533	4,400	4,450
USA	2,867	3,303	3,302	3,289	3,426
Canada	1,284	1,543	1,543	1,530	1,560
Brazil	861	1,178	1,178	1,250	1,275
Mexico	234	344	344	360	390
China	135	100	100	115	115
Japan	3	4	4	4	4
S. Korea	2	1	1	1	1
Philippines	1	1	1	1	1
Hong Kong	0	0	0	0	0
Others	399	583	583	594	594
<b>Total</b>	<b>9,334</b>	<b>11,603</b>	<b>11,589</b>	<b>11,544</b>	<b>11,816</b>

Source: USDA

## GLOBAL PIG FEED PRODUCTION

Region	2019	2020	Growth
Africa	2.46	2.48	1%
Asia-Pacific	120.64	120.61	0%
Europe	72.39	72.94	1%
Latin America	32.65	35.02	7%
Middle East	0.01	0.01	0%
North America	53.09	53.96	2%
Oceania	1.34	1.35	0%
<b>Total</b>	<b>282.58</b>	<b>286.36</b>	<b>1%</b>

Source: 2021 Global Feed Survey  
\*All numbers are in million metric tons.

leadership with 4.4 million tons. The U.S., the second largest pork exporter, exported over 3 million tons in the same period. Canada and Brazil ranked third and fourth, respectively, in world pork exports.

### MARKET STATUS IN GLOBAL PIG FEED

According to 2020 Alltech Global Feed Survey; pig feeds take the second place in global compound feed production (1.126 billion metric tons) with a share of 24.1 percent. The Asia-Pacific region stands out with 120.6 million tons in pig feed production, which was 286.3 million tons globally in 2020. Asia-Pacific region is followed by Europe with 72.9 million tons and by North America with 53.9 million tons in pig feed.

According to the survey; pig feed production was greatly impacted by African swine fever, with an 11% decrease. The primary producing region for pig feed remains Asia-Pacific, but it also experienced the largest decline of 26%, with China (-35%), Cambodia (-22%), Vietnam (-21%) and Thailand (-16%) experiencing large decreases. Europe, North America and Latin America remained relatively stable compared to the previous year, within a percentage point's worth of gain or loss. While Africa is a small region from a tonnage standpoint for pig feed, it showed a large increase of 29%.

### PORK MARKET TRENDS

According to Pork Meat Market (2021–2027) re-

port of Allied Market Research; the global pork meat market size was valued at \$236,112.7 million in 2019, and is projected to reach \$257,874.5 million by 2027, registering a CAGR of 3.9% from 2021 to 2027. The frozen segment was the highest contributor to the pork meat market in 2019, and is estimated to grow at a CAGR of 3.9% during 2021–2027 forecast period. Asia-Pacific was the highest revenue contributor, accounting for more than half of the global market share 2019, and is estimated to grow at a CAGR of 4.5% through the forecast period.

The growth of the pork meat market can be attributed to changes in the food consumption pattern of people all around the world. The expansion of retail market and easy availability of the product through various sales channel make it convenient for consumers to purchase packaged pork meat, which drive the sales figures. However, rise in the adoption of veganism and stringent law implemented against animal cruelty act as the major restraints of the global pork meat market. On the contrary, increase in popularity for organic pork meat and clean label products is expected to offer lucrative opportunities for the expansion and the global pork meat market growth.

Depending on the global pork meat market analysis by type, the frozen segment accounted for the highest share in 2019. The frozen segment is growing manifold due to rapid increase in consumption of meat, poultry and seafood. However, the frozen segment is expected to witness a modest growth rate through the forecast period. The growth of this segment can be attributed to the fact that consumers often prefer chilled pork meat than the frozen meat.

Depending on the global pork meat market forecast by application, the commercial segment accounted for the highest share in 2019. The growth in the commercial application of pork can be directly contributed to the growing working population and the trend of consuming meals outside homes. On the contrary, the outbreak of coronavirus has reduced the demand for pork in commercial establishments, and as a result, the consumption of pork meat through these establishments has been impact-

ed negatively. The household segment is projected to witness a notable growth rate throughout the forecast period. This is attributed to the fact that the household consumption of pork has increased considerably in Asia-Pacific, because it is a staple food. Moreover, various benefits associated with pork meat such as it is a rich source of proteins and vitamins and its luscious taste boost the growth of pork meat market. Moreover, the demand for pork meat for home consumption has increased, due to implementation of stringent lockdown, which, in turn, increased the consumption of home food.

Region wise, Asia-Pacific was the most prominent market for pork meat in 2019, and is expected to exhibit high growth rate during the forecast period. Europe and North America are expected to witness steady growth rate throughout the forecast period, owing to the presence of a large number of local players.

The players in the pork meat industry have adopted product launch as their key development strategy to increase profitability and improve their stance in the pork meat market. The key players profiled in the report include WH Group, JBS S.A., Smithfield Foods, Triumph Foods, Danish Crown, Tyson Foods Inc., Tönnies, Yurun Group, Vion Food Group Ltd., and Shuanghui Development.

### PIG FEED MARKET TRENDS

According to the Swine Feed Market (2021 - 2026) report prepared by Mordor Intelligence; the swine feed market was valued at USD 135.30 billion in 2019 and is expected to register a CAGR of 4.1% during the forecast period, 2020-2025. Rising consumption of pork meat is expected to drive the product demand in the market.

According to Food and Agricultural Organization (FAO), 50% of the global pig population is concentrated in China followed by the EU and the U.S. Such trends show that these regions will remain the highest compound feed consumers for pork production.

Asia is the leading market for pork consumption

and production which accounts for about half of the world production. Owing to huge consumption of pork meat, the Asia-Pacific region it is the largest market for swine feed products. South East Asia is the largest producer and exporter of pork in the world, followed by Europe and North America.

According to IMARC Group's Swine Feed Market report; the increasing concerns regarding food safety have created a demand for high-quality swine feed to ensure meat safety. Another factor that is stimulating the growth of the swine feed market is the rising awareness about the importance of maintaining a healthy pig diet amongst farm owners. In accordance with this, they are shifting from regular swine feed to functional and premium variants that help in improving the immunity of the animals against enzootic diseases as well as reducing the risk of metabolic disorders, acidosis, injuries and infections. Furthermore, an increase in the demand for organic pig meat from consumers in the developed nations, along with the introduction of new animal rearing practices and maintenance of high farming standards, has created a positive outlook for the global swine feed market.

### Resources

- *Alltech 2021 Global Feed Survey*, <https://one.alltech.com/2021-global-feed-survey/>
- *Mordor Intelligence, Swine Feed Market (2021 - 2026) report*, <https://www.mordorintelligence.com/industry-reports/global-swine-feed-market-industry>
- *IMARC Group, Swine Feed Market report, 2021-2026*, <https://www.imarcgroup.com/swine-feed-market>
- *Food and Agriculture Organization of the United Nations (FAO), Meat Market Review-March 2021*, <http://www.fao.org/3/cb3700en/cb3700en.pdf>
- *US Department of Agriculture, Foreign Agricultural Service (USDA), Livestock and Poultry: World Markets and Trade, July 12, 2021*, <https://www.fas.usda.gov/data/livestock-and-poultry-world-markets-and-trade>
- *Allied Market Research, Pork Meat Market (2021-2027) report*, <https://www.alliedmarketresearch.com/pork-meat-market>



 [www.feedandadditive.com](http://www.feedandadditive.com)



feedandadditive