Feed Additive

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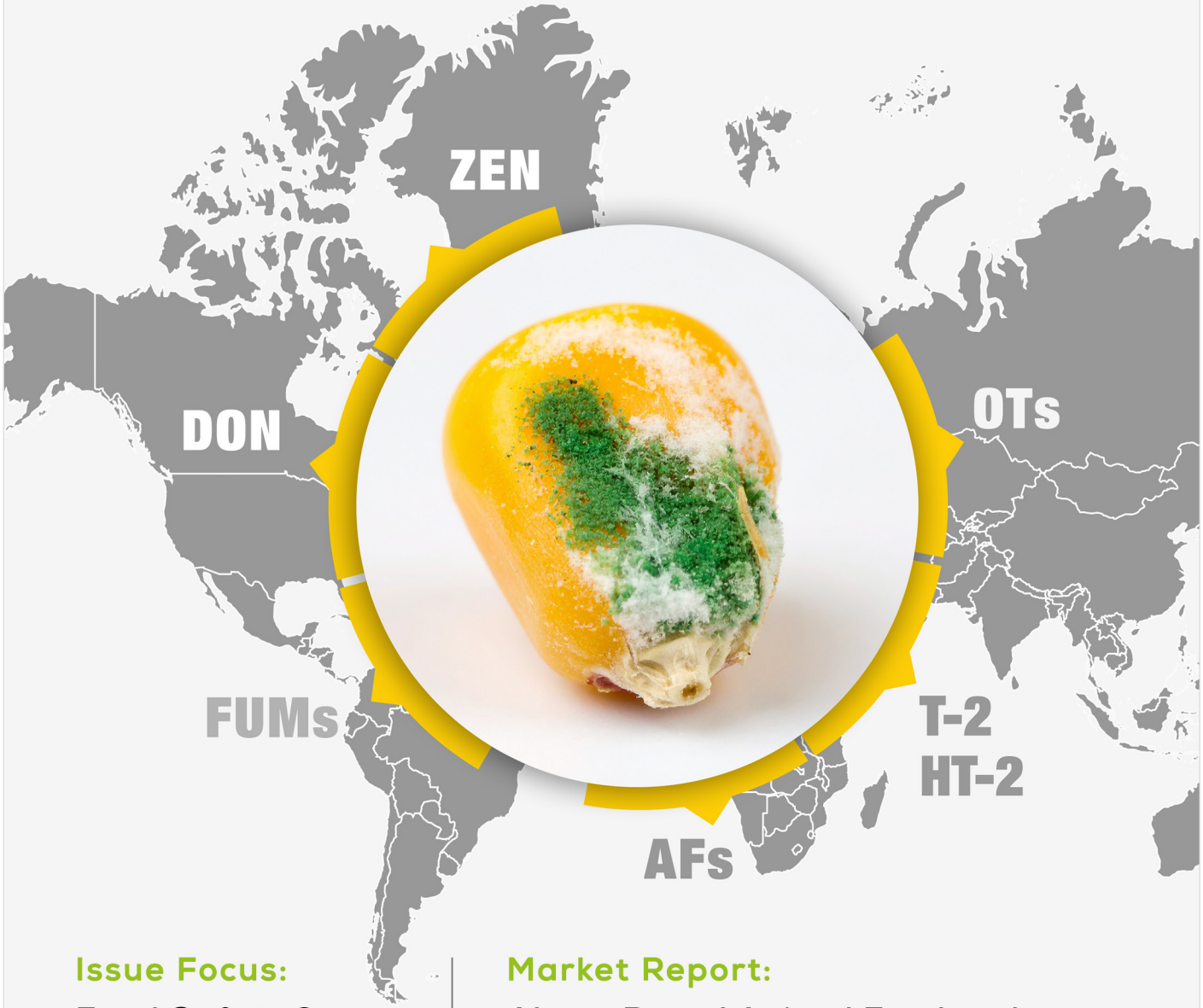

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with smarter feed management

EDITOR **Derya YILDIZ**

The Frail Chain: Feed Safety in the Wake of Growing Risks

The foundation for safe and sustainable livestock farming is quality and healthy feedstuffs. But geopolitical tensions, logistical bottlenecks and fluctuations in the raw material supply disrupt the global feed ingredient supply chain and lead to inconsistent quality. They also make access to feedstuffs both more expensive and more unpredictable. When negligence in storage and transportation is added to this, the problem is not only economic, but also poses serious health risks.

The smallest negligence in the post-harvest processes of feedstuffs can lead to the formation of harmful metabolites such as mycotoxins in a short time. Inadequate storage areas, inappropriate temperature-humidity balance and uncontrolled transportation conditions can render these valuable raw materials unusable. Climate change also aggravates the situation: Sudden temperature changes and increased humidity increase the risk of toxins such as aflatoxin, DON and fumonisin. These toxins not only threaten animal health, performance and welfare, but can also reach humans through animal products such as meat, milk and eggs. Today, the threat of these toxins, which weaken the immune system and cause yield losses, has reached a level that cannot be ignored in terms of public health. Today, the threat of these toxins, which weaken the immune system and cause yield losses, has reached a level that cannot be ignored in terms of public health. This situation makes feed safety not only a production issue, but also the shared responsibility of all stakeholders.

To summarize, feed safety is no longer the responsibility of feed producers alone, but of everyone from farmers to the food industry, from public authorities to the end consumer. Effective inspection, proper protection and up-to-date toxin management practices will shape not only the healthy production chain of today but also of the future.

In an era where food safety is closely linked to feed safety, feed protection is not a choice, but a responsibility to protect the health of animals, people and the planet. As part of this responsibility, we have covered various aspects of feed safety and toxin management in this month's issue. I hope you find it a useful and inspiring read.

Hope to meet you in the next one...

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CAN THE UK FEED INDUSTRY PLAY A BREXIT TRUMP CARD?

James McCulloch
Head of Feed Sector
Agricultural Industries Confederation (AIC)

Since the EU exit on 31 January 2020, the UK animal feed industry is managing the implications of departure from the trade bloc including, those for trade, regulation, and the ambition of the UK Government to improve food security.

TRADE

The UK industry sources 16mt of raw materials annually, with 54% from home-grown origins and the remainder globally. This exposes the industry to geopolitical shocks such as Covid, the war in Ukraine, Suez supply challenges, and now a looming global trade war.

It would be fair to conclude that the UK animal feed industry has yet to see benefits from the EU exit. However, independent of the EU, the UK may navigate a competitive advantage, with US tariff proposals and EU countermeasures being a prime example.

The initial US tariff proposal for EU goods was 20%, whilst only 10% for UK goods. In response, the EU proposed countermeasures of 25% on various US food and feed goods. The UK has not imposed any tariffs to date, but the Government is consulting on the issue.

The UK imports various feed materials and additives from the US, either directly or via the EU. These include maize, soya beans and meal, beet pulp, beet molasses, distiller's dried grains with solubles (DDGs), corn gluten, a range of feed additives, and amino acids.

Another example of an independent UK trade policy that benefits the feed industry is the decision not to place any anti-dumping measures on Chinese lysine imports. The EU provisional measures were set out in Implementing Regulation (EU) 2025/74 on 13 January 2025 and, if imposed, will have considerable economic implications for the EU industry.

However, Northern Ireland feed businesses importing Chinese lysine will be subject to EU measures, though these may be reversed under the Windsor Framework.

The Agricultural Industries Confederation (AIC), representing the interests of the UK feed industry, is engaged in discussions with the UK Government on tariffs and will be seeking a positive outcome for Members.

While trade policies are crucial, another significant area of focus for the UK feed industry is the regulatory landscape, particularly the opportunity to negotiate a UK/EU Sanitary and Phytosanitary (SPS) Veterinary Agreement.

UK/EU SPS VETERINARY AGREEMENT

AIC has engaged in separate discussions with the Department for Environment, Food and Rural Affairs (Defra) over the Government's ambition to negotiate an EU-SPS veterinary agreement. The Government has now begun the work of negotiating such an agreement with the EU, a policy shift that could benefit the entire agri-food supply chain in the UK. Since the Government took office, AIC has been working closely with ministers and civil servants as they engage in these negotiations to help foster a beneficial outcome for Members, to remove unnecessary barriers to trade between the UK and EU. Amongst such challenges, one cannot overlook the complexities that have arisen from trade between Great Britain and Northern Ireland in SPS matters. On 19 May, a high-level EU-UK summit will take place in London, and this will form part of the discussions.

REGULATION

Regulation is another area where UK policy proposals are leading to greater divergence from EU feed regulations. Simplifying the regulated products regime will benefit feed businesses. The UK Food Standards Agency (FSA) has proposed removing the need for 10-year renewals for feed additives, genetically modified organisms (GMOs), and smoke flavourings. They also suggest publishing authorisations after a ministerial decision, rather than prescribing them in legislation.

These proposals are welcomed by industry and will help ensure speedier approvals for new feed additives and GMOs and remove the cost of preparing and submitting dossiers for renewals.

Proposed deforestation regulations in the EU and UK have occupied much feed industry resource and, in the UK, the focus has been on identifying the differences between the EU Deforestation Regulation (EUDR) and the UK Forest Risk Commodities Regulation (UKFRC). Table at the bottom of the page highlights the main differences

Again, the UK deforestation regulation proposals appear pragmatic, and the industry supports the principle of deforestation-free supply chains. AIC has engaged in discussions with food and feed supply chain partners to highlight the extra compliance costs both sets of regulations will bring. It is important to note that Northern Ireland businesses might need to follow both UKFRC and EUDR rules.

A further regulatory proposal in the UK is the Precision Breeding (PB) Act, which regulates technologies such as gene-editing in plants and animals, presents an opportunity for the UK feed industry. In February 2025, UK Ministers announced that secondary legislation to implement the Precision Breeding Act for plants would be laid in Parliament. The necessary secondary legislation is expected to pass through Parliament and will allow FSA and Defra to receive applications for Precision Bred Organisms (PBOs) in England. AIC will represent the industry's interests in the Government's Precision Breeding Working Group, to ensure consistency of PB legislation across the UK, noting that similar legislation has now taken a step further forwards in the EU.

While regulatory changes are essential for industry growth, ensuring food security remains a priority for the UK Government, especially in responses to recent global challenges.

UK FOOD SECURITY

The UK Government has published a Food Security Report which identifies the challenges to the UK food supply chain resulting from major shocks such as:

- Societal responses to the COVID-19 pandemic caused fluctuations in supply chains due to government measures and economic stimulus,
- Russia's invasion of Ukraine in February 2022 disrupted energy and grain supplies, leading to higher food prices and impacting UK food security,
- Conflict in the Middle East altered supply routes, showing the global trade system's adaptability,
- Extreme weather conditions, exacerbated by climate change, caused further localized food chain disruptions.

The report serves as an independent evidence base to inform users rather than a policy or strategy. In practice, this means that it provides the Government, Parliament, food chain stakeholders, and the wider public with the data and analysis needed to monitor UK food security and develop effective responses to issues.

The UK feed industry is developing a risk register for feed materials and additives to inform discussions around food security issues – after all, food security depends to some extent on feed security.

	Illegal DF[1]	Legal DF	Illegal con[2]	Legal con	Direct	Embedded	Cut-off date	Geolocation data	Entry into force
EUDR	Yes	Yes	Yes	No	Yes – first placer on the market. Importers and EU farmers	No - 'relevant products' embedded in beef need to comply	Yes – Dec 2020	Yes	1.1.2026
UK FRC	Yes	No	Yes	No	Yes – annual due diligence report for businesses over £50m t/o and >500t in scope material	Yes – all in scope material embedded in all food must be accounted for	No	No	TBC

DF[1] Deforestation — Con[2] Conversion

Trouw Nutrition to present piglet physiology insights at DPP-NA

Trouw Nutrition, Nutreco's livestock feed business, announced it is collaborating with swine researchers, veterinarians, and nutritionists to share insights that decode piglets' physiological potential during the 16th International Symposium on Digestive Physiology of Pigs (DPP-NA), 20-23 May, 2025, in Lake Geneva, Wisconsin, USA.

In addition to serving as a gold sponsor of DPP-NA, Trouw Nutrition will be contributing research on animal nutrition, gastro-intestinal development, water acidification, mycotoxin mitigation, and more. The company's scientific contributions to the symposium include participation in two piglet nutrition panels and the submission of five scientific abstracts:

- The balance of dietary SID Thr with total dietary fibre for weaning piglets to optimise their growth performance, intestinal morphology, and mucin secretion – Michael Wellington and co-authors,
- Particle size of oat hulls in diets of nursery pigs influences their gastro-intestinal maturation – Tetske Hulshof and co-authors,
- (Oral presentation) Transcriptomic insights into the ileum and hypothalamus of poorly adapted weaner pigs – Lluis Faba Camats and co-authors,
- Effects of organic acid supplementation via water on the performance of weaned piglets – Karolina Von Zuben Augusto, Giseli Heim, Andrea Maria Silvestrim, and co-authors,
- Effects of mycotoxin mitigation additives against the emerging mycotoxins enniatins on suckling and nursery piglet performance – Sandra van Kuijk and co-authors.

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ADM inaugurates first wet pet food plant in Mexico

One of the global leaders in human and animal nutrition, ADM inaugurated a new pet food plant in Yecapixtla, Morelos. This facility, featuring three production lines and an investment of $39 million dollars, is ADM's first in Mexico dedicated to wet food for dogs and cats.

Since 2008, the company has become one of the leading players in the domestic animal nutrition industry in Mexico through its brands Ganador®, Minino®, Top Choice®, and FullTrust®. ADM points out that part of this consolidation is due to significant investments, in addition to opening this new line. The company inaugurated a new production line in 2023 to expand pet food production in Guadalajara and a Macro Distribution Center in the State of Mexico.

In addition to this, the care of these animals has been increasing. In fact, the Pet Nutrition Insights Report developed by the company, revealed that 79% of consumers worldwide would be willing to spend more on preventive care and premium food for their pets. In this sense, ADM explains it decided to expand its production facility in Mexico to meet the growing demand for food made with meat and other ingredients selected by animal nutrition experts, providing beloved pets with a balanced and varied diet.

The Morelos Plant stands out as one of the most modern facilities of the company in Mexico. Its automated processes contribute to promoting ergonomic work for employees, reducing energy consumption and efficiently using water, according to the announcement.

Read more>>

New study points to return on investment in salmon feed

Veramaris and Manolin shared the findings of a new study quantifying the commercial benefits of higher EPA and DHA in salmon feed. Big data analysis of Norway's commercial salmon production reveals the full benefits of higher levels of dietary Omega-3 EPA & DHA on survival, feed performance and quality, giving further evidence of the return on investment in better nutrition.

This new analysis uses real-world data to compare health and harvest metrics. EPA & DHA levels in Atlantic salmon diets act as levers, tipping the odds in favor of fish health and feed efficiency. The study shows how investment in nutrition helps to protect value throughout the supply chain, from farm to table.

The companies report the next info about the study: "This study, which processed a decade of data from 166 farms, 430 million fish and nine Norway production zones, builds on the findings of our previously published scientific research. Mortality rates were 8% lower and eFCR decreased by 13%, while flesh quality also

improved in populations fed diets rich in EPA & DHA. Improvements in predictability also increased by up to 50%, which translates into greater control over outcomes and more reliable business. "

Read more>>

Andritz to deliver complete feed mill to Saudi poultry producer

International technology group Andritz received an order from Alwadi Poultry Farms Company, based in Riyadh, Saudi Arabia, to deliver a complete, high-capacity feed mill for the production of poultry and ruminant feed. Andritz defines the order as a significant step in its expansion in the feed industry in the Middle East and Africa (MEA) region.

The new feed plant, which will be located in Riyadh Province, is scheduled to begin operations in the first half of 2026. Designed for a total capacity of 90 tons per hour (TPH), the facility will include two production lines for poultry feed (60 TPH) and one for ruminant feed (30 TPH).

Andritz will supply the complete process lines – from raw material intake to finished product – including key machinery such as hammer mills, mixers, pellet mills, and crumblers, with major components coming from manufacturing facilities in Europe. The order also includes installation supervision, commissioning, and local after-sales support by Andritz. With Andritz's advanced technol-

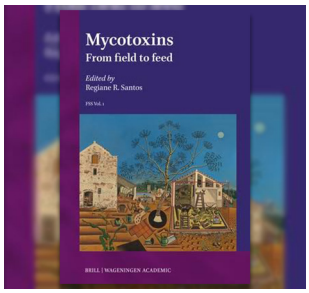
ogy, the plant is expected to offer high efficiency and flexibility as well as robust process control – all tailored to provide high-performance animal feed solutions for the Saudi market.

Established in 1975, Alwadi Poultry Farms Company is one of the leading poultry producers in Saudi Arabia, with integrated operations spanning chicken breeding, hatcheries, feed production, and poultry processing. The investment in this new plant underlines the company's strategy to enhance its production capacity, feed quality, and market position, according to the announcement.

Read more>>

Global experts unite to shed light on mycotoxins in new book

Mycotoxins are toxins produced by fungi, and circa 80% of animal feeds contain two or more mycotoxins. The book "Mycotoxins: From Field to Feed", edited by Dr. Regiane R. Santos, Senior Researcher at Schothorst Feed Research (SFR), discusses the potential risks of these contaminants for pigs, cattle, poultry, horses, fish, insects, and pets. It also focuses on prevention and detection in animal feed and on how to minimise adverse effects caused by feed contamination.



The book includes contributions from international experts from all over the world and is divided into 19 chapters. For instance, Professor Tegzes from Western University of Health Sciences (USA) wrote a chapter on the effects of mycotoxins in pets, while Professor Antonissen from Ghent University (Belgium) contributed with updates related to poultry. Professor Gallo from the Catholic University of the Sacred Heart (Italy) discusses the effects of mycotoxins on ruminants, and Dr. Alassane-Kpembi from Montreal University (Canada) discusses the interaction of mycotoxins with other mycotoxins, contaminants, and veterinary drugs.

Climate change plays a significant role in the increase of crop contamination with mycotoxins. As global temperatures rise and weather patterns become more erratic, the conditions that promote fungal growth are more present. This change can lead to shifts in the fungal species present in crop fields, creating an environment where more mycotoxin-producing fungi thrive. To discuss this, a chapter was written by Professor Medina from Cranfield University (UK).

The main goal of Dr. Santos is to promote the interaction among farmers, nutritionists, veterinarians, policymakers, university researchers, and the feed industry. "A bridge is needed between fundamental and applied research," she says.

Read more>>

New survey: 51% of vets feel unappreciated in their profession

Leading up to World Veterinary Day (April 26, 2025), Boehringer Ingelheim unveiled new survey results that shed light on animal owners' perceptions of the essential role that veterinarians play in animal health and community well-being. The 2025 survey of animal owners adds to a 2024 survey, also conducted in partnership with market research institute Kynetec, which explored if veterinarians feel valued and understood by animal owners. This is part of Boehringer Ingelheim's Going Beyond campaign, which seeks to put a spotlight on aspects of veterinary work that too often remain unseen and underrecognized.

"In collaboration with our Going Beyond campaign partners, we are proud to celebrate veterinary teams, bringing attention to their crucial role worldwide as animal health practitioners, advocates, researchers, educators, surgeons, public health experts and more," said Claire Fowler, Head of Global Strategic Marketing at Boehringer Ingelheim Animal Health.

The 2025 Going Beyond survey of animal owners revealed several findings, which contrast significantly with perceptions shared in the 2024 survey of veterinarians.

In the 2025 survey, 94% of animal owners said they appreciate the veterinary profession, and 91% recognized that veterinary teams are essential or important to our society. By comparison, 49% of veterinarians last year said animal owners appreciate the veterinary profession.

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New Report: Insect protein could be 13.5 times worse for climate than soy

Up to one fifth of the world's greenhouse gas emissions derive from meat production, the majority of which is from pig and poultry meat. With around 60% of emissions from pig and poultry meat linked to the production of animal feed, there has been much debate within the sector over the use of alternative animal feed sources with insect-based feed gaining interest as it may require less water, energy and land resource than plant-based products.

In July 2023, the UK government's Department for Environment, Food and Rural Affairs (DEFRA) commissioned Ricardo's sustainability team to provide an independent, scientifically robust Life Cycle Assessment (LCA) report exploring how, from an emissions reduction point of view, the production of insect protein might perform as pig and poultry feed compared to conventional soybean and fish stocks.

The research looked at the potential cradle-to-gate – ie. from raw material acquisition to manufacturing and distribution - impacts of using the larvae from Black Soldier Fly Larvae (BSFL) (Hermetia illucens) reared from both permitted sources (e.g wheat-based feed) and currently unpermitted sources (e.g food waste, chicken manure).

The associated potential impacts of the BSFL feed were assessed in terms of 16 environmental impact categories, including climate change, acidification, ecotoxicity, land, and water use. Comparative assessments were made for soybean meal grown in Brazil and transported to the UK, and fish meal made from blue whiting caught off the Scottish coast.

Read more>>

USA-based company unveils new approach to bird flu

In recent months, the bird flu pandemic has continued to devastate poultry operations around the world amidst continual outbreaks, tens of millions of birds lost, and skyrocketing egg prices. Avian Enterprises, LLC, an international company that provides bird repellant products for the agricultural industry and others, developed a new product – Avian Migrate® Goose and Bird Repellant – poised to offer poultry farmers a novel new solution.

The U.S. Department of Agriculture (USDA) and Centers for Disease Control and Prevention (CDC) have determined that aquatic birds such as– ducks, geese and swans congregating around ponds and other bodies of water near egg producing facilities– carry and spread the virus through their saliva and feces to chicken feed and other grounds where the domestic birds reside. Avian Migrate contains ingredients approved by the EPA, including those found in food products. It is sprayed in a light mist around a facility and grassy areas within 300 feet for

protection. Moreover, an InvisiDye® marker, seen only by the targeted birds, adds a visual warning in the 200-400mm spectrum with sensory and visual deterrents. According to the announcement, Avian Migrate® is a new variation on this proven technology, including how it is applied around a target area.

Recently, their Avian Control® product was examined for efficacy and confirmed overwhelmingly effective in a non-peer reviewed study of dairy barn facilities by Ohio State University. A 2025 peer-reviewed study is currently being planned, Avian Enterprises points out.

Read more>>

New white paper highlights role of dietary biotics in pet gut health

Alltech announced the publication of a new white paper titled “Dietary biotics: Strategies to optimize pet intestinal health and wellbeing” by Dr. Richard Murphy, Director of Research at Alltech, and Dr. Karina Horgan, Research Group Director of Alltech’s biology division. The new white paper explores the role of pre-, pro- and postbiotics in supporting pet gut health and wellness.

The paper highlights the growing importance of gut health in companion animal nutrition, emphasizing the link between a balanced microbiome and overall wellbeing.

"The microbiome plays a crucial role in nutrient absorption, immune function and disease resistance," says Dr. Murphy. "By incorporating targeted dietary biotics into pet nutrition, we can positively influence gut health, mitigate the effects of harmful pathogens and improve overall pet wellbeing."

A well-balanced intestinal microbiome is essential for digestion, immune response, and maintaining a healthy gut barrier. When gastrointestinal (GI) health is compromised, nutrient digestion and absorption are affected and susceptibility to disease is heightened. The paper details how specific biotic interventions — prebiotics, probiotics and postbiotics — can support a healthy gut ecosystem, ensuring improved digestive health, stronger immunity and enhanced resilience against pathogens.

Read more>>

Agri-Food Outlook: Global feed production increased by 1.2% in 2024

Alltech, one of the global leaders in animal nutrition and biotechnology, released its 2025 Agri-Food Outlook, a report that includes the results of the company's 14th annual global feed production survey. The publication shows that global feed production rebounded in 2024 after a stagnant 2023, increasing from 1.380 billion metric tons (mt) (+1.2%) to 1.396 billion mt. According to analysts, this growth — which was achieved despite challenges that included highly pathogenic avian influenza (HPAI), climate fluctuations and economic uncertainty — underscores the resilience and adaptability of the international agriculture industry.

The annual survey that serves as the foundation of the Agri-Food Outlook collected data from 142 countries and 28,235 feed mills in 2024. By analysing compound feed production and prices — collected by Alltech's global sales team and in partnership with feed associations and official data-collecting organizations — the survey provides a comprehensive snapshot of global feed production. These insights serve as a barometer for the overall livestock industry, highlighting key trends across species, regional challenges and opportunities for growth.

The top 10 feed-producing countries in 2024 were China (which produced 315.030 million mt of feed, down 2.03% from 2023), the U.S. (269.620 million mt; +0.68%), Brazil (86.636 million mt; +2.43%), India (55.243 million

mt; +4.56%), Mexico (41.401 million mt; +1.38%), Russia (38.481 million mt; +8.53%), Spain (35.972 million mt; +1.46%), Vietnam (25.850 million mt; +3.41%), Türkiye (24.502 million mt; +4.83%) and Japan (24.297 million mt; +0.14%). Together, the top 10 countries produced 65.6% of the world's feed — and 52% of all global feed production was concentrated in just four countries: China, the U.S., Brazil and India.

Read more>>

Phileo: Chondroitin solution supports joint health in pets

Phileo by Lesaffre, a global player in animal nutrition and health solutions, announced the launch of Safchondro® – an innovative, animal-free chondroitin sulfate product designed to support joint health and mobility in pets.

Safchondro® is produced through precision fermentation using a proprietary, non-GMO microbial strain, followed by a targeted sulfation process to enhance bioavailability and efficacy, according to the announcement. The company points to this advanced manufacturing approach as offering several key benefits compared to traditional, animal-derived chondroitin sources:

• Consistent Quality: Safchondro® provides a standardized, highly purified (99%) chondroitin sulfate, ensuring reliable efficacy,

• Enhanced Safety: As an animal-free solution, Safchondro® eliminates potential safety concerns associated with animal-derived products and decreases the risk of allergic reactions,

• Improved Sustainability: Phileo's precision fermentation technology reduces the environmental impact compared to conventional chondroitin extraction methods,

• Superior Bioavailability: Safchondro®'s low molecular weight and targeted sulfation process result in enhanced gut absorption and biological activity.

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FEFAC calls for direct negotiations on agri-food and feed products

European Feed Manufacturers' Federation (FEFAC) President Pedro Cordero expressed his deep regret about the US imposition of reciprocal tariffs of 20% on the EU, covering all agri-food exports to the US. He also shared concerns about the announced EC counter tariffs including essential, critical and strategic US agri-food products and feed ingredients, like soyabeans, coccidiostats, lysine and probiotics as well as maize and co-products like corn gluten feed and DDGS, noting that current EU import tariffs are at "0 duty" level for essential US feed ingredients.

Cordero urged the US and EU trade authorities "to open direct negotiations, seeking to exempt all agri-food products including essential feed ingredients from both US reciprocal and EU counter tariff schedules to safeguard global food security and resilience of the agri-food value chain."

Pedro Cordero stressed that "access to essential, critical and strategic U.S. feed ingredients is a crucial component of our collective EU and US feed chain efforts to ensure both feed and food security in the US, EU and at global level." He referred to existing great opportunities to double US/EU Ag products and feed trade, which could contribute to close the current US Agri- food trade deficit with the EU.

Read more>>

CCPA Group strengthens South American presence

The CCPA Group, a specialist in animal nutrition for almost 60 years, announced the acquisition of Nutrisur, a Uruguayan premix company with over 20 years of experience in the animal nutrition sector. CCPA points out this strategic operation as allowing the company to expand its presence in Latin America and strengthen its commitment to its customers in these key markets. The acquisition will be carried out through EURO-NUTEC PREMIX, a joint venture created in 1996 between CCPA Group (France) and NUTEC® Group (Mexico).

Nutrisur, located in Canelones, in southern Uruguay, is a major national player recognized for its professionalism, innovation capacity, and the quality of its products and services that meet the specific needs of farmers and their animals.

Nutrisur will now be able to rely on the research and experimentation resources of the CCPA and NUTEC® Groups. "This acquisition represents a key step in our growth strategy in Latin America," says Mickaël Marcerou, Chairman of Euro-Nutec's Board of Directors. "We are convinced that Nutrisur's expertise combined with our know-how will allow us to accelerate our development and offer increasingly innovative products and services that improve the profitability, sustainability, and efficiency

of farmers in Uruguay and the Southern Cone."

"This investment strengthens our commitment to innovation and the development of the livestock sector. We remain determined to optimize animal nutrition through digital transformation globally," adds Jérémie Larcher, CEO of NUTEC® Group.

Read more>>

New FAO-led study points to productivity as key for antibiotic reduction

A new study led by the Food and Agriculture Organization of the United Nations (FAO) and research partners highlights that improving livestock productivity is key to achieving substantial reductions in global antibiotic use.

Without targeted interventions, antibiotic use in livestock is projected to rise nearly 30% by 2040. However, the new research, published in Nature Communications, finds that strategic productivity gains in livestock systems could cut projected antibiotic use by half.

The study projects that, under a business-as-usual scenario, global livestock antibiotic use could rise to 143,481 tons by 2040, an overall increase of 30% from 2019. However, alternative scenarios indicate that antibiotic use could be reduced by up to 57% if livestock productivity is optimized. By improving animal health, management practices, and production efficiency, antibiotic use could be lowered to approximately 62,000

tons by 2040, demonstrating the potential of targeted interventions in achieving global reduction goals.

"Enhancing livestock production efficiency is key to curbing antibiotic use," said Alejandro Acosta, Livestock Economist at FAO and lead author of the study. "By producing more animal-sourced food with the same or fewer animals, we can reduce the need for antibiotics on farmed animals while strengthening global food security."

Read more>>

Eurolysine unveils new initiative to expand production capacity

Eurolysine, the sole lysine producer located in the European Union, announced the launch of a feasibility study aimed at increasing its lysine production capacity. The company points to the initiative as a reflection of its commitment to strengthening the EU's sovereignty in essential amino acids for animal nutrition while responding to the growing demand for sustainable and locally produced feed ingredients.

"Avril took over Eurolysine less than a year ago and we announced an investment plan of 130 million euros over the next five years to develop production. This investment plan has already begun and lysine production already increased significantly over the recent months. The plant will reach full speed production in Q3 2025. The study which is now launched opens a new chapter looking beyond the restauration of Eurolysine's historical production capacity. The relaunch of Eurolysine illustrates the Avril's determination to promote European agricultural and industrial sovereignty," said Jean-Philippe Puig, CEO of Avril.

"With this new project, we are talking about a 20% increase in production capacity at the 2027 horizon. As the only lysine producer in the EU, Eurolysine plays a strategic role in supporting the European feed industry. This feasibility study will allow us to explore innovative solutions to scale up our production capacity while maintaining our high standards of quality, efficiency, and sustainability," added Eddy Feijen, CEO of Eurolysine.

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Avril opens first internal laboratory for feed and food

Avril took a new step in its innovation strategy with the opening of Innolab, its first integrated laboratory, located at the heart of the group's campus in Bruz (near Rennes, France). Designed to foster cross-functionality collaboration and synergy between food, feed, and data expertise, the company describes the space as being dedicated to designing the food of tomorrow.

The laboratory is focused on addressing the needs of Avril's business units and the support of its clients. Nearly 50 researchers are united around a common mission: To provide concrete and innovative solutions and technical support to tackle the challenges of agricultural, food, and environmental transitions.

Strategically located in the heart of France's livestock region and close to the nutrition and animal expertise teams of Sanders and MiXscience, the FEED division of Innolab is designing solutions to meet key challenges in animal agriculture: Farm competitiveness and product quality, greenhouse gas reduction, disease prevention, and animal welfare.

Innolab houses in vitro testing capabilities that replace traditional animal testing. By simulating the digestive systems of ruminants, poultry, and pigs, Avril notes that the lab is fully equipped to develop new nutritional and functional innovations.

Read more>>

Skretting inaugurates its first dedicated LifeStart facility in Asia

Skretting China celebrated the grand opening of its new LifeStart production line in Zhuhai – Skretting's first dedicated LifeStart facility in Asia, on April 17, 2025. At the same time, they launched five new innovative hatchery feed products, for diverse species including salmon, tilapia, golden pompano, snakehead and catfish.

According to the announcement, the double celebration is significant as it signals Skretting's confidence in the future of China's aquaculture industry, and its commitment to supporting its long-term growth. As China is the largest animal protein market in the world, where seafood is second only to pork, Skretting and its parent company Nutreco have chosen to boost production capabilities to serve the LifeStart segment, and become the most value-driven nutrition company in China.

"China is one of the most dynamic and competitive markets globally, not just in scale, but in speed of development, diversity of species, and evolving customer needs. Within the global Nutreco organisation, China plays an increasingly strategic role as

a key market," said Bastiaan van Tilburg, CEO of Skretting. "Our ambition in LifeStart in China is high. We aim to be the undisputed leader in this space by 2030, particularly for salmonids, shrimp and marine fish," he adds.

Skretting points out LifeStart products as feed products fed to larvae and juveniles in the first few months of their life, in order to influence the quality and success rate of farming through the whole production cycle.

Read more>>

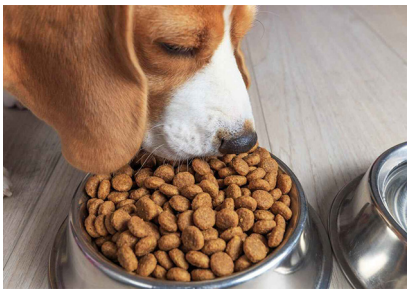
IFF expands pet care portfolio with latest science-backed innovations

International Flavors & Fragrances Inc. (IFF), a global powerhouse in bioscience and innovation, announced a groundbreaking expansion of its pet portfolio. The company points to the launch as marking a significant leap in its mission to revolutionize companion animal care through advanced biotechnology and innovation.

"We're excited to bring our world-class bioscience into the pet wellness space," said Dr. Jordon Gruber, Companion Animal Technical Leader, Health & Biosciences, IFF. "Our new portfolio empowers brands to tackle key challenges, delivering standout products that enhance pet health and wellness in a competitive marketplace. From improving gut health and dental care to hydration and reducing odors, we are setting a new benchmark."

Leveraging decades of expertise in human and animal wellness, IFF integrates flavors, functional technologies, processing aids, and ingredients into a cohesive ecosystem designed to drive industry innovation.

IFF's Pet Solutions are supported by specialized R&D centers, including the Pet Translational Research Lab (Wilmington, Delaware, USA), Pet Enzymes Lab (Brabrand, Denmark), and Pet Applications Lab (New Century, Kansas, USA). IFF explains these centers advance clinical science and application research, ensuring every ingredient and solution is backed by real data and impactful results.



Read more>>

Cargill honored with Edison Award for its layer innovation

During the Edison Awards™, Cargill's REVEAL™ Layers won a bronze award in the Smart Farming & Sustainability category. Cargill points out that REVEAL™ Layers is a cost-effective solution to monitor poultry body condition.

Cargill Animal Nutrition and Health (ANH) announced that REVEAL™ Layers, its groundbreaking, non-invasive technology for monitoring hen body condition, won a bronze award at the prestigious 2025 Edison Awards™ in the category of Smart Farming & Sustainability. The Edison Awards™, held from April 2-3 in Florida, USA, honor excellence in innovation, recognizing groundbreaking technologies that drive progress in industries worldwide. Cargill points to the accomplishment as a testament to its commitment to innovation and excellence in poultry production.

Through its best-in-class scientists and technical team members, Cargill ANH aims to solve customer challenges, improve their production outcomes globally, and innovate on what matters most to them.

HOW CAN REVEAL™ LAYERS SUPPORT PRODUCTION OUTCOMES?

Cargill explains REVEAL™ Layers as a first-of-its-kind, non-invasive near-infrared (NIR) technology that monitors poultry body condition. This innovation supports poultry producers by helping to:

• **Make real-time decisions:** REVEAL™ Layers provides real-time data on body condition, enabling precise adjustments to diet condition based on flock insights. This can help improve performance and increase profitability.

• **Support long-term egg production:** Optimal body condition supports sustained egg production over the long term, ensuring that hens remain productive while maintaining immunity.

• **Improve profitability:** By combining REVEAL™ Layers with Cargill's nutritional expertise, producers can significantly reduce feed costs while maintaining high productivity.

• **Proven ROI:** REVEAL™ Layers enables producers to achieve significant increases in eggs per hen, extend the laying period by up to 10 weeks, and realize a 15:1 ROI through precise dietary adjustments and non-invasive monitoring.

WHY IS BODY CONDITION IMPORTANT?

Maintaining optimal body condition is the foundation of long-term flock performance. Proper body condition supports:

• **Overall Hen Welfare:** Supporting resilient birds.

• **Liver Health:** Helping maintain normal metabolism.

• **Efficient Nutrient Metabolism:** Supporting hens to convert feed into eggs effectively.

KNOW YOUR FLOCK

The company emphasizes REVEAL™ Layers as offering a simple, cost-effective solution to monitor fattening status, helping improve egg laying performance, and supporting animal welfare.

More information about REVEAL™ Layers and how it can benefit poultry operations can be found on Cargill's website.

FEFAC publishes its Feed & Food Report 2024

The Feed & Food Report 2024, recently published by the European Feed Manufacturers' Federation (FEFAC), offers a comprehensive overview of the economic trends shaping the European feed sector, highlighting the industry's vital role within the EU feed and food supply chain and its contribution to the livestock and aquaculture economies.

Current report presents key data from the 2023 calendar year, covering areas such as compound feed production, feed material usage, industry turnover, as well as meat production and consumption statistics.

The industrial compound feed industry is a dynamic sector with slow but steady growth over the past two decades. According to FEFAC, this growth reflects market preferences of livestock and aquaculture farmers on efficient compound feed to meet increasingly stringent performance and quality standards. While the decline recorded in 2020 can be primarily attributed to the UK's withdrawal from EU production totals, subsequent decreases in production reflect broader global disruptions. Stating that factors such as the COVID-19 pandemic, geopolitical tensions, notably the conflict in Ukraine, and member states' environmental policies, have reverberated throughout the EU livestock sector, the federation adds that these challenges have cast a shadow over the EU feed industry, contributing to a recent decline in production.

Read more>>

Wayne-Sanderson Farms and BinSentry partner for supply chain management

One of the largest poultry producers in the US, Wayne-Sanderson Farms announced its partnership with BinSentry to enhance management of the company's animal feed supply chain throughout its operations.

The companies reached an agreement that will see Wayne-Sanderson Farms deploy BinSentry's ProSense Feed sensors on feed bins positioned adjacent to poultry houses across all of its operations. According to the announcement, these sensors will provide highly accurate feed inventory tracking, allowing operations managers to identify and address potential issues in their supply chains much more quickly compared to manual processes still used in much of the industry today.

With more than 2,000 farm partners and 26,000 employees at 23 processing facilities across the southeastern United States, Wayne-Sanderson points to this effort as reflecting its commitment to supporting family farmers and promoting animal welfare, sustainability, and workplace safety, while providing high-quality food to consumers.

"Over the past two years, we have been working diligently to apply new technology solutions to improve the management of our animal feed supply chain, which represents our largest operating

expense," said Kevin McDaniel, CEO of Wayne-Sanderson Farms. "The BinSentry platform is a true win-win solution that aligns with our goals by improving supply chain management, replacing manual processes, and allowing us to focus on feeding our chickens high-quality feed to care for them and produce the best food for our customers."

Read more>>

BIG DATA IS TRANSFORMING DAIRY FARMING

Dairy Data Warehouse Has Been Leading the Way for Over 11 Years

SEAMLESS DAIRY DATA SOLUTIONS FOR BETTER DECISIONS

Like many aspects of the agriculture industry, big data in dairy farming is changing the game, with businesses across feeding, genetics, sensors, and dairy advisory services leveraging standardized dairy data to improve efficiency, productivity, and sustainability. Dairy Data Warehouse (DDW) provides tools that help companies create innovative solutions, enhance herd performance, and support consultants make better decisions. DDW contributes both individual and herd-level information to assist agribusinesses with decision making across 47 countries.

DDW offers seamless dairy data solutions, allowing customers to plug into herd management software, milk processing systems, MROs and TMR softwares. Customers can choose from over 120 KPIs to measure and monitor such as average lactation, average days in milk, days to conception, insemination/pregnancy rates and many more.

DRILL DOWN TO INDIVIDUAL COWS

DDW has detailed dairy data solutions for every individual cow on the farms we partner with—what we refer to as Individual Cow Data Marts (ICDMS). This solution offers pinpointed data on everything from a cow's fertility to milk production. Big data in dairy farming accessed through ICDMS can show health and reproductive tracking for that animal, her milk production trends and feeding and movement data.

ICDMS is ideal to help businesses build precision dairy farming tools, animal health applications, genetics solutions, or any solution requiring animal-by-animal consideration when making decisions. If your company is creating tech for the farm or veterinarians, ICDMS from DDW can be critical for your success.

EXAMPLES OF DAIRY DATA SOLUTIONS IN ACTION

ABC Feed Company integrates dairy data solutions from DDW to track how different rations impact milk yield across multiple dairy farms. By adjusting nutrient composition based on real-time feed conversion efficiency data, the company has helped their customers reduce feed waste while improving milk production.

XY Genetics Company utilizes reproduction and milk production data from DDW to rank bulls based on real-world performance. Dairy farmers are then able to better select sires that maximize herd fertility and milk yield.

Tech Sensor Company 123 integrates health and milk production KPIs from DDW with their movement tracking sensors. By combining activity data with milk yield and health records, dairy farmers can more quickly detect lameness and mastitis, lowering treatment costs.

TAKE A 30,000-FOOT VIEW

DDW takes individual cow data a step further, by combining dairy data solutions into herd-wide intelligence. Our herd-level insights solution, KPI Library, provides dairy data solutions that can be used for benchmarking, analytics and decision-making tools.

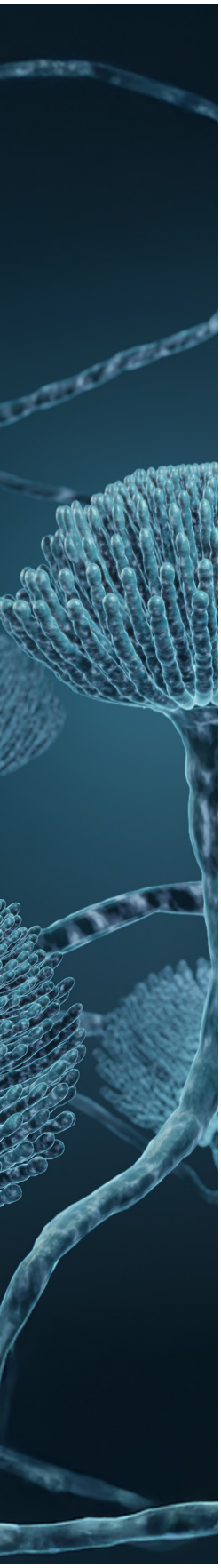
E.g., DDW's KPI Library can aggregate big data in dairy farming showing milk yield per herd, fertility and breeding performance for each dairy operation, and indicators for animal health and sustainability across each herd.

Another example might be examining feed conversion efficiency across herds, milk yield per cow, and fat-to-protein ratio. By digging into these dairy data solutions, dairy nutritionists can ensure cows receive the right balance of nutrients to optimize milk production without overfeeding, which can be wasteful and expensive.

This big data in dairy farming can be utilized to make better decisions that need to be taken at an industry-wide level.

For more information, visit Dairy Data Warehouse online or on our YouTube channel.

FEED SAFETY & TOXIN MANAGEMENT



- The relevance of mycotoxin mitigating strategies on dairy farms
  Dr. Cornelia Becker, Biochem
- Mycotoxins as contributors to antibiotic resistance?
  Dr. Inge Heinzl & Marie Gallissot, EW Nutrition
- Managing the health risks of emerging mycotoxins
  Josep Garcia-Sirera, Agrimprove
- Harnessing organic acids to combat moulds and preserve grain quality
  Eugenio Alcalde, Selko
- Tackling Fumonisins: A new era in animal health
  Mariano Gomory, MIAVIT GmbH
- Mycotoxin testing for millers: Ensuring safe and high-quality feed
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  Dr. Vivi Koletsi, Alltech Coppens
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  Dr. Swamy Haladi, Trouw Nutrition

THE RELEVANCE OF MYCOTOXIN MITIGATING STRATEGIES ON DAIRY FARMS

Dr. Cornelia Becker
Product Manager Toxin Management
Biochem

When the relevance of mycotoxin mitigating strategies in dairy farms was discussed in the past, the focus was on managing aflatoxin B1 in the final feed to avoid a high carry-over rate of AFM1 into milk and thus protect human health. In recent years, however, the health of the dairy cow itself and its maintenance have become increasingly important.

Even if ruminants are less sensitive to the effects of mycotoxins than monogastric animals thanks to a certain microbial detoxification in the rumen, this protection may not be sufficient in all cases:

- The feed of dairy cows leads to a high exposure to a broad spectrum of mycotoxins, especially through the various silages (Fink-Gremmels, 2008). As the dry matter intake is also very high, dairy cow feed obviously carries a high qualitative and quantitative risk for the uptake of mycotoxins.
- The degradation of mycotoxins is reduced when feeding with high energy density due to a shortened passage time or, for example, in the case of deoxynivalenol (DON) with reduced rumen pH (Debevere et al., 2020). It can therefore be assumed that intensive feeding is associated with a reduced detoxification of mycotoxins overall.
- When some mycotoxins are degraded, the degradation product can sometimes be even more harmful than the original toxin. For example, the degradation of zearalenone (ZEA) leads, among other things, to the formation of α-zearalenol (Seeling et al., 2005), which is 60 times more estrogenic than zearalenone itself.

As a result, there is a real risk that larger quantities of mycotoxins may escape ruminal detoxification and lead to symptoms similar to those of monogastric animal species. The most frequently reported clinical signs are reduced milk yield, an altered milk quality, which is particularly evident in reduced milk fat, increased somatic cell count (SCC) or partly reproductive disorders.

There is a wide range of variations in the assessment or determination of critical contamination levels. While in scientific trials with an artificial contamination by purified mycotoxins, very high quantities appeared to be necessary to trigger such symptoms, field reports point to reduced health and performance even at levels far below the EFSA guidance values when feeding naturally contaminated raw materials (Whitlow et al., 2008). In the following, several field trials are presented that show from different perspectives how low to moderate levels of field contamination can have a negative impact on dairy cow performance and health and how an efficient broad spectrum toxin binder (B.I.O. Tox®Activ8, Biochem) can prevent these adverse effects.

FIELD TRIAL I

The first field trial was conducted as an on-off design on a German dairy farm with about 1,180 lactating Holstein Friesian cows. Farm production data had shown a clearly negative tendency from spring onwards, reaching a low point in June. The mycotoxin DON was first detected in the milk and then also in TMR together with ZEA. Subsequently, the toxin binder (TB) was added to the TMR of the lactating cows by a premixture, resulting in a dosage of 20 g/head and day in the Start group and 25 g/head and day in the High Yield group for a period of two months. Meanwhile, mycotoxin levels in the milk as well as the development of performance parameters were monitored. Table 1 provides an overview of all results before and at the end of the trial period.

During the trial period, all parameters were improved. Considering the on-off character of the trial, these parameters certainly may also be influenced by other environmental factors like the varying quality of feed ingredients. The daily maximum temperatures monitored from June till end of trial period did not show extreme or strongly deviating conditions and are unlikely to have had a decisive influence on the performance as well as the average lactation day of the herd, which was nearly the same.

The clear reduction of DON-derivates in the milk with no change in the contamination of the TMR suggests that TB is effective in reducing the bioavailability of DON. This factor may have contributed decisively to the stabilization of performance and health issues during the trial period.

After the successful stabilization of the performance parameters, the trial farm discontinued the use of the TB in October. However, after about two months, parameters started to deteriorate, and the milk analysis again showed an elevated DON level. Hence, the farm started reusing TB and parameters stabilized again, including the DON level below the guidance value. Figure 1 shows the development of DON levels in milk and TMR.

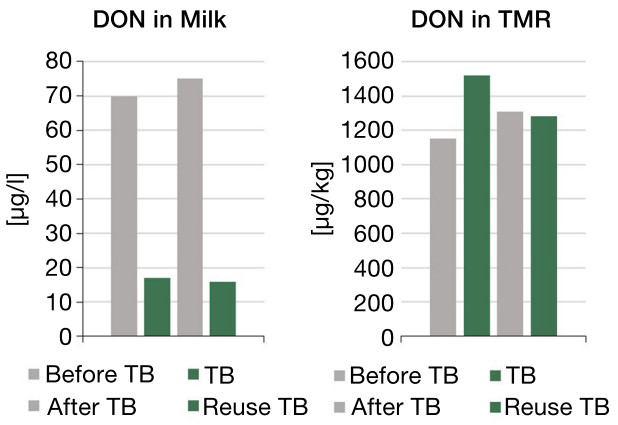

Figure 1. Development of DON levels in milk and TMR

Table 1. Overview results before and at end of trial period

Parameter	Before trial	End of trial
Mycotoxin level TMR	1,150 ppb DON - 119 ppb ZEA	1,519 ppb DON - 163 ppb ZEA
Mycotoxin level milk	70 ppb DON	17.3 ppb DON
Milking average (official monthly testing)	31.3 kg/cow/day	33.8 kg/cow/day
Milk fat (monthly average tank milk)	3.66 %	4.05 %
Milk protein (Monthly average tank milk)	3.20 %	3.29 %
SCC	475 [x1,000/ml]	390 [x1,000/ml]

FIELD TRIAL II

The next field trial took place on a Czech dairy farm with about 500 Czech Simmental cows. The aim was to test the influence of the TB on milk yield, milk ingredients and SCC under a moderate field contamination with mycotoxins. The TMR analysis showed contamination with 700 ppb DON and 190 ppb ZEA and the farmer, being used to higher inclusion rates for such products, insisted on double the recommended dosage of 25 g to 50 g TB per cow and day. The product was used for a duration of 8 weeks and the results of the monthly milk testing, which records milk yield, ingredients and SCC, were used for the evaluation.

Figure 2 shows the temporal development of the parameters over the test months (green bars) as well as 4 months before and one month after product application (grey bars). Under the use of the TB, milk yield increased while SCC was reduced compared to the months without product use. Taking into account the milk fat and protein contents monitored in parallel, it was also possible to calculate the energy corrected milk (ECM), showing as well a clear economical advantage for the farmer. After deducting the product costs, the farm was left with an average additional income of more than 100 € per day.

FIELD TRIAL III

The positive results obtained in Germany and Czeck Republic were confirmed by a further field experience on a dairy farm in Northern Ireland. The farm with around 200 Holstein Friesian lactating cows faced an unusual drop in performance, which was accompanied by an increased SCC and mastitis incidence as well as a reduced appetite in the cows. The mycotoxin analysis of the TMR revealed only a low contamination of approx. 200 ppb DON and the cows received a dosage of 25 g TB per head and day over an observation period of eight weeks.

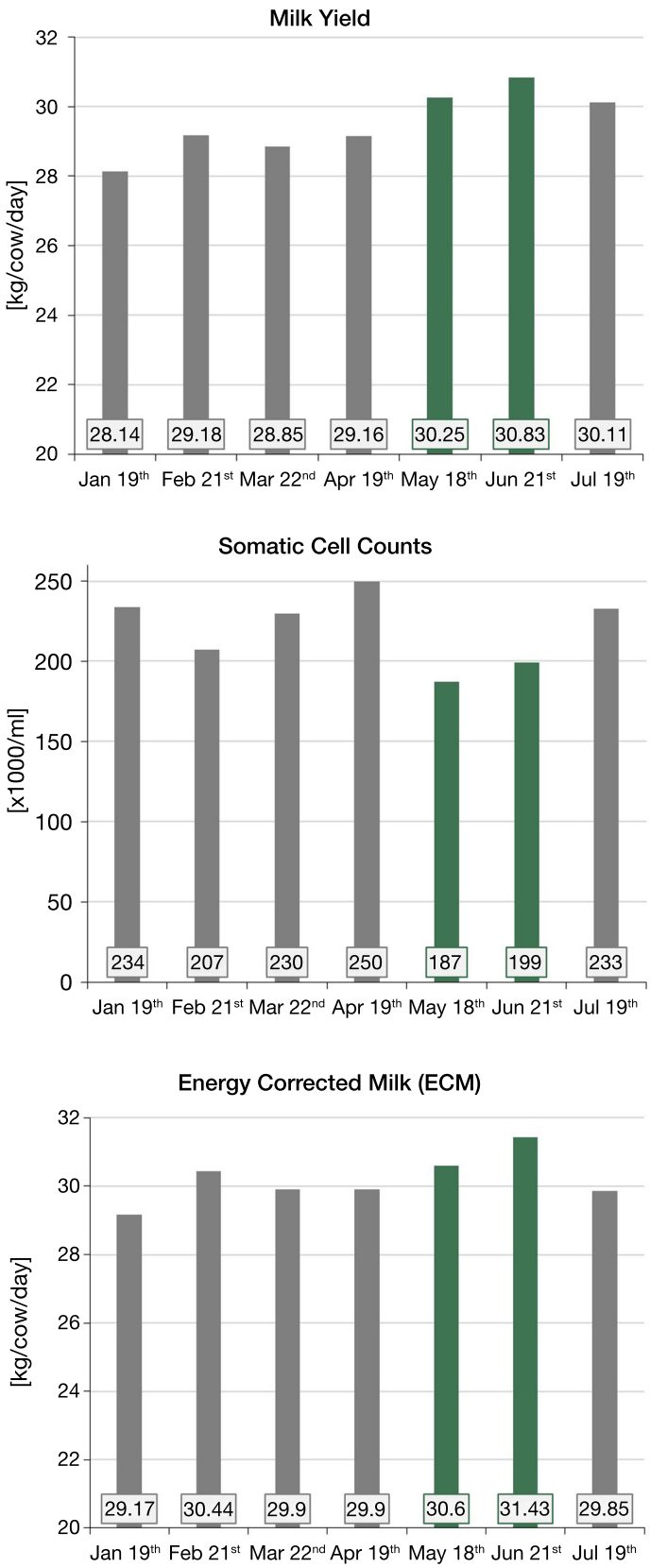

Figure 2. Temporal development of parameters; trial months marked in green colour

Table 2 provides an overview of the temporal development of performance parameters.

Milk yield was once again increased, while the SCC was reduced under the use of TB. Due to the positive impact also on milk ingredients, the profitability of the farm was particularly improved with the strongly increased ECM. Even considering the additional costs for the TB, the farm ended up with an average of over 300 € more income per day. In addition, the cows' appetite normalized, and the incidence of mastitis was clearly reduced.

Table 2. Overview temporal development of performance parameters

Parameter	Before trial	End of trial
Milk yield	28.0 kg/cow/day	31.8 kg/cow/day
Milk fat	3.93 %	4.09 %
Milk protein	3.33 %	3.37 %
ECM	27.7 kg/cow/day	32.1 kg/cow/day
SCC	541 [x1000/ml]	250 [x1000/ml]

FIELD TRIAL IV

The last field trial presented in this series aims to show another, completely different facet of the clinical appearance of mycotoxins. It was conducted on a French dairy farm with about 70 lactating Montbéliarde cows and 20 heifers of the same breed with regular access to pasture grazing. Farm reproduction data showed a clearly reduced fertility compared to the previous reference period. This was accompanied by an increased prevalence of ovarian cysts and endometritis as well as cows not expressing heat behaviour or showing heat signs out of oestrus. The TMR analysis revealed an average contamination with ZEA of 13 ppb and DON of 447 ppb. However, other, undeterminable mycotoxins could have been ingested during grazing. Consequently, the TB was added to the TMR with a dosage of 50 g/head/day during the first month, followed by a dosage of 20 g/head/day for the following four months. The reproductive health was assessed by the scanning technician who screened the animals for gestation after artificial insemination (AI).

Figure 3 shows the historical development of the AI index (artificial insemination done/ fertile insemination, AI/FI) before and during the trial period considering also the fertility level before the problems began.

The reproductive parameters show a clear improvement during the trial period, especially concerning the insemination success. During the third period, where the TB was added to the TMR, the AI

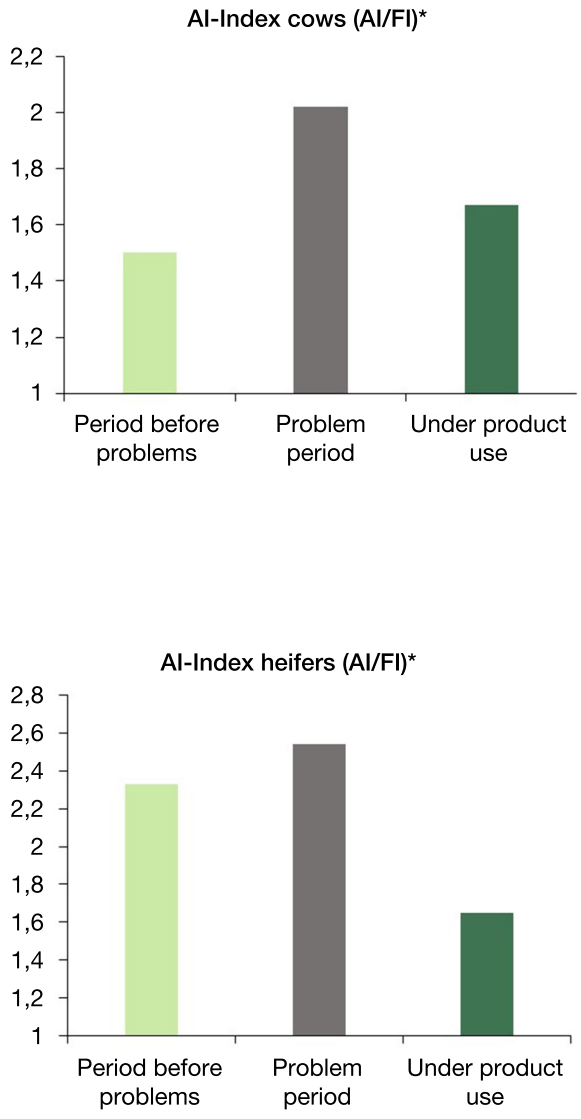

Figure 3. Development AI index (AI/FI), artificial inseminations required/fertile insemination)

index was clearly decreased again. Concerning the heifers, the AI index was improved even more significantly. In parallel with the fertility parameters, the urogenital health parameters monitored by the scanning technician were similarly improved. After the trial period, the farmer kept using the product at a daily dosage of 20 g per cow and day.

SUMMARY & CONCLUSION

The different types of field trials introduced here demonstrate that mycotoxins can have significant impacts on the health and productivity of dairy cows under field conditions. Particularly in the presence of DON, a reduced milk yield and milk fat were observed. Increased SCC is also one of the frequently observed problems. Apart from this, reduced fertility, especially promoted by ZEA, can be another costly consequence.

Efficient toxin binders, such as the product applied in these field trials, are specific strategies against this environmental stress factor. They safely neutralize a relevant negative component in the environment of dairy cows and thus not only preserve health and performance, but also the profitability of dairy farms.

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About Dr. Cornelia Becker

After her veterinarian studies in Hungary, Dr. Cornelia Becker worked as a vet for large animals for about 18 years, focusing especially on pig production and animal nutrition. She also gained experience as a special consultant in one of the leading mineral feed mills of Germany. In 2019, she joined Biochem as an R&D Product Manager for Toxin Solutions.

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MYCOTOXINS AS CONTRIBUTORS TO ANTIBIOTIC RESISTANCE?

"Given the widespread presence of Deoxynivalenol in food and animal feed, its potential role in antibiotic resistance poses a serious threat. The combination of increased bacterial resistance and weakened antibiotic efficacy could lead to more difficult-to-treat infections. This is particularly concerning in hospital settings, where antibiotic-resistant infections already cause high mortality rates."

Antibiotic resistance is a growing global health concern, making infections more complicated to treat and increasing the risk of disease spread, severe illness, and death. While overuse and misuse of antibiotics are the primary causes, recent research has uncovered another unexpected contributor: mycotoxins. Among these, deoxynivalenol (DON), a toxin commonly found in contaminated grains, has been shown to significantly alter gut microbiota and promote antibiotic resistance. This article examines how DON impacts gut bacteria, influences antibiotic resistance, and highlights why this issue warrants urgent attention.

MYCOTOXINS – ORIGINATORS OF ANTIMICROBIAL RESISTANCE?

Actually, it would be logical…

Alexander Fleming discovered Penicillin when he returned after the summer holidays and saw that a mold had grown on the agar plate he had prepared. Around the mold, Staphylococcus was unable to proliferate. The reason was a substance produced by the mold – penicillin, which, like other toxins produced by molds, is a mycotoxin. In his article about the origin of antibiotics and mycotoxins, Shier (2011) stated that antibiotics and mycotoxins share considerable similarities in structure, metabolic roles, and biosynthesis.

A SHORT EXCURSUS TO ANTIMICROBIAL RESISTANCE

In general, the primary mechanisms of resistance involve the prevention or limitation of the anti-

microbial substance's uptake, modifying the drug target, inactivating the drug, or facilitating its discharge with efflux pumps.

There are two types of resistance: natural resistance, which is further divided into intrinsic and induced resistance, and acquired resistance.

Intrinsic resistance is a "characteristic" of a bacterial species and is not dependent on antibiotic exposure. An example is the reduced permeability of the outer membrane of gram-negative bacteria, which prevents certain antibiotics from entering.

Induced resistance, however, needs to be initiated by antibiotics. Here, multidrug-efflux pumps can be mentioned.

The third one, **acquired resistance**, refers to the process by which bacteria acquire genetic material, the resistance genes, from other bacteria that are resistant. The mechanisms include vertical transfer to daughter cells and horizontal transfer, such as the transfer from dead bacteria to living ones, by viruses, or the transfer of plasmids (Reygaert, 2018).

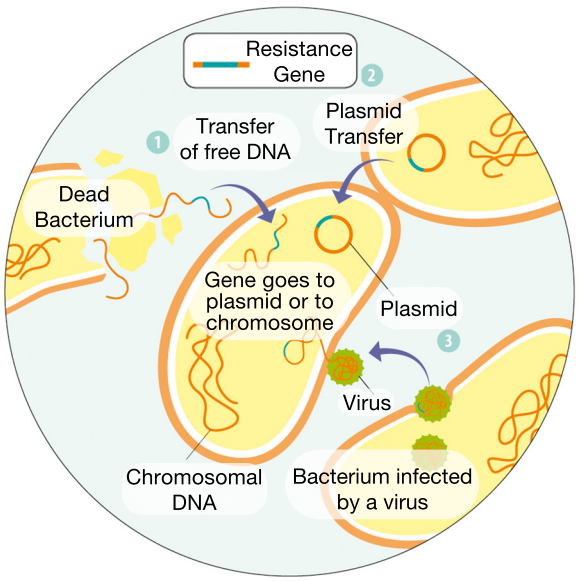

Figure 1. Different possibilities of transfer of resistance genes

DEOXYNIVALENOL (DON) PROMOTES RESISTANCE IN GUT MICROBIOTA

A Chinese group of researchers (Deng et al., 2025) examined for the first time the influence of DON on the intestinal microbiota of chickens. One of the most alarming findings is DON's ability to enhance antibiotic resistance. It contributes to this issue in several ways:

1. Encouraging resistant bacteria – By disrupting microbial balance, DON provides a survival advantage to bacteria that carry resistance genes.

2. Activating resistance genes – Studies suggest that DON can increase the expression of genes that help bacteria withstand antibiotics.

3. Enhancing gene transfer – Bacteria can share resistance genes through horizontal gene transfer. DON appears to promote this process, making antibiotic-resistant strains spread more rapidly.

4. Weakening antibiotic effectiveness – DON-induced changes in the gut environment can reduce the effectiveness of antibiotics, making treatments less successful.

A further indication that mycotoxins can enhance resistance is the significant overlap in the geographical distribution of antimicrobial-resistant bacteria and genes with that of mycotoxins, as noted by Deng et al.

WHICH PROTECTION MECHANISMS DO BACTERIA HAVE AGAINST MYCOTOXINS?

In the case of mycotoxins, bacteria employ similar molecular mechanisms to those used against antibiotics. In an in vitro experiment, Hassan et al. (2019) challenged Devosia mutans, a gram-negative bacterium, with DON in the growth medium. DON inhibits protein synthesis, induces oxidative stress, and compromises cell membrane integrity in eucaryotic cells. Hassan et al. asserted three adaptive mechanisms as the response to the challenge:

1. Activation of cellular membrane proteins (adenosine 5'-triphosphate-binding cassette -ABC- transporters) responsible for the unidirectional transport

of substrates, either outward or inward. These ABC transporters can work as drug efflux pumps.

2. Production of DON-specific deactivation enzymes, thereby engaging a toxin-specific pyrroloquinoline quinone-dependent detoxification pathway. This enables the bacterial isolate to transform DON to a non-toxic stereoisomer.

3. Upregulation of auxiliary coping proteins, such as porins (transmembrane proteins involved in metabolite exchange), glutathione S-transferases, and phosphotransferases, both of which are likely involved in the detoxification of xenobiotics.

PUBLIC HEALTH IMPLICATIONS AND PREVENTIVE MEASURES

Given the widespread presence of DON in food and animal feed, its potential role in antibiotic resistance poses a serious threat. The combination of increased bacterial resistance and weakened antibiotic efficacy could lead to more difficult-to-treat infections. This is particularly concerning in hospital settings, where antibiotic-resistant infections already cause high mortality rates.

To address the issue, several strategies can be implemented:

1. Reducing DON contamination: Implementing improved agricultural practices, such as crop rotation, the use of fungal-resistant crop varieties, and maintaining proper storage conditions, can help limit fungal growth and DON production.

2. Monitoring food and feed supply – Strict regulations and testing for DON contamination in grains and animal feed are essential to minimize human and animal exposure.

3. Effective mycotoxin risk management at feed mill and farm levels: Using tools such as MasterRisk and effective products combatting mycotoxins.

4. Maintaining gut health: A healthy diet rich in fiber, probiotics, and gut health-supporting feed supplements, such as Ventar D or products from the Activo line, may help counteract some of the adverse effects of DON on gut microbiota.

5. Developing new treatments: Research into alternative therapies and new antibiotics is crucial to combat the rise of antibiotic resistance.

ANTIMICROBIAL RESISTANCE: BE AWARE OF THE MYCOTOXINS!

The connection between mycotoxins, such as DON, and antibiotic resistance underscores the need for a broader perspective on public health and food safety and once again brings the "One Health Concept" into focus. While antibiotic overuse remains the primary driver of resistance, environmental factors, such as exposure to mycotoxins, should not be overlooked. By increasing awareness, enhancing food safety regulations, and investing in research, we can take steps to mitigate this emerging threat and safeguard the effectiveness of antibiotics for future generations.

About Dr. Inge Heinzl

Inge Heinzl has a PhD in Agriculture from the University of Munich and has a long experience working in animal nutrition. For the last 15 years she has been working in EW Nutrition, collaborating with product managers and technical managers on topics such as gut health with reduced antibiotic use, egg immunoglobulins for swine and ruminants, and feed quality, with particular emphasis on mycotoxins and endotoxins.

About Marie Gallissot

Marie Gallissot is the Category Manager Feed Quality Solutions at EW Nutrition. She has a rich background and over 15 years' experience in toxin solutions and feed management. Gallissot oversees a portfolio comprising toxin binders, antioxidants, acidifiers and more, working in close collaboration with regional affiliates as well as connected platforms in EW Nutrition.

MANAGING THE HEALTH RISKS OF EMERGING MYCOTOXINS

Josep Garcia-Sirera
Category Specialist Toxin Binders
Agrimprove

"In recent years, advances in analytical techniques and food safety monitoring have led to a growing body of research focused on emerging mycotoxins (EMs)—a group of lesser-known fungal metabolites. These EMs can negatively affect animal health and performance, even at low concentrations, especially when co-occurring. There is an urgent need for cumulative risk assessments and effective mitigation strategies to manage the health risks associated with simultaneous exposure to multiple mycotoxins."

Fumonisins (FUMs), deoxynivalenol (DON), aflatoxins (AFs), zearalenone (ZEN), T-2/HT-2 toxins, and ochratoxins (OTs) remain the most significant mycotoxins from a food and feed safety perspective. This is largely due to their widespread presence in agricultural products, their well-documented toxic effects on both human and animal health, and their strict regulation across many regions of the world.

In recent years, advances in analytical techniques and food safety monitoring have led to a growing body of research focused on *emerging mycotoxins* (EMs)—a group of lesser-known fungal metabolites. The term 'emerging mycotoxins' was first introduced in 2008 to describe compounds such as fusaproliferin (FP), beauvericin (BEA), enniatins (ENNs), and moniliformin (MON), all produced by *Fusarium* species. Today, EMs are broadly defined as mycotoxins that are not routinely tested for or regulated, yet they are increasingly detected in food and feed samples.

Although once considered of minor importance, EMs are now being found in high concentrations and at notable frequencies in cereals, cereal-based products, fruits, animal feed, and both processed and raw foods. Their frequent co-occurrence with regulated mycotoxins has raised growing concerns regarding their potential health risks and the need for broader surveillance and risk assessment.

PREVALENCE OF EMERGING MYCOTOXINS

The emerging mycotoxins most frequently detected worldwide include: fusaric acid (FUS), enniatins (ENNs), culmorin, apicidin, butenolide, fusaproliferin, alternaria toxins, aurofusarin, emodin, nivalenol (NIV), beauvericin (BEA), diacetoxyscirpenol (DAS), patulin (PAT), moniliformin (MON), and sterigmatocystin (STG).

These EMs are generally not regulated, nor are they routinely included in mycotoxin monitoring programs. Nevertheless, large-scale surveys show that

EMs are becoming frequent contaminants in crops and animal feed. Their prevalence is largely influenced by environmental conditions, such as the weather, and they often co-occur with regulated mycotoxins.

The most common EMs found in agricultural commodities are nivalenol, enniatins (A, A1, B, and B1), beauvericin, diacetoxyscirpenol, fusaric acid, patulin, moniliformin, and sterigmatocystin. The most prevalent are nivalenol, beauvericin, and enniatins – and these are sometimes found at exceedingly high concentrations. For instance, nivalenol occurs in concentrations of 0.1 to 15,600 mg/kg, beauvericin at 0.01 to 8,854 mg/kg, and enniatins at 0.25 to 10,000 mg/kg.

Samples from Europe, Africa, and Asia, in particular, have shown high occurrence rates of nivalenol, beauvericin, and enniatins. High levels of EMs (excluding patulin) have been found in cereals like wheat, oats, barley, maize, and sorghum. Finished feeds for poultry, ovine, pig, cattle, and fish have also shown contaminations, predominantly with sterigmatocystin, beauvericin, patulin, moniliformin, nivalenol, and enniatins. Silage samples have also shown high levels of fusaric acid, enniatins, nivalenol, and beauvericin.

As is the case with regulated mycotoxins, EMs are usually found in combination. Analysis of data from multiple studies reveals various EM combinations. Over 90% of the analyzed studies detected 2 or more EMs per sample. The most frequent combinations are:

1. BEA + ENNs
2. BEA + ENNs + MON
3. BEA + ENNs + NIV

TOXICITY OF EMERGING MYCOTOXINS

The toxicity of EMs can be considered individually, in combination with other EMs, or in combination with regulated mycotoxins. Although EMs are less studied than regulated mycotoxins, several have demonstrated significant toxic potential.

Beauvericin (BEA) and enniatins (ENNs) may not affect feed consumption or body weight in monogastrics at 10,000 mg/kg, but, due to lipophilicity and rapid absorption, these toxins may accumulate in animal-derived products like meat, liver, skin, and eggs. To date, human toxicity data is limited.

Diacetoxyscirpenol (DAS) causes intestinal toxicity in pigs at concentrations of 2 mg/kg. In poultry, 0.3–20 mg/kg can even lead to oral lesions, reduced feed conversion, and reproductive issues. Moniliformin (MON) affects body weight, feed intake, egg production, and hematological parameters in monogastrics at 25–100 mg/kg. Limited data is available for Nivalenol (NIV), Sterigmatocystin (STG), and Patulin (PAT) regarding livestock effects.

On top of that, we know that co-contamination between regulated mycotoxins and EMs (e.g., DON, ZEN, BEA, ENNs, and NIV) significantly reduces weight gain and feed efficiency and induces organ damage. For example, pigs fed beauvericin (3578 mg/kg), enniatins (1830 mg/kg), and deoxynivalenol (2524 mg/kg) had reduced weight gain and microbial shifts.

Poultry studies have shown that long-term exposure to mixtures of deoxynivalenol, zearalenone, FBs, beauvericin, enniatins, and diacetoxyscirpenol impairs feed conversion significantly. Combinations of DAS, T-2, and AFs have also caused diarrhea, reduced growth, and feed inefficiency.

Another study has shown that equine liver disease outbreaks can be linked to the consumption of forages contaminated with mixed EMs and regulated mycotoxins.

In general, studies of EMs toxicity in livestock animals show that adverse effects in farm animals are often caused only at concentrations well above the levels commonly found in the field. Nevertheless, exposing livestock to feeds with co-occurring EMs and regulated mycotoxins at moderate to low levels can yield synergistic or additive effects.

MITIGATION STRATEGIES

Strategies to protect animal production from the effects of emerging mycotoxins largely mirror those used against traditional mycotoxins. The 2 primary approaches are biotransformation and binding:

- Biotransformation involves breaking down the mycotoxin molecule into metabolites that are either non-toxic or significantly less harmful to the animal. However, due to the relatively recent attention being given to emerging mycotoxins, there are currently no commercial products that specifically target these compounds through biotransformation.
- Binding agents have shown some success in mitigating the effects of traditional mycotoxins. However, the lipophilic nature of many EMs makes them poorly suited for adsorption by common natural clay-based binders. As an alternative, organic or inorganic binders already available on the market—designed for more lipophilic traditional mycotoxins—may offer a promising solution for mitigating the impact of EMs. An anti-mycotoxin functional feed ingredient like Agrimprove's Mycoad AZ or the Vitafix range prevents absorption into the animal's gastrointestinal tract and the consequent toxic effects.

In conclusion, even at low concentrations, EMs—especially when co-occurring—can negatively affect animal health and performance. There is an urgent need for cumulative risk assessments and effective mitigation strategies to manage the health risks associated with simultaneous exposure to multiple mycotoxins. A binder like Mycoad AZ or the Vitafix range offers significant organ protection against a wide range of traditional and emerging mycotoxins.

HARNESSING ORGANIC ACIDS TO COMBAT MOULDS AND PRESERVE GRAIN QUALITY

Eugenio Alcalde
Global Product Manager Fylax
Selko

"Grain, being a living organism, generates heat and moisture during respiration. These conditions can quickly deteriorate grain quality if not properly controlled. Maintaining optimal thermal conditions, such as cooling grain below 16°C to curb insect activity, along with moisture management to prevent mould growth, is vital for preserving grain quality and lowering the risk of mycotoxin contamination."

Grain storage practices can have a big effect on protecting and preserving grain quality, which in turn can support animal health and performance, feed-to-food safety, and producers' margins. Post-harvest losses can be significant, ranging from 5–10% in developed countries. In lower-middle-income nations, these losses can escalate to 30–35% (Magan et al., 2020). The FAO reports that 10% of post-harvest grain losses stem from fungal contamination.

Proper drying and storage after harvest are essential for maintaining grain quality. Inadequate handling can result in significant losses that reduce both yield and financial value. Unsuitable storage environments provide favourable conditions for insect infestations, mould, and other microbial contamination. Such degradation often results in severe economic repercussions, especially in resource-constrained economies. Additionally, moulds can produce mycotoxins that compromise grain quality, leading to nutritional deficiencies and posing serious health risks to both animals and consumers. Aflatoxin, a mycotoxin generated by *Aspergillus flavus*, is recognized as one of the most powerful carcinogens in existence (Cho et al., 2022). Grains can become tainted with aflatoxins both pre- and post-harvest, with contamination levels rising when drying and storage are poorly managed, posing dangers to both human and animal health (Chulze, 2010). Inappropriate storage conditions also facilitate the production of numerous other mycotoxins, resulting in simultaneous contamination. Mycotoxin development is on the rise. During the 15th Mycotoxin Forum, it was noted that whereas a few years ago, the number of known mycotoxins hovered around 600, that number has increased to 700 today.

Grain, being a living organism, generates heat and moisture during respiration. These conditions can quickly deteriorate grain quality if not properly controlled. Maintaining optimal thermal conditions, such as cooling grain below 16°C to curb insect activity, along with moisture management to prevent mould growth, is vital for preserving grain quality and lowering the risk of mycotoxin contamination. Comprehensive storage strategies involving natural and artificial drying, routine moisture checks, aeration systems, and cleaning methods help regulate temperature, ensure airflow, and eliminate debris to limit spoilage.

Mycotoxins and Climate Conditions: IMPACTS ON GRAIN AND FOOD SAFETY

Mycotoxin presence in grains is significantly affected by weather conditions that encourage fungal proliferation and toxin synthesis, especially during periods of stress. Elevated temperatures and moisture levels, worsened by climate change, increase the likelihood of contamination from fungi like *Aspergillus* and *Fusarium*. History offers a warning of how climate conditions can lead to a mycotoxin crisis.

The mycotoxin crisis in Eastern Europe in 2013 emphasized how severe weather conditions intensified mycotoxin contamination, severely impacting maize production and leading to significant milk contamination in the Balkan area. Aflatoxin M1, a mycotoxin found in the milk of cows that consumed contaminated feed, was detected, raising concerns for public health. Furthermore, elevated levels of mycotoxins were detected in dry fermented sausages in Croatia, exceeding the legal thresholds for processed cereals and highlighting the wider ramifications of mycotoxins within the food supply chain (Garcia-Cela & Gasperini, 2024). The mycotoxin crisis of 2013 resulted in the recall of aflatoxin-tainted feed, affecting numerous countries and causing significant financial losses in the millions for stakeholders such as maize traders, feed manufacturers, and the dairy industry (Focker et al., 2021). These observations stress the importance of ongoing surveillance for mycotoxin contamination in both grains and animal products. More recent events have also introduced concern about how climate events are affecting mycotoxin contamination. For instance, in Northern Italy, a pattern of drought followed by rainfall has been associated with increases in aflatoxin concentrations, while wetter seasons contribute to higher levels of other mycotoxins such as zearalenone and deoxynivalenol (DON) (Locatelli et al., 2022).

Yet, these measures may not always be practical or adequate to fully maintain the quality of stored grain introducing additional protective steps, such as the use of organic acids, provides an antimicrobial defence that inhibits the proliferation of moulds, yeasts, and bacteria, effectively preserving grain quality.

Organic acids serve as a formidable asset in integrated grain storage techniques. The mode of action deployed by organic acids prevents microbial growth by establishing an environment that is detrimental to bacteria, yeasts, and moulds, including those that generate mycotoxins. When integrated into a holistic storage approach, organic acids significantly protect grain quality by curbing spoilage, minimizing nutritional losses, and enhancing shelf life.

THE ROLE OF ORGANIC ACIDS IN GRAIN PRESERVATION

Adaptive storage techniques, which include efficient monitoring systems and the use of organic acid treatments, are vital for safeguarding grain quality, ensuring food safety, and reducing health hazards in an evolving climate.

Organic acids, including propionic acid, are well-known for their antimicrobial effectiveness, especially in low moisture environments, where they inhibit the growth of spoilage bacteria, yeasts, and moulds that produce mycotoxins. These acids infiltrate microbial cells in their undissociated state, acidifying the cytoplasm and depleting energy reserves, which interrupts growth and metabolic functions. The established efficacy of organic acids in preserving grain quality makes them an essential component of grain storage management (Dijksterhuis et al., 2024).

Maintaining grain quality during storage is crucial for minimizing losses and preserving its nutritional content. Minimising loss and optimising grain quality during storage were key objectives in the development of Fylax Grain. The potent mixture of buffered

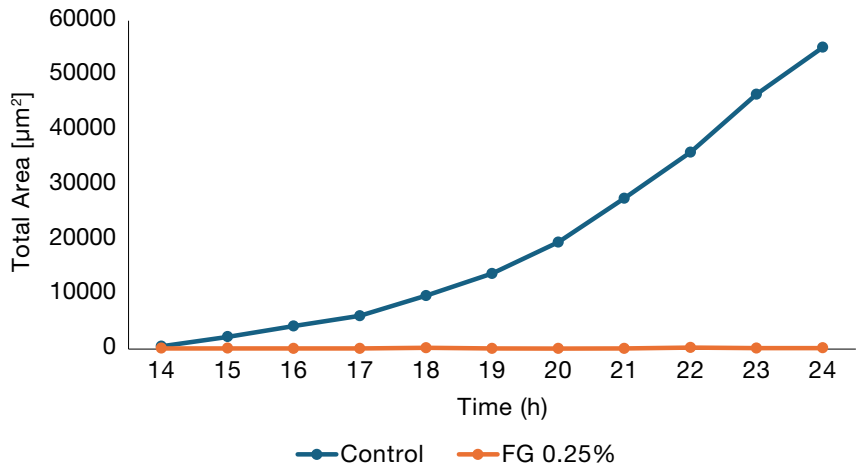

Figure 1. Mycelia growth of A. chevalieri over a 24-hour treatment in presence of Fylax Grain (FG)

The effectiveness of Fylax Grain has been validated in both laboratory and field settings. Figure 1 illustrates its influence on the germination of spores and mycelial growth of the mycotoxin-producing mould *Aspergillus chevalieri*. Moreover, the application of Fylax Grain to stored barley successfully lowered mould and yeast populations to below detectable levels, as demonstrated in Figures 2 and 3.

and non-buffered organic acids provides a holistic solution that inhibits the growth of mould and yeast while preventing quality degradation in grains. The product's blend of organic acids lowers the pH, creating an unfavourable environment for microorganisms, including those responsible for mycotoxin contamination, such as *Aspergillus flavus, Aspergillus parasiticus,* and *Aspergillus chevalieri*. By disrupting microbial metabolism, the product effectively diminishes mycotoxin production and spoilage, prolongs grain shelf life, and improves storage safety.

To further improve grain preservation, innovative organic acid treatments such as Fylax Grain can be effortlessly combined with enhanced storage management. This collaboration guarantees that grain quality is effectively protected under various conditions, providing a thorough and dependable solution to the difficulties of grain storage.

CONCLUSION

Successful grain storage requires a holistic strategy to address environmental and microbial issues, par-

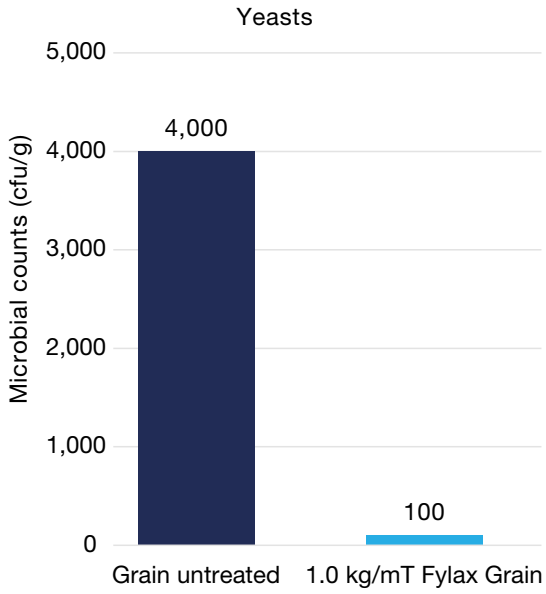

Figure 2. Average yeast counts on grain at day 7 after treatment with Fylax Grain

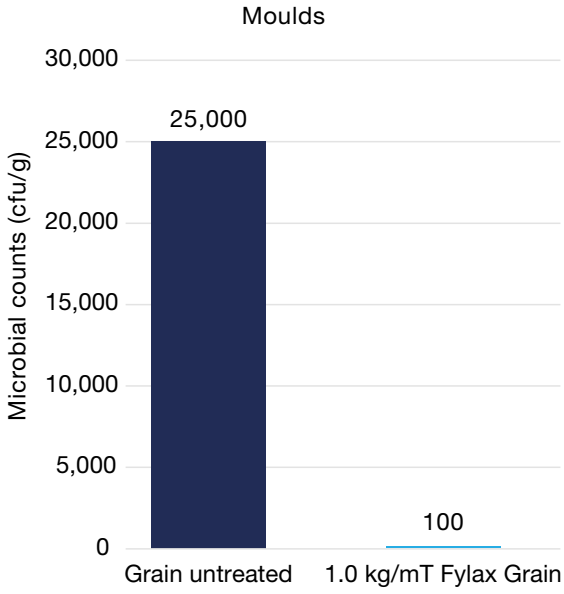

Figure 3. Average mould counts on grain on day 14 after treatment with Fylax Grain

ticularly as climate change heightens the likelihood of mould growth and mycotoxin contamination. Organic acids, like those found in Fylax Grain, are vital in this process due to their strong antimicrobial attributes that combat moulds and yeasts, including mycotoxin-producing fungi such as Aspergillus and Fusarium. These acids contribute to lowering microbial levels, averting spoilage, and prolonging shelf life, thus forming a fundamental aspect of contemporary grain preservation. It is important to remember that not all mycotoxin contamination occurs during storage. For mycotoxins that develop in the field prior to storage, incorporating an effective mycotoxin management product, such as TOXO-XL, into animal feed helps safeguard grains from microbial threats prior to harvest.

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About Eugenio Alcalde

Eugenio Alcalde Rodríguez is the Global Product Manager for Fylax at Selko, the feed additive brand of Trouw Nutrition. He is specialised in mould control and moisture optimization solutions for the feed industry. With a robust academic foundation, he holds a Bachelor's degree in Biology, a Master's in Microbiology, and a Ph.D. in Fungal Biology, from the University of Sevilla, Spain.

He further expanded his expertise with postdoctoral research in biotechnology, focusing on fungi and yeasts, at Royal Holloway, University of London. Eugenio Alcalde has completed an Executive MBA at Maastricht University, enhancing his strategic business acumen. His passion for fungal biology and biotechnology has driven his career for over 15 years, with significant contributions in both research and industry applications. Alcalde worked in biotech industry developing a technology platform in fungal hosts to produce high value products to several industries. He has published several peer-reviewed papers and presented at international conferences in multiple countries. His extensive experience spans research, project management, and business development, ensuring effective implementation of innovative solutions in the feed industry. Alcalde combines scientific excellence with strategic business insights, playing a key role in driving the success of mould control products on a global scale.

TACKLING FUMONISINS: A NEW ERA IN ANIMAL HEALTH

Mariano Gomory
Junior Product Manager – Toxinbinder
MIAVIT GmbH

"The alterations caused by fumonisins in cellular metabolism have significant consequences in various tissues. For example, in the intestinal epithelium, inhibition of cell division and growth affects the turnover of epithelial cells, while induced apoptosis and weakening of tight junctions compromise the intestinal barrier, increasing permeability (leaky gut)."

Despite advances in monitoring and mitigating mycotoxins, their presence in animal production remains a critical challenge due to their diversity and the impact of climate change, which predisposes higher concentrations of mycotoxins in feed and demands increasingly stringent and, above all, flexible control measures against these fungal-derived metabolites.

Among mycotoxins, fumonisins, produced by *Fusarium* species, stand out due to their high global incidence, particularly in regions with warm and humid conditions that favor their development. Their impact on animal health and productivity is often underestimated in many production systems due to late detection and subclinical effects. Nevertheless, fumonisins affect key zootechnical parameters such as daily weight gain and conversion efficiency, and also cause immunosuppression that reduces resistance to diseases, leading to significant economic losses for producers.

From a physiological perspective, fumonisins inhibit the enzyme ceramide synthase, which is essential for the proper metabolism of sphingolipids such as ceramide, sphingomyelin and glycosphingolipids. These molecules play critical roles in cellular biology, from membrane structure to signaling and regulation of vital functions. Inhibiting this enzyme leads to the excessive accumulation of sphinganine and sphingosine (Sa:So) in the cytoplasm, two molecules that, at high concentrations, are toxic to the body.

This metabolic dysfunction disrupts signaling pathways at the cell membrane level, directly affecting cell differentiation and growth, as well as immune system function, since rapid cellular signaling is necessary to deal with infections or vaccines. Additionally, it predisposes to mitochondrial membrane dysfunction, resulting in overproduction of reactive oxygen species (ROS), inducing oxidative stress, damaging cellular structures, and activating pro-inflammatory pathways that ultimately compromise cellular function and trigger apoptosis.

The alterations caused by fumonisins in cellular metabolism have significant consequences in various tissues. For example, in the intestinal epithelium, inhibition of cell division and growth affects

the turnover of epithelial cells, while induced apoptosis and weakening of tight junctions compromise the intestinal barrier, increasing permeability (leaky gut). This condition facilitates the entry of bacteria, toxins, and endotoxins into the bloodstream, triggering systemic inflammation. In response to epithelial damage, goblet cells secrete excess mucin as a protective mechanism; however, over time, this leads to their destruction, leaving the intestine even more vulnerable to external aggressions. Together, these processes result in a considerable impact on intestinal homeostasis and overall organism health.

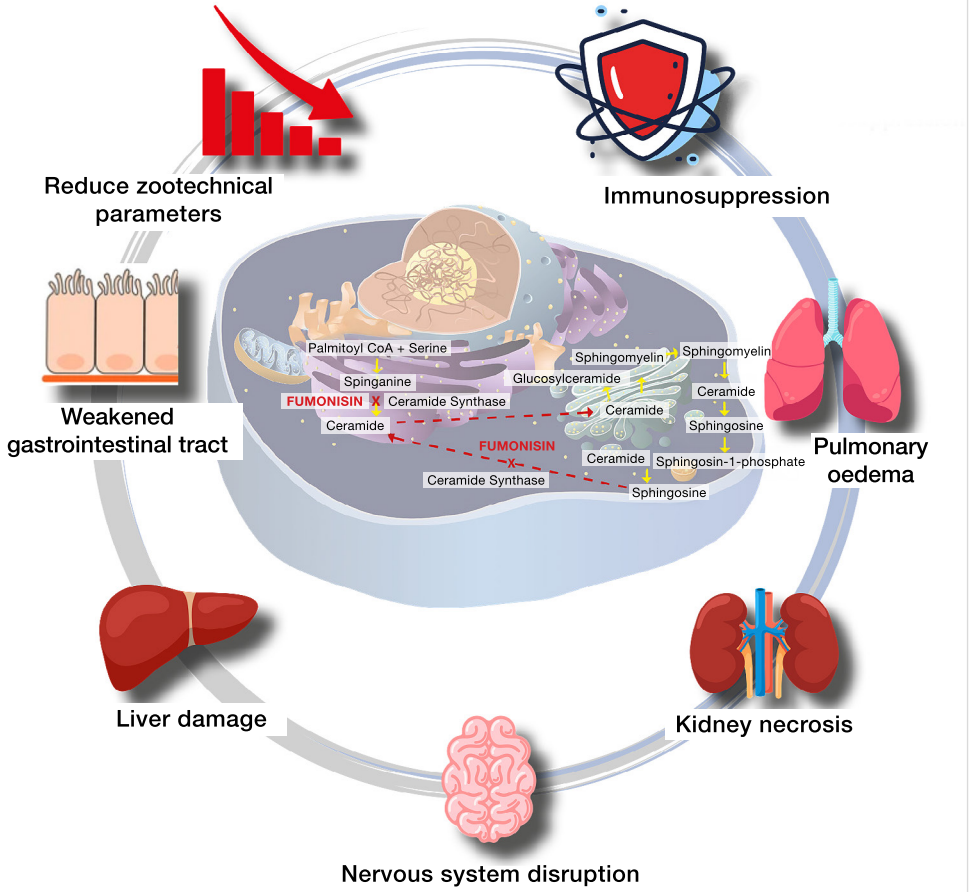


Figure 1. Impact of fumonisins on animal physiology

Due to variability in mycotoxin levels between grain batches or different grain suppliers, as well as delays in analytical results, traditional powdered products incorporated into feed limit the effectiveness of these strategies as a quick response. By the time contamination is detected, physiological damage may already be well established, negatively impacting animal performance. This highlights the need for more flexible solutions that can intervene rapidly when contamination occurs.

An innovative alternative to traditional methods is MiaBond Drink® from MIAVIT GmbH, a water-soluble product that uses an enzymatic inactivation approach to neutralize fumonisins in real-time, allowing precise dosing and a rapid response without the need to reformulate diets. MiaBond Drink® also strengthens immune function, supports intestinal integrity, and improves the animals' energy and water efficiency, promoting faster recovery and more stable productive performance.

The introduction of solutions like MiaBond Drink® offers effective control of fumonisins, setting a new standard in mycotoxin risk management in modern animal production. Its ability to quickly neutralize fumonisins, while providing additional physiological benefits, makes it a key tool for improving food safety and maximizing profitability in livestock farming.

References available upon request.

About Mariano Gomory

Mariano Gomory is an Agricultural Engineer graduated from the University of Buenos Aires (UBA), where he also served as a teaching assistant in the Beef Cattle Production department. Specializing in animal nutrition, he has gained experience in various technical and commercial roles, particularly in advising on additives and functional ingredients for all animal species. He is currently working as a Junior Product Manager Toxinbinder at MIAVIT GmbH, where he continues to apply his expertise in animal nutrition while seeking innovative solutions for the industry.

Mycotoxin Testing for Millers: ENSURING SAFE AND HIGH-QUALITY FEED

Anneliese Müller
Product Manager Mycotoxin Risk Management, ANH
dsm-firmenich

Mycotoxins, toxic compounds produced by fungi, pose a significant risk to both human health and animal welfare. As millers, it is crucial to understand mycotoxin contamination, implement effective testing protocols, and mitigate risks throughout the feed production process. In this educational article, we'll explore key considerations and strategies for mycotoxin testing in the milling industry.

UNDERSTANDING COMMON MYCOTOXIN CONTAMINATION

Mycotoxins can contaminate various crops, including wheat, barley, oats, maize, and rye. Different regions and climates may favour the growth of specific mycotoxin-producing fungi. To stay informed, millers should rely on mycotoxin survey data specific to their area. By understanding common mycotoxins and their prevalence, millers can make informed decisions about sourcing raw materials.

COLLABORATING WITH SUPPLIERS

Millers should actively communicate with suppliers to gather information on mycotoxin levels in incoming ingredients. Suppliers play a crucial role in ensuring the safety of raw materials. By requesting data on mycotoxin contamination, millers can assess the risk associated with each batch of ingredients.

RAPID TESTING FOR MAIN MYCOTOXINS

Rapid tests are essential for timely mycotoxin detection. These tests provide quick results for main mycotoxins, allowing millers to take immediate action. Regardless of the source of feed materials, rapid testing, as part of a quality control process leads to better awareness of mycotoxin risks and allows for proper mycotoxin management.

BEYOND COMPOUND FEED: ADDITIONAL RISKS

While compound feed production is a critical stage, millers must also consider risks from other sources. Byproducts, straw, and other farm-level factors can introduce mycotoxins into the feed supply chain. Millers should be vigilant and address potential contamination risks beyond the feed mill.

PROPER SAMPLING PROCEDURES

Mycotoxins are not evenly distributed within raw materials. Hot spots can occur, leading to inaccurate test results. Millers must follow proper sampling procedures to ensure representative samples. Regular sampling and testing are essential to maintain consistent quality. Assessing mycotoxins can be difficult due to the uneven distribution of mycotoxins in the commodity, especially in whole kernels. Different parts of the lot may contain different concentrations of mycotoxins. Depending on the type

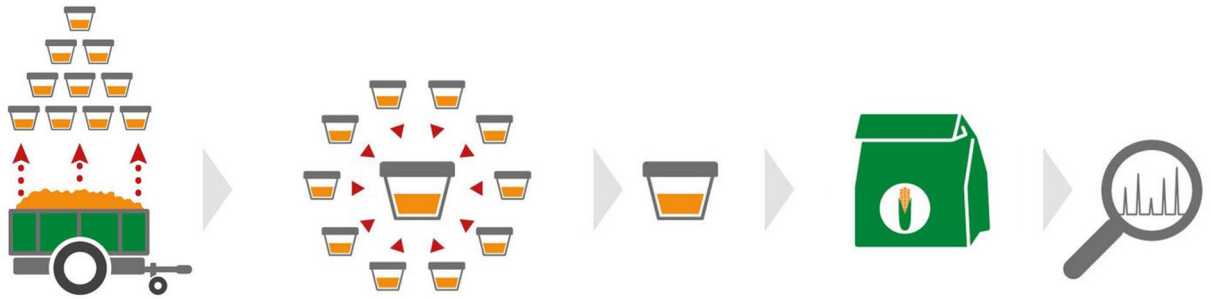


Figure 1. The basic steps for a successful sampling procedure

of product that will be sampled, a minimum number of incremental samples should be collected in order to obtain a representative sample for analysis. Figure 1 illustrates the basic steps for a successful sampling procedure.

SAMPLE SELECTION

Every individual item in the lot should have an equal chance of being selected: This is a method called random sampling. It is essential to select equipment that is adequate for sampling. For example, probes should be able to sample large particles and reach every location in the lot. If the lot has been blended thoroughly during handling, then it is assumed that all particles are distributed uniformly and representative samples may be collected. However, when particles are not distributed uniformly, the aggregate sample should be an accumulation of several small incremental samples taken from many different locations throughout the lot. In general, sampling is best achieved when the lot is in motion.

EXTRACTING SAMPLES DURING TRANSFER

In the context of mycotoxin analysis, the reliability of results significantly relies on meticulous sampling techniques, especially during the critical phase of product transfer. This section delves into the intricacies of sampling during transfer, addressing scenarios involving both loading buckets and loading spouts.

SAMPLING FROM A MOVING STREAM (LOADING BUCKET)

Efficiently collecting incremental samples of products, each weighing 100 g, during the transfer is crucial for obtaining a representative analysis. This process involves taking samples at periodic intervals throughout the transfer, allowing for a comprehensive understanding of mycotoxin distribution within the product flow. When utilizing a loading bucket, precision is vital. Scoop samples must be carefully extracted from the grain within each loaded bucket. An optimal spot for sample collection is identified to ensure a strategic approach in capturing a cross-section of the product.

SAMPLING FROM A MOVING STREAM (LOADING SPOUT)

In scenarios involving a loading spout, the sampling methodology adapts to the dynamic nature of the transfer. Automatic sampling can be achieved us-

ing a cross-cut sample, as discussed in the Sampling Equipment section. Alternatively, a manual approach involves cutting through the moving stream with a cup or scoop. In this manual approach, it is crucial to identify the precise location for sample collection. Collecting as many samples as necessary, altering the position of the cup or scoop with each extraction, ensures a comprehensive representation of mycotoxin distribution within the product stream. These precise sampling practices adhere to industry standards, showcasing a commitment to accuracy in mycotoxin analysis. By incorporating these techniques during transfer, researchers and professionals can elevate the reliability and accuracy of their findings, contributing to a more robust understanding of mycotoxin presence in agricultural products.

SAMPLING FROM STORAGE TRUCKS, BUNKERS AND BAG SILOS

When sampling from storage or trucks, collect incremental samples (100 g) from various places distributed throughout the lot where the grain is accessible. The minimum length of the sampling probe should be two meters. For bunker and bag silos, collect incremental samples by puncturing the plastic cover using a sharp, cone-shaped sampling device. Holes should be evenly distributed over the entire surface of the silo (Figure 2). Refill each hole cautiously immediately afterwards and cover using a strong tape to prevent possible contamination.

OPTIMISING STORAGE CONDITIONS

Storage conditions significantly impact mycotoxin levels. Proper storage practices, including temperature control and moisture management, help prevent mycotoxin development. Millers should prioritize optimal storage conditions to minimize contamination risks.

MYCOTOXIN TESTING TIPS

- Sampling should be conducted on a regular basis.
- Every new batch should be sampled.
- Improper storage may affect the quality of grain.

ESTABLISHING A MYCOTOXIN MITIGATION STRATEGY

A comprehensive strategy is essential for managing mycotoxin risks. Millers should consider the following steps:

- **Testing Program:** Implement a robust mycotoxin testing program. Regular testing of raw ingredients ensures early detection and timely intervention.

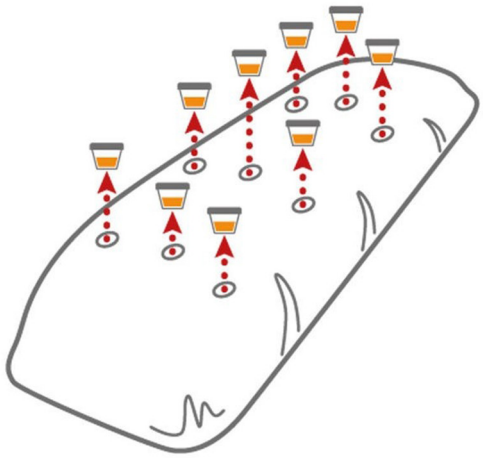
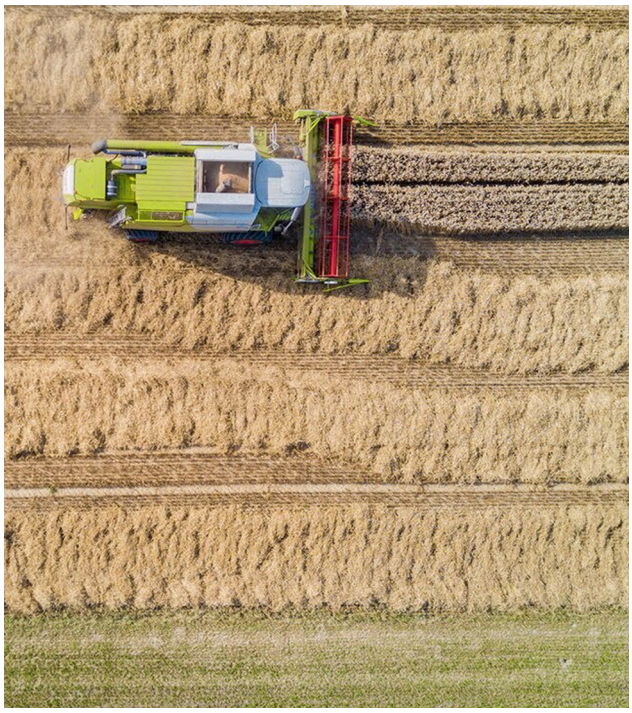


Figure 2. For bunker and bag silos, collect incremental samples by puncturing the plastic cover using a sharp, cone-shaped sampling device. Holes should be evenly distributed over the entire surface of the silo



• **Adjust Frequency:** Tailor testing frequency based on risk factors, seasonality, and supplier reliability.

• **Monitoring:** Continuously monitor mycotoxin levels and adjust protocols as needed.

• **Deactivation Products:** Consider using mycotoxin deactivation products to enhance feed safety.

• **Internal Risk Thresholds:** Set internal thresholds based on regulatory limits and species sensitivity.

• **Formulation Optimization:** Adjust feed formulations to reduce mycotoxin risk (if dilution is permissible by legislation).

FINAL FEED TESTING

To validate the effectiveness of the testing program, millers should periodically test the final feed. Liquid chromatography-tandem mass spectrometry (LC-MS/MS) provides accurate results for a wide range of mycotoxins. Confirming that the feed meets safety standards ensures consumer protection and animal well-being.

MULTI-MYCOTOXIN ANALYSIS

Mycotoxins often occur together, and their combined effects can be more significant. Multi-mycotoxin analysis reveals the full picture of contamination, including masked and emerging mycotoxins. Millers should consider comprehensive testing to address all potential risks. Mycotoxin testing is a critical aspect of feed safety. By staying informed, implementing effective protocols, and prioritizing quality, millers contribute to healthier animals and safer food products. Let's continue to raise the bar for mycotoxin management in the milling industry.

About Anneliese Müller

Anneliese Müller is a Global Product Manager for Mycotoxin Risk Management. She studied biology at the University of Vienna and did her PhD in survival mechanisms of foodborne pathogens at the University of Veterinary Medicine Vienna. She is regularly working with and publishing the results of the global dsm-firmenich Mycotoxin Survey.

MANAGING MYCOTOXIN RISKS IN ASIA-PACIFIC AQUACULTURE

Dr. Vivi Koletsi
Global Technical Support Specialist
Alltech Coppens

"Geographical regions also vary in their susceptibility to the different mycotoxin types. For instance, storage mycotoxins such as aflatoxin and ochratoxin A are of particular concern in the Asia-Pacific region due to the high temperatures and humidity that favor their growth. These mycotoxins can reduce feed efficiency, damage vital organs like the hepatopancreas, and lower survival rates in aquatic species."

ASIA-PACIFIC'S DOMINANCE IN AQUACULTURE

Global aquaculture production now accounts for 51% of the global supply of aquatic animals, surpassing fisheries for the first time — and this increase is primarily driven by growth in the Asia-Pacific region, which in 2022 produced 83.4 million metric tons (MT) of aquatic animals out of the 94.4 million MT produced worldwide.

INNOVATIONS IN AQUAFEED FORMULATIONS

The aquaculture industry's rapid expansion is supported by innovations in aquafeed formulations, with fed aquaculture now representing 73% of total production. With fish meal and fish oil becoming scarcer and more expensive, the industry has turned to alternative protein sources, primarily plant-based ingredients.

Soybean meal is the most common plant protein used in the diets of farmed aquatic species, with inclusion rates varying across species such as Asian sea bass (25%), white-leg shrimp (35%), and pangasius catfish (42%). Other plant-based ingredients — such as wheatmeal, cornmeal and byproducts like dried distillers grains with solubles (DDGS) — are also widely used.

RISKS OF MYCOTOXIN CONTAMINATION

While plant-based ingredients are essential for sustainability, they bring the risk of mycotoxin contamination.

Mycotoxins are toxic compounds produced by specific fungi that grow on plants before and after harvest, especially in inadequate storage conditions. Common mycotoxins in aquafeeds include *Fusarium*-produced toxins (e.g., fumonisins and deoxynivalenol), as well as aflatoxins and ochratoxin A, which are produced by *Aspergillus* and *Penicillium* species during storage.

The Alltech 37+® lab offers advanced mycotoxin analysis technology such as liquid chromatography–tandem mass spectrometry (LC-MS/MS), which allows for the detection of up to 54 different mycotoxins. To assess the general risk of mycotoxin contamination, we examined the mycotoxin profiles of samples of soybean meal, DDGS, wheat and corn.

• Over 90% of DDGS samples contained *Fusarium*-produced mycotoxins such as fumonisins, and around 13% of these samples also contained aflatoxin B1.

• Soybean meal samples were found to contain fusaric acid, while wheat and corn samples showed high levels of type B trichothecenes (e.g., deoxynivalenol).

• Notably, emerging mycotoxins — toxins that are not yet regulated — were found in over 70% of all samples tested, highlighting the rising risk and the necessity of proper mycotoxin management.

EFFECTS OF MYCOTOXINS ON AQUATIC SPECIES

The presence of mycotoxins in aquafeeds poses significant risks to aquatic species. Mycotoxins can impair growth, immune response, and overall health in fish and shrimp.

Each aqua species exhibits specific sensitivities to different mycotoxins. For instance, carp are particularly vulnerable to deoxynivalenol, which has been shown to affect organ health and reduce growth performance. T-2 toxin, another common mycotoxin, can decrease feed intake and cause oxidative stress and DNA damage in common carp.

In shrimp, even low concentrations of deoxynivalenol (around 330 ppb) can lead to reduced weight gain and can impact gene expression related to antioxidative defenses. T-2 toxin and fumonisins also significantly affect shrimp health, leading to muscle deterioration, reduced growth and increased mortality. These changes not only affect the animals' welfare but also reduce the quality and nutritional value of shrimp for consumers.

Geographical regions also vary in their susceptibility to the different mycotoxin types. For instance, storage mycotoxins such as aflatoxin and ochratoxin A are of particular concern in the Asia-Pacific region due to the high temperatures and humidity that favor their growth. These mycotoxins can reduce feed efficiency, damage vital organs like the hepatopancreas, and lower survival rates in aquatic species.

MYCOTOXIN PREVENTION AND MITIGATION STRATEGIES

Mycotoxin contamination can occur before and/or after harvest — but preventing fungal growth on crops pre-harvest has become increasingly challenging due to climate change. As a result, feed mills are now more likely to receive feedstuffs that have already been contaminated in the fields.

Fortunately, some preventive and corrective steps can be implemented at this stage to mitigate the risk of exposing fish and shrimp to mycotoxins. In fact, mycotoxin prevention and mitigation strategies along the aquafeed supply chain are primarily implemented at the feed mill level (Figure 1). The implementation of a monitoring plan at feed mills, which screen feedstuffs upon arrival, is an effective option for preventing mycotoxin contamination.

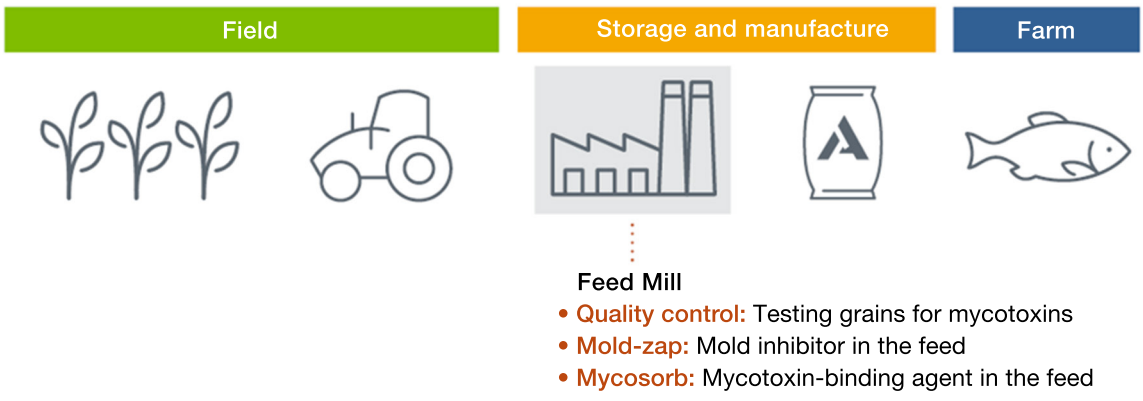


Figure 1. Recommended mycotoxin prevention and mitigation strategies for feed mills

Alltech® RAPIREAD™ technology is another effective option, enabling feed producers to quickly identify and analyze up to seven key mycotoxins on-farm. Producers should also periodically send samples of their feedstuffs and final feeds for a full-spectrum analysis by a certified lab such as the Alltech 37+ lab, which can detect up to 54 different mycotoxins.

Based on the results of those analyses, feed producers can strategically supplement mycotoxin-adsorbing agents — such as those in the Mycosorb® range from Alltech — in their formulas. Some producers may decide to include these agents for prophylactic purposes without necessarily implementing a full mycotoxin-monitoring plan.

Another common feed-formulation strategy is to include mold inhibitors, such as Alltech's MoldZap®, to help inhibit fungal growth and minimize the risk of contamination during storage.

THE ROLE OF YEAST CELL WALL EXTRACT (YCWE)

Evaluating the effectiveness of any multi-binding agent is crucial, considering that feedstuffs and aquafeeds are commonly contaminated with multiple mycotoxins.

In the literature, Mycosorb solutions are referred to as yeast cell wall extract and backed by decades of scientific research. Among the various detoxifying agents with multiple-mycotoxin-binding claims tested in vitro, YCWE has demonstrated the greatest efficacy, adsorbing more than 50% of deoxynivalenol, zearalenone, fumonisin B1, ochratoxin A, T-2 toxin and aflatoxin B1. YCWE has also been successfully tested in vivo in several aquatic species.

Mycosorb technology consists of insoluble carbohydrates primarily derived from the glucans in the cell walls of the Saccharomyces cerevisiae strain of yeast. Mycosorb A+® goes a step further by combining these yeast cell wall components with carbohydrate components from algae. The flexible surfaces of these active yeast cell wall components facilitate the absorption of free mycotoxins. More specifically, β-D-glucans feature spaces that align perfectly with specific mycotoxins, making them optimal binding sites. The algal components of Mycosorb A+ further enhance its binding capacity, allowing it to adsorb a broader range of mycotoxins.

Unlike clay-based mycotoxin binders, the yeast and algae components of this solution do not interact with the essential nutrients, minerals or vitamins included in the diet. Instead, they specifically bind mycotoxins in the gastrointestinal tract, inhibiting the absorption of mycotoxins into the bloodstream and their distribution to target organs. They also promote the excretion of mycotoxins through the feces. As a result, the bioavailability of these mycotoxins is minimized, as is their potential impact on animal health and performance.

About Dr. Vivi Koletsi

Dr. Vivi Koletsi is a Global Technical Support Specialist within Alltech's Technology Group. She collaborates with the company's global aqua team regarding all technologies on the aquatic species side.

Dr. Koletsi, a native of Ioannina, Greece, first became interested in aquaculture while completing her undergraduate studies in biology at the Aristotle University of Thessaloniki. She began focusing on fish nutrition in earnest while pursuing her master's degree in aquaculture and marine resource management at Wageningen University & Research in the Netherlands. This interest led her to complete an internship with Alltech Coppens, during which she established a protocol to help prevent mycotoxin contamination in aqua feeds.

Upon earning her master's degree, Dr. Koletsi continued her mycotoxin research at the doctoral level with support from Alltech in collaboration with the Aquaculture and Fisheries Group at Wageningen University & Research. While completing her doctoral studies, Dr. Koletsi conducted trials at Alltech Coppens' facilities while continuing laboratory work at Wageningen. Her focus was on mycotoxins' impact on rainbow trout.

Dr. Koletsi joined Alltech as a team member upon completion of her Ph.D. in 2023.

8 outtakes from the 15th World Mycotoxin Forum: MANAGING CHAOS AND COMPLEXITY

"During the 15th World Mycotoxin Forum (WMF) in Salzburg, Austria, 7-9 April, delegates explored mycotoxins through the lens of 'building a resilient food system in the digital decade.' Trouw Nutrition, a gold sponsor of WMF, contributed new research; presented innovative mitigation approaches to advance feed-to-food safety; and convened next-generation scientists to contribute novel ideas for managing mycotoxin risk."

Dr. Swamy Haladi, *Global Technical Commercial Manager, Trouw Nutrition*

Despite ongoing advances supporting feed safety on the farm and at the mill, challenges continue to proliferate. Mycotoxins are a good example. Whereas just a few years ago, roughly 600 mycotoxins were recognized, today there are more than 700 known mycotoxins. Mitigating the risks that these toxic metabolites pose to animal and human health is made more complex by emerging mycotoxins and more extreme weather events driven by climate change.

During the 15th World Mycotoxin Forum (WMF) in Salzburg, Austria, 7-9 April, delegates explored mycotoxins through the lens of "building a resilient food system in the digital decade." Trouw Nutrition, a gold sponsor of WMF, contributed new research; presented innovative mitigation approaches to advance feed-to-food safety; and convened next-generation scientists to contribute novel ideas for managing mycotoxin risk.

Below, we look at eight key takeaways from the 15th WMF.

Takeaway 1: Rapid analysis can support faster detection and earlier mitigation

Mycotoxins pose problems for stakeholders across the value chain. Tools that can quickly and accurately scan raw materials for harmful mycotoxins support the health and performance of animals. Such

technologies also support feed mills in determining whether to accept or reject ingredients used in feed. On-site, rapid assessment tools can be complemented by confirmatory analytical tools at laboratories.

Takeaway 2: Technology can support animals' resilience to mycotoxins

Resilience was a big theme at WMF, and technology can play an important role in helping animals be more resilient. For example, Trouw Nutrition is conducting research on enzyme, gut health and immune booster technologies that may help animals be less susceptible to the harmful effects of mycotoxins.

Takeaway 3: Human exposure to mycotoxins suggests neurodegenerative concerns

Beyond harming animals, mycotoxins also pose a threat to humans. Historically, much of the concern about mycotoxins and human health risk has focused on liver and esophageal cancers. However, science is starting to link neurological diseases such as Parkinson's disease and Alzheimer's to mycotoxins. Further investigation is needed to understand how long-term mycotoxin exposure may affect human health.

Takeaway 4: Differential diagnosis can prevent wrong conclusions

The mycotoxin landscape is dynamic and constantly evolves at farms and feed mills. Amid this toxicological chaos, relying on a single strategy for managing mycotoxin risk is impractical and likely to be ineffective. During WMF, Trouw Nutrition presented the concept of differential diagnosis as a strategy for effective mycotoxin risk management. Differential diagnosis aims to identify the causative factors behind performance issues on the farm. When an animal starts presenting a problem – such as gizzard erosions in chickens, reproductive problems in pigs, or lameness in dairy cows – it is important not to jump to conclusions and blame the issue on mycotoxins. Instead, employing a multi-discipline approach that considers the interrelationship between the animal's health status, farm management, and feed mill processes can get to the root of a problem. As differential diagnosis brings a more holistic approach to exploring a problem, it helps prevent overlooking interventions that may best address an issue. For example, a farm might need to update its vaccination programmes, or a feed mill might implement additional biosecurity measures.

Takeaway 5: Predictive capabilities should be considered in context with practical limitations

The predictive capabilities of AI are quite promising for mycotoxin research and may make it easier to introduce pre-emptory mitigation strategies in the future. However, predictive insights are only as

Dr. Swamy Haladi at the 15th World Mycotoxin Forum

valid as the data put into AI models. Sampling error can skew AI-generated results, potentially leading to inaccurate conclusions. For example, a greater amount of data collected from one country or a higher concentration of samples from an area experiencing high levels of contamination may skew the broader dataset. A lack of proper sample labeling procedures can further complicate sampling.

Takeaway 6: Interactions with emerging mycotoxins may affect toxicity levels

Enniatins are an interesting group of emerging mycotoxins that are produced from *Fusarium* fungus. They act as natural ionophores and disrupt cellular calcium homeostasis and affect mitochondrial function. They can also act as enzyme inhibitors, affecting processes like lipid metabolism. Such an effect of enniatins may potentially increase the negative effects of deoxynivalenol (DON), leading to enhanced overall toxicity. Already in Europe, these two mycotoxins are reported at significant concentrations in animal feeds.

Takeaway 7: Climate and infrastructure in different regions contribute to the global mycotoxin challenge

Conditions that are out of producers' hands can contribute to different mycotoxin issues. For example, while North America has advanced harvesting technology and storage facilities, the climactic conditions of fields in the U.S. Midwest are favourable for the growth of *Fusarium* fungus and subsequent DON and ZEA mycotoxin production. Conditions in the months of July and August provide a perfect opportunity for this fungus to attack as evidenced by many global surveys.

Conversely, climate conditions in Africa are less conducive to mould growth capable of producing DON and ZEA than in the Midwest. However, fewer good systems for storing raw materials can provide favourable conditions for the growth of moulds, capable of producing aflatoxins, and ochratoxins.

Takeaway 8: Mycotoxin risk management presents an ongoing challenge and opportunity for the industry

As noted at WMF, the number of known mycotoxins continues to increase. However, researchers are also pioneering innovative approaches including enzyme, microbial, and phytogenic tools to address mycotoxin risk. Additionally, differential diagnosis can help inform approaches that target the underlying issue.

The research continues as new scientists are finding mycotoxin risk management an exciting area. During a Young Scientists Forum presented by Trouw Nutrition at WMF, young scientists shared their ideas for tackling both new and ongoing mycotoxin challenges worldwide. The winning idea highlighted how a better understanding of the occurrence and adverse effects of emerging mycotoxins, in addition to "Big 6" mycotoxins, may help in realizing a holistic approach to mycotoxin risk management. Within the research community, work to advance mycotoxin understanding is leading to new commercial offerings for producers. Trouw Nutrition will soon launch TOXO®-HP in Brazil, a mycotoxin mitigation tool that targets fumonisins, in addition to other well-known and emerging mycotoxins.

Lieske van Eck
Research Scientist – Poultry
Cargill ANH

Inês Carvalhido
Poultry Technology Lead
Cargill ANH

THE POWER OF REAL-TIME LAYING HEN BODY MEASUREMENT FOR PRECISION NUTRITION

"REVEAL™ Layers represents a transformative leap in poultry farming, offering a non-invasive, real-time solution to monitor and optimize laying hen body condition. This technology not only helps address the growing global demand for animal protein but also supports the welfare and productivity of hens, leading to sustainable and profitable egg production."

REVEAL™ Layers, developed by Cargill Animal Nutrition and Health (ANH), is a groundbreaking, non-invasive technology that enables real-time monitoring of laying hen body condition. By leveraging near-infrared (NIR) technology, REVEAL™ Layers provides precise data to support diet optimization, long-term egg production, and possible cost reduction.

This innovative tool is trusted and implemented globally, and most importantly proven in the field. In this article we will look at why we need to extend laying periods, why hen body composition is important, and how REVEAL™ Layers solves industry challenges and helps producers take their laying hen performance to the next level.

REAL PROBLEM

Global demand for animal protein is rising, with poultry meat and egg consumption expected to grow by 15% by 2032, making up 41% of all meat protein consumed. This increase is driven by population growth, higher incomes, and poultry's feed efficiency. Eggs, being affordable and nutrient-rich, are crucial to meeting this demand, with worldwide production projected to grow by 18% by 2050, necessitating advancements in hen laying productivity.

Understanding body condition is essential for long-term layer performance, supporting overall hen welfare, liver health, and efficient nutrient metabolism, all of which are crucial for sustained egg production. Maintaining the right body condition

with precise nutrition also prevents fattening issues that can negatively impact laying performance and the general well-being of a hen. However, this means producers must first know their flock's condition to make the right dietary decisions.

A challenge to this has been the inability to **non-invasively** assess hens in the field, which Cargill ANH solves with REVEAL™ Layers.

REAL SOLUTION

REVEAL™ Layers is a first-of-its-kind, non-invasive near-infrared technology that monitors poultry body condition. This innovation supports poultry producers by helping to:

• **Make real-time decisions:** REVEAL™ Layers provides real-time data on body condition, enabling precise adjustments to diet composition based on flock insights. This can help improve performance and increase profitability,

• **Support long-term egg production:** Optimal body condition supports sustained egg production over the long term, ensuring that hens remain productive whilst maintaining good health,

• **Improve profitability:** By combining REVEAL™ Layers with Cargill's nutritional expertise, producers can possibly reduce feed costs while increasing egg production.

REVEAL™ is also used effortlessly in three easy steps:

• **Scan the hen:** REVEAL™ technology uses NIR light absorbed through the skin to measure fat pads,

• **Collect results:** The NIR device connects via Bluetooth to a mobile device, displaying results directly on the screen,

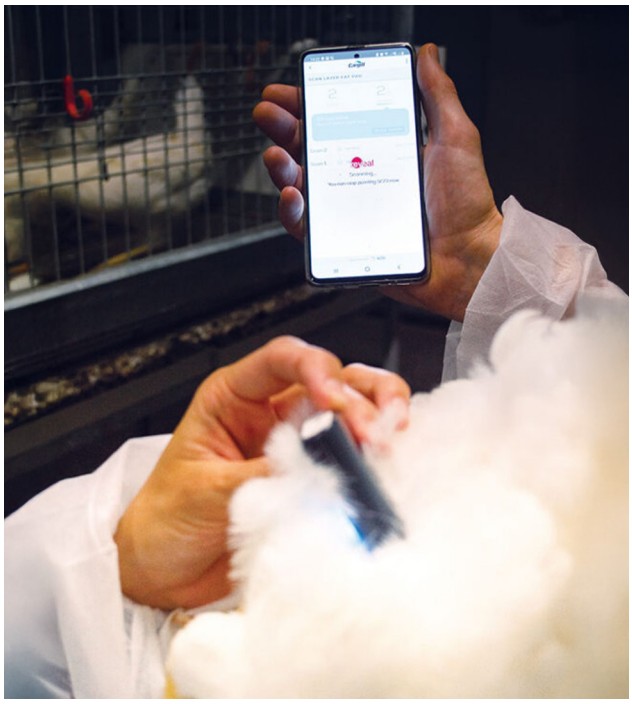
• **Interpret results:** Compare the flock's results to the optimal range for the age of the laying hens to provide precise nutritional advice.

Click here to see a video demonstration of how it works.

REAL VALUE

By modifying diet formulations and/or management practices to optimize body condition based on the results of the REVEAL™ scanning we can increase egg production.

Producers report significant increases in egg production per hen housed over the productive cycle of up to 100 weeks, depending on the starting point



of deployment and duration of use. This supports producers in working towards the genetic potential of laying hens, which can produce 500 eggs per hen in a lifetime. Additionally, it supports extended laying periods of up to 10 weeks, increasing profitability while reducing costs associated with hen replacement. With a potential ROI of 15:1, even a 1% improvement in egg production can significantly enhance revenue.

RESEARCH AND DEVELOPMENT

Cargill's scientists are continuously conducting research to improve production outcomes, and to ensure that solutions, including REVEAL™ Layers, are based on strong scientific evidence.

Cargill Senior Scientist Lieske van Eck and Poultry Technology Lead Inês Carvalhido, in collaboration with Wageningen University, recently conducted a 55-week study evaluating the impact of nutrition on laying persistency and the body composition of laying hens. The findings underscore the importance of precision nutrition for egg-producing hens.

This study, published in the acclaimed Poultry Science journal, highlights that precise and tailored nutrition plays a crucial role in influencing both laying persistency and body composition. By carefully adjusting the diet to meet the specific needs of the hens at different stages of their life cycle, it is possible to enhance their overall productivity and health. This includes ensuring that the hens receive the right balance of proteins, vitamins, and minerals.

MAXIMIZING POTENTIAL

REVEAL™ Layers represents a transformative leap in poultry farming, offering a non-invasive, real-time solution to monitor and optimize laying hen body condition. This technology not only helps address the growing global demand for animal protein but also supports the welfare and productivity of hens, leading to sustainable and profitable egg production.

If you are interested to see how REVEAL™ Layers can benefit your own egg production, or you want to read more about the technology, click here today.

About Lieske van Eck

Lieske van Eck is a senior researcher in the global R&D team at Cargill Animal Nutrition. She specialized in laying hen nutrition and is now responsible for research focusing on laying hen and broiler breeder nutrition, hen body composition, laying persistency, egg(shell) quality, and mineral nutrition.

She is finalizing her Ph.D. at Wageningen University, studying the effects of rearing and laying hen nutrition on body composition and long-term egg production.

About Inês Carvalhido

Inês Carvalhido works as Poultry Technology Lead in Cargill Animal Nutrition and Health, based in The Netherlands. The main role is to make a bridge with R&D and business to implement new technologies and understand the market needs.

Carvalhido finished a Bachelor in Animal Science in Trás-os-Montes e Alto Douro University in Vila Real, Portugal and a Master in Animal Nutrition in Wageningen University in 2012. Then, for five years, has held a role in an animal nutrition company. Since 2017, she has gained experience in Cargill.

Alizé Philouze
Ruminant Nutritionist
Techna Nutrition France

Jamie-Leigh Douglas
Ruminant Technical Sales Manager
Techna Nutrition UK and Ireland

FEED EFFICIENCY: THE CHALLENGE OF A DAIRY COW

It is well known that the most efficient diets are the most profitable. Maximising feed intake and milk production is thus essential to improve the gross margin of the dairy farm. In fact, a + 0.1 point improvement in the milk index - ratio between the quantity of fat corrected milk + primiparous correction and DMI - leads to an increase of 0.5 euros/cow/day in the margin on feed cost (Techna Research). Feed efficiency is something you need to manage from the beginning to the end of the career of the dairy cow.

WHAT IS FEED EFFICIENCY?

The definition of efficiency is a ratio of outputs to inputs. Therefore, feed efficiency is a measure of an animal's ability to transform ingested feed into metabolically available nutrients for production. A feed efficient animal should eat less whilst maintaining production or eat the same with increasing production. For example, for a 30 L dairy cow, to improve feed efficiency from 1.4 (l/Kg DM) to 1.5 means that we save around 1.4 Kg DM intake/cow/day.

It was long assumed that digestibility was similar across individuals. However, it is now evident that individual cows differ in their ability to digest various feedstuffs. These differences in digestibility among dairy cows is due to many factors such as nutrition (being one of the main focuses), breed (selecting genetically more efficient animals), health of the animal, days in milk, weather, and management etc.

As an industry we can make incremental changes to factors such as management, nutrition and selecting more feed efficient animals which will have a big impact overall on feed efficiency.

In terms of nutrient digestibility and uptake there are two main focuses: Rumen and small intestine.

The rumen is the most well discussed part of the dairy cows' digestive tract; it is often called the engine of the cow. The rumen's anaerobic environment and a pH of between 5.8 - 6.8 favours the growth of microbes. These microbes digest or ferment feed within the rumen and make volatile fatty acids (VFAs) which are absorbed through the rumen wall where they can be used as a source of energy by the cow. The major nutrients required by rumen microbes are carbohydrate and protein in which there is a fine balance between the two to meet the microbial requirement. An imbalance can affect the microbial population and have a negative impact on nutrient digestibility, feed efficiency and the production of the dairy cow. Optimal rumen function is crucial for maximising microbial protein synthesis and the quality of the protein reaching the small intestine.

The small intestine is not as widely discussed in dairy cows, however it has a role to play in the digestive process. The small intestine consists of three sections: The duodenum, jejunum and ileum. The small intestine completes most of the digestive process and absorbs many nutrients through villi (small finger-like projections). From the villi the nutrients enter into the blood and lymphatic systems.

RUMEN NUTRITION

Carbohydrates

Carbohydrates are the primary source of energy in the dairy cows' diets. The majority of carbohydrates are digested in the rumen through microbial fermentation where almost all the digestible carbohydrates are converted to VFA's (acetic, propionic and butyric acid) and absorbed through the rumen wall as a source of energy. The ratio of acetate, butyrate, and propionate is determined by the source of carbohydrates and the rate of digestion. It is one of the major factors controlling the energy available for microbial growth and consequently the energy and protein available to the cow.

Ruminal fermentation of carbohydrates affects productivity and is a critical consideration for diet formulation.

Protein

Protein is a key nutrient but in deficit (less RDP) or in excess (high RDP) it can have a negative effect on the cow. A lactating cow's protein requirement is between 14% and 17%, depending on yield. Cows have a greater bypass protein (DUP) requirement as their yield increases.

Within the rumen, the digestion of proteins results in the production of peptides - peptides are further hydrolyzed to amino acids, some of which are deaminated, producing ammonia. Peptides, amino acids, and ammonia all individually serve as sources of N for various microbes. However, problems can occur when there is a high level of RDP present which can accumulate in the rumen. Energy is then needed to excrete excess nitrogen, rather than using energy for milk production.

Feeding the cow a specific blend of essential oils—such as NOVATAN—increases protein use and reduces ammonia emissions. It improves protein efficiency and rebalances protein partitioning—with more bypass and less RDP. Therefore, the cow can utilise protein that would otherwise be wasted and which would be having a negative effect on the cow and on the environment.

Fats and oils

Fats and oils are concentrated sources of energy to the dairy cow where the majority of it is digested in the small intestine. The type and level of fat in the diet influences the milk fat content and fatty acid profile. Also feeding a lot of unsaturated fatty acids can be toxic to rumen bacteria, slow fiber digestion, and lower rumen pH which will negatively impact feed efficiency.

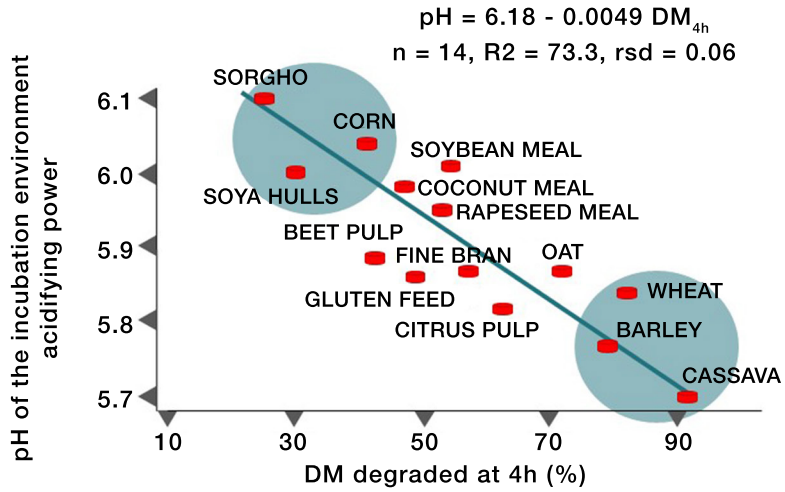
RUMEN HEALTH

Subacute Ruminal Acidosis (SARA)

The rumen should ideally be at pH 6-7. Throughout the day there will be periods when the pH drops below pH 6, but it is for how long it stays below pH 6 that has a negative impact and this is when subacute ruminal acidosis (SARA) occurs. SARA in dairy cows is a common metabolic disease characterised by a prolonged, but not severe, decrease in rumen pH. The decrease in rumen pH can be caused by diets high in readily fermentable carbohydrates and low in fiber.

SARA is associated with decreased fiber degradation, decreased acetate to propionate ratio, and decreased CH_4 formation, which can reduce feed intake, milk yields and milk fat. Not only that but it can cause 'leaky gut' where the gut wall is compromised and will reduce the efficiency of nutrient absorption and increase the risk of unwanted bacteria and toxins getting into the blood. When bacteria or toxins are absorbed into the blood, this initiates an immune response, which is an energy cost to the animal.

To assess the degree of safety regarding the risk of SARA, a rumen indicator was integrated into the data management tool EASY MAP, considering several parameters such as fat/protein ratio, fat equivalent lactation and fat drop.



Source: According to Sauvant et al., 2010

Figure 1. Relationship between the acidogenic value of feeds and the degradation of their DM in sacco at 4h

In addition, following research in collaboration with the INRA in France, Techna developed a DM4 criteria. This is a measure that can be used to determine the proportion of dry matter that has been degraded after four hours in the rumen—starch, sugars, NDF, pectins, protein and so on. DM4 is a criterion used to predict the risk of acidosis across all major raw materials (Figure 1). Fresh grass—in particular young grass—has a high DM4 value. Anything that has a DM4 of 50% and above is a feed that is putting the rumen at risk of a SARA and acidosis. Ensuring rumen pH is stable and optimal will help keep the rumen in good health. Buffer feeding and/or using feed additives such as yeasts, buffers and essential oils, will help stabilise rumen pH. Rumen buffers act by alkalising the rumen, while a specific blend of essential oils will switch the lactate into propionate—securing rumen pH.

Mycotoxins

Mycotoxins are toxic secondary metabolites produced by certain fungi (molds) that can contaminate feedstuffs like forages and grains. Mycotoxins can negatively impact dairy cows, leading to reduced milk production, decreased feed intake, impaired immune function, and potential health issues; ultimately impacting feed efficiency.

Cows are usually able to manage some level of mycotoxins in their diet but as the load grows so does the risk. It tends to be at times of stress that cows will be affected most but these can be as small as a routine foot trimming or vaccination. By the time you see the effects of mycotoxins, such as swollen hocks, increased temperatures or reduced intakes, milk yield will already have suffered.

To help manage mycotoxins, feed should be stored properly, tested for mycotoxins, and if mycotoxins are present then use feed additives such as VITAL-PROTECT that help mitigate mycotoxins while maintaining digestive tract integrity.

SMALL INTESTINE

Not all nutrients are fermented in the rumen, a portion escapes fermentation and flows into the small intestine. The small intestine is the absorption centre for many nutrients such as starch and protein. Starch that avoids rumen digestion is broken down and absorbed in the small intestine, providing glucose directly to the cow.

Protein absorbed in the small intestine is delivered as microbial protein from rumen microbes and undegraded protein (RUP). Both microbial and dietary proteins are digested by enzymes, breaking them down into amino acids. These amino acids are then absorbed into the bloodstream for use by the animal and are a significant source of amino acids for the ruminant. The intestinal crypts in particu-

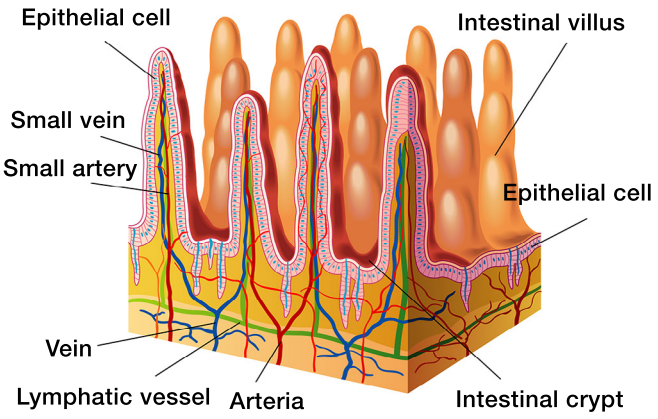


Figure 2. Diagram of an intestinal villi

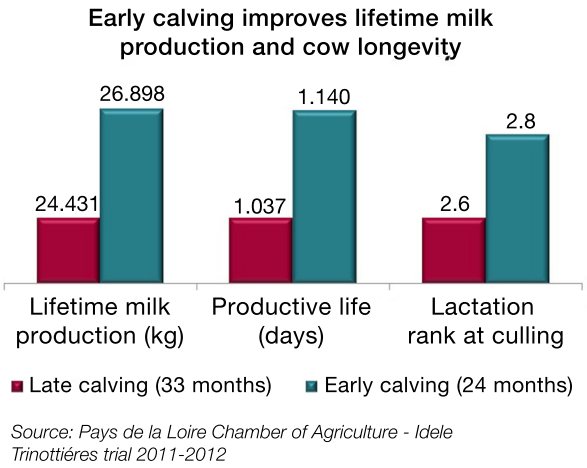


Figure 3. Impact of early calving on the dairy cow's career

lar are the site of intense nutrient absorption and increasing the capacity of absorption is a way to improve feed efficiency (Figure 2). Some feed additives help with increasing the villi size and crypt depth within the small intestine such as essential oils, prebiotics, enzymes, etc.

MONITORING PERFORMANCES

Many factors can contribute to improvements in feed efficiency, but without good monitoring practices then how can the herd's improvements be known and future goals be achieved? To meet this need, EASY MAP, a decision making tool, collects the herd's milk data, processes it and provides a detailed analysis of the herd's performance. The aim is to provide a cutting-edge zootechnical interpretation, by creating various indicators that link feed and zootechnical performance: Milk production, rumen safety, energy coverage and protein efficiency.

Data management tools like EASY MAP allow an insight into what the farm is achieving so that changes can be implemented and future goals to be set.

GOOD MANAGEMENT PRACTICES

It is based on several important levers:

- A good preparation for breeding will improve the efficiency of the feed diet and thus positively improve the reproduction, health, production of the herd, and age at first calving (Figure 3). A calving age between 22-25 months can lead to higher lifetime milk production, improved reproductive health, and reduced rearing costs,

- Ensuring adequate feeding space to prevent bullying, injuries, and stress, which can reduce feed intake,
- Providing adequate lighting in cubicle and roaming areas to stimulate feeding,
- Cows should always have access to clean water, which is extremely important for the production, health and welfare of the cow.

GENETICS

Feed efficiency is one of the most economically important traits and is sufficiently heritable to respond to genetic selection. Currently, selecting for feed efficient traits is done through research and industry settings with special facilities designed for this purpose. This is costly and limits the number of animals measured in the research projects and by cattle breeders. Therefore, progress has been slow. However, as the size of dairy herds increase, automated milking is becoming more and more widespread. Milking robots can help interpret ration ef-

ficiency thanks to the various data they can provide instantaneously (feed intake, rumination and milk production).

CONCLUSION

By selecting the right feed components, managing the balance of VFAs through optimising pH, good management practices and data monitoring; dairy farmers can optimise the feed efficiency of their cows for better performance and profitability. With an improvement in feed efficiency less nutrients should be wasted, and it should lead to less land and resources required for feed production. Striving to be as efficient as possible benefits the farm no matter the situation.

Feed efficiency of dairy cows is a crucial objective. At Techna, we remain committed to advancing our knowledge and expertise to enable the industry to become more efficient.

About Alizé Philouze

Alizé Philouze holds an engineering degree in ruminant production from ESA in Angers (France) and has several years' experience in ruminant nutrition and breeding. She is currently a ruminant nutritionist at TECHNA, where she combines scientific research and practical applications to support ruminant feed manufacturers in France and abroad.

About Jamie-Leigh Douglas

With a doctorate in ruminant nutrition from Aberystwyth University, Wales, Douglas has over 10 years expertise in the field. She works closely with feed mills and nutritionists focusing on developing tailored solutions that address balancing zootechnical and environmental performance, animal welfare, economical profitability in the ruminant sector.

Future Challenges for Poultry: OUR VISION AT LUCTA

Jesús Rubio
Poultry Product Manager and Business Development
LUCTA

A planet in constant motion and the threat of a new world order due to recent political changes place us in a more uncertain and, above all, more challenging scenario for agri-food production.
Poultry farming is a type of animal production that has traditionally performed well during times of crisis. Currently, it is in a very favorable price situation due to an optimal balance between supply and demand. However, it faces numerous threats, and it is essential to understand and navigate this situation.

Growth forecasts are generally positive, although with varying intensity across different continents. Europe, the continent with the lowest growth potential, is expected to see a 1% increase in production during the current year, with a 0.8% rise in domestic consumption and a 2% increase in exports. (Source: Expana 2025 Poultry Outlook, Trends, Forecast and HPAI Impact).

The fundamental factors affecting price and demand are feed costs—which account for 67% of the total cost—energy costs, and European Union regulations (European Chicken Commitment), which govern certain production aspects and will undoubtedly influence costs. Limitations on maximum growth and stocking density may lead to increases in production costs and environmental impact. The European Union will likely favor **slow-growing chicken production**, and it is a reality that consumers have leaned toward **cage-free egg production systems** beyond what current regulations require.

The threat of **highly infectious diseases such as HPAI (Highly Pathogenic Avian Influenza) and Newcastle adds an additional risk to the industry**, which is further exacerbated by the growing trend of rearing birds in outdoor environments.

Alongside these internal threats, the **geopolitical situation and foreign trade** dynamics will shape the overall trend. The resolution (or not) of the conflict in Ukraine, potential changes in ingredient imports from the USA, and the implementation of certain tariffs could act as levers of change.

As usual, the South and Southeast Asian markets are expected to see the highest growth in 2025. In contrast, the American continent may experience some contraction due to a shortage in breeder supply and a profitability crisis, where HPAI (Highly Pathogenic Avian Influenza) is having a more negative impact. Although these outcomes may help to balance the markets, they are clearly limiting global growth (Source: Rabobank).

Consumer perception of poultry products has undergone a **very interesting upward revaluation**, generating extraordinary demand for certain products. Eggs, once criticized just a few years ago for increasing blood cholesterol levels, have completely transformed their image and are now seen as a product with health benefits. Their value as a source of high-quality protein is trending, and it's one of the reasons behind the **rise in consumption (up to 8% in countries like Spain) and a price increase of up to 25% in some countries.** The perfect storm of high demand and low supply is driving prices up and leading to a level of sector financing never seen before. Structural changes in the industry within the European Union, stemming from animal welfare regulations and the growing consumer preference for cage-free eggs, are largely responsible for the reduced number of laying hens in production. In addition, the culling of birds testing positive for HPAI has further contributed to this supply shortage.

From a food quality perspective, **the reduction in antibiotic use in animal production is a reality.** Over the past four years, according to official prescription sources (Presvet, Spain), the use of antibiotics in livestock farming has decreased by up to 53% in Spain.

Although this downward trend in antibiotic use may be more pronounced in Europe—due to regulatory measures- it is being mirrored across all continents as a result of market globalization.

Undoubtedly, **the quality of the final product in the supermarket, along with the possibility of enriching that product (such as altering fatty acid profiles)**, adds value both to poultry and turkey meat, as well as eggs.

In light of this situation, what should be the vision of a company dedicated to the production of feed additives for animal nutrition?

Basically, we must keep in mind what the key challenges in poultry farming will be in the near future:

• Zootechnical performance will continue to be the main benchmark for evaluation in production companies. Feed conversion remains a key factor, given the significant weight of feed costs in the total cost per kilogram. However, in certain regions, **the need for slower-growing broilers is reducing the prominence of this parameter**. Diets with lower energy per kilogram will likely become more com-

mon, and the reference value may shift toward caloric conversion instead.

Another trend in animal nutrition is the use of alternative raw materials (by-products, insect meals, etc.) to reduce feed costs. These new compounds can show more anti-nutritional factors.

In any case, digestive efficiency is a critical factor to consider in any feeding strategy that includes the use of specific additives, especially in an environment where gaining flexibility is a trend in dietary formulation with the use of alternative feed ingredients of local production.

• Such a drastic reduction in antibiotic use requires deeper investment in areas like biosecurity, but above all, **special attention to intestinal integrity**, which is undoubtedly one of the most important immune-related organs in poultry. Intestinal inflammatory processes—previously partially mitigated by antibiotics—lead to reduced nutrient absorption and weakened immune protection. Among other strategies, additives with anti-inflammatory and immunomodulatory actions are now taking center stage.

• **Protection against highly specific diseases such as coccidiosis** will require different strategies and the support of feed additives, whether in vaccination programs or in the use of ionophore versus chemical coccidiostats.

• **Production cycles are becoming longer**. The best example of this evolution is laying hens, which now have production cycles exceeding 100 weeks, while still maintaining good egg production and quality. Without a doubt, maintaining these quality standards beyond 50 weeks of age requires maximum hepatoprotection and a resilient gut integrity.

• **Heat stress**, in a world facing profound climate change, is becoming an increasingly recurrent issue. Feed intake is compromised in this situation and a higher appearance of intestinal issues as leaky gut occurs. It is a must to sustain intake and animal homeostasis with strategies that contribute to a more resilient poultry production.

• The **quality of poultry products**, beyond being a hallmark demanded by consumers, is also a clear indicator of essential animal welfare. Meat free from myopathies, with lower risk of lipid oxidation, and the absence of footpad dermatitis are now essential requirements.

• **Welfare measures** that free laying hens from cages expose them to a **different feeding pattern**. Until now, feed intake was not seen as an issue. From now on, with free-cage hens, achieving target weight and pre-lay uniformity is no longer straightforward, and specific techniques are needed to ensure proper feed intake.

• Last but not least, everything proposed must be approached through a lens of **sustainability** and under the close watch of the circular economy. Making the most of existing resources to reduce the use of natural ones and prevent waste generation is the driving force that should guide the economy.

LUCTA is a company that celebrated its 75th anniversary in 2024. Dedicated to the production of

flavors, fragrances, and additives for animal nutrition, its expertise across different animal species focuses on the development of flavors and other solutions to ensure optimal feed intake and products aimed at supporting digestive efficiency and animal welfare.

In recent years, the company -based in Spain- has also developed and produced its own **Olive Bioactives**, which **have shown strong anti-inflammatory and antioxidant properties**, among others, becoming a promising tool for the development of solutions targeting current and future poultry industry challenges.

The obtention of olive-derived bioactive compounds constitutes a notable example of circular economy principles, particularly in Spain, the world's leading producer of olive oil.

Proper guidance tailored to each poultry category and production phase is essential in finding the right solution, as there are no global answers—only specific ones.

LUCTA is committed to providing **sustainable solutions for palatability, efficiency and animal welfare**, as well as for the preservation of feed, ingredients, and premixes.

About Jesús Rubio

Jesús Rubio studied Veterinary Medicine at the University of Zaragoza, obtaining his degree in 1993. After working for different companies in poultry genetics and poultry production, and following a period of more than 20 years in the veterinary pharmaceutical industry, he joined LUCTA in September 2024 as a Poultry Product Manager and Business Development within the Feed Additives Division.

POWER PEAK PERFORMANCE WITH SMARTER FEED MANAGEMENT

Yianna Rhodes
Product Manager - Feed Operations
VAS

"Some feed management software enables data storage in the cloud, which offers an additional layer of flexibility to the system. Now information can be shared and easily accessed from literally anywhere. Farmers, consultants and veterinarians can review real-time feeding data, offering guidance and decision-making support without needing to be on-site."

Feeding a modern dairy herd is no small feat. On any given day, the average operation feeds upwards of 2,000 cows, twice daily. If the average high-producing cow eats 120 pounds of feed per day, that's 120 tons of feed that must be mixed and fed every day.

And that's only one part of it – there's also multiple rations that need to be mixed for different groups, feeding schedules to follow and not to mention all the behind-the-scenes work that goes into sourcing the feed and making sure there's adequate inventory.

Feeding a modern dairy herd is complex and requires more than a notebook and pen or relying on memory to manage. Robust feed management software is a must to keep everything running smoothly so cows get fed the same ration, mixed properly, and delivered at the same time every day to maintain good health and productivity.

IT'S THE LITTLE THINGS

When managing something so pivotal to the success of a dairy operation, details matter. Even small fluctuations in a feeding program can have a big impact. For example, a feeder may only be off by 50 or 100 pounds per mix, but that compounds over time and by the end of the week that slight variation throws off inventory projections.

Thankfully, there are tools available to help producers spot and fix mixing errors. Feed management software from providers like VAS gives producers the data they need to train feeders more effectively; hone feeding practices and reinforce the importance of precision. In fact, one 1,100-cow dairy saved $10,000 per month on corn alone by tracking feed usage with their feed management software, dropping from five loads of ground corn to four.

How feed management software simplifies ration mixing and delivery:

- Reveals and minimizes mixing mistakes to maintain accurate feed inventories,
- Guides feeders through ingredient selection in real-time, ensuring proper order and volume,
- Monitors the time that rations are dropped in

front of cows, volume delivered, and feed refusals so cows receive consistent nutrition day after day.

REPORTING TOOLS OFFER VALUABLE INSIGHTS

Feed management software does more than just keep feeding on track; it offers valuable insights to help producers make more informed decisions that impact the health of the herd and production efficiency.

Each dairy is unique, and customizable reports and dashboards allow producers to generate information that's most important to their specific dairy. These reports can be quickly referenced so key personnel and consultants can keep a pulse on performance and nutrition metrics, making necessary adjustments to optimize performance.

Reports showing dry matter intake and ingredient usage are at the very base of any successful feeding program. These reports help producers and their team understand what their cows are eating and the volume of ingredients that are being fed. With this level of visibility, producers gain the power to fine-tune rations, verify ingredient usage and uncover new ways to optimize dry matter intake – capabilities that are virtually impossible without a dedicated feed management system.

Automating reports from a feed management program allows for daily updates on things like feeder performance or inventory levels. Some dairies send inventory reports with run-out dates to their feed mill, streamlining delivery. Other dairies use the reports to identify opportunities for additional feeder training and to encourage continuous improvement.

INTEGRATION WITH OTHER SOFTWARE

At its core, efficiency on the dairy is defined by how many pounds of milk can be generated per pound of feed. Another benefit of VAS' feed management software is that it can seamlessly integrate with a farm's herd management system, such as DairyComp, allowing them to connect feed consumption with milk production to better understand income over feed costs. This is where hidden opportunities can really start coming into focus. In some instances, producers may realize that feeding a cheaper ration will result in greater potential profit and ultimately strengthen their bottom line.

Integrating feed and herd management systems can also streamline daily workflows by seamlessly exchanging data on pen counts. This ensures the rations are automatically updated in real time, always reflecting the precise amounts that need to be mixed and delivered.

Additionally, integrating an inventory management tool like WeighComp takes it a step further by tracking when commodities are coming into storage facilities, when it leaves and how it was used on the farm – enabling transparency and more proactive feed management.

EASILY ACCESS FEED DATA FROM ANYWHERE

Some feed management software enables data storage in the cloud, which offers an additional layer of flexibility to the system. Now information can be shared and easily accessed from literally anywhere. Farmers, consultants and veterinarians can review real-time feeding data, offering guidance and decision-making support without needing to be on-site.

With the sheer volume of feed processed each day on a dairy, and the mountains of data available, it takes more than a pen and paper to stay current. A good feed management system simplifies the process, saves money, empowers your team and helps ensure cows get the nutrition they need – every single day.

PRECISION FARMING AND BIOTECHNOLOGY

Joe Hugill
Associate Director – Animal Health Skills Alliance

"Together, precision farming and biotechnology are redefining the boundaries of what's possible in sustainable animal nutrition. By marrying real-time data with innovative feed inputs, the industry is creating a smarter food system—one where animals are nourished more efficiently, waste is minimised, and ecological impact is kept in check."

As agriculture faces pressure to meet global food demands sustainably, precision farming and biotechnology are transforming animal nutrition. These innovations reduce environmental impact, boost feed efficiency, and improve animal health—revolutionising how we nourish livestock in a resource-constrained world.

PRECISION FARMING: TAILORING NUTRITION IN REAL TIME

Precision farming integrates advanced technologies—data analytics, automation, sensors, and machine learning—to manage livestock nutrition with extraordinary accuracy. Rather than relying on broad averages or fixed feeding schedules, precision nutrition ensures each animal receives exactly the nutrients it needs based on its physiological condition, behaviour, and environment.

Smart Feeding Systems and Automated Dispensers

One of the most impactful applications is the use of automated feeding systems that track each animal's weight, activity, growth rate, and dietary intake. These systems use embedded AI and sensor technology to customise rations dynamically.

For example, high-producing dairy cows can be provided with more energy-dense rations, while less active or lower-producing animals receive lighter diets. This reduces feed waste, prevents overfeeding, and lowers nitrogen excretion—minimising environmental impact and improving animal health.

Automated systems also reduce the labour burden on farmers, standardise feeding accuracy, and enable 24/7 adjustments that respond to real-time data, improving efficiency and consistency across the herd.

IoT Sensors And Real-Time Monitoring

Precision farming thrives on real-time, farm-level intelligence. Internet of Things (IoT) devices—deployed in feeding troughs, barns, and even attached to animals—track environmental and nutritional variables such as:

- Feed quality and moisture,
- Animal behaviour and eating patterns,

- Temperature and humidity,
- Rumination and digestion rates.

If a sensor detects a sudden drop in feed intake in a particular animal or pen, it could indicate illness or feed spoilage. Farmers receive instant alerts, allowing early intervention and avoiding prolonged health or performance losses. This minimises feed waste while supporting animal welfare and productivity.

The data generated also contributes to long-term decision-making. By tracking correlations between feeding behaviour and animal performance, producers can refine strategies to better match nutritional inputs with biological outcomes.

Data-Driven Feed Optimisation

Perhaps the most transformative impact of precision farming lies in its ability to optimise nutrition over time. Machine learning platforms aggregate thousands of data points across various dimensions—animal physiology, feed composition, climate conditions—and use predictive analytics to fine-tune feeding programmes.

This ensures that animals are receiving the most effective nutrient mixes not only for their current needs but also based on projected growth patterns and weather fluctuations. As a result, the farm reduces its carbon footprint by improving feed conversion ratios and lowering methane emissions.

In short, precision farming transforms nutrition from a reactive task to a proactive system—one that's constantly learning and adapting to enhance outcomes for animals, farmers, and the environment.

BIOTECHNOLOGY: REINVENTING FEED FROM THE GROUND UP

While precision farming optimises how feed is delivered and utilised, biotechnology is redefining what that feed actually consists of. Innovations in microbial fermentation, algae cultivation, and alternative protein production are providing sustainable substitutes for resource-intensive crops like soy and corn.

Microbial Fermentation and Single-Cell Proteins

Biotech companies are increasingly turning to single-cell proteins (SCPs)—high-protein ingredients cultivated from bacteria, yeast, or algae. These organisms can grow rapidly using substrates like methane, agricultural waste, or even CO_2, making them both scalable and sustainable.

SCPs are rich in essential amino acids and free from many of the anti-nutritional factors found in traditional feedstocks. Their production consumes far less water and land than soy or corn, making them ideal for a planet with limited natural resources.

Companies like Calysta and KnipBio are already piloting SCPs at industrial scale, providing protein solutions that are environmentally friendly and nutritionally robust.

Algae-Based Feeds and Omega-3 Alternatives

Another promising biotech innovation is algae-based feed, particularly as a replacement for marine-derived omega-3 fatty acids. Omega-3s are essential for animal health and influence the quality of meat, milk, and eggs, but traditional sources like fishmeal are environmentally unsustainable due to overfishing.

Algae, on the other hand, can be grown in controlled environments using minimal inputs, and are rich in DHA and EPA—the key long-chain omega-3s. Incorporating algae into animal diets not only supports animal immunity and fertility but also helps reduce the sector's reliance on depleting marine ecosystems.

These solutions are especially important in aquaculture and poultry, where omega-3s are critical for fast, healthy growth.

Insect-Based Bioconversion

Biotechnology has also given rise to insect farming as a highly efficient way to upcycle organic waste into nutrient-rich animal feed. Species like black soldier fly larvae can convert food waste and agricultural by-products into high-quality protein and fat suitable for poultry, pigs, and fish.

Beyond sustainability, biotech advances are helping optimise the growth and feed conversion efficiency of these insects, while ensuring pathogen control and regulatory compliance. Although still emerging in many markets, insect-based feed is gaining momentum as both policy frameworks and consumer perceptions evolve.

Feeding the Future: A Smarter, Greener System

Together, precision farming and biotechnology are redefining the boundaries of what's possible in sustainable animal nutrition. By marrying real-time data with innovative feed inputs, the industry is creating a smarter food system—one where animals are nourished more efficiently, waste is minimised, and ecological impact is kept in check.

Key benefits include:

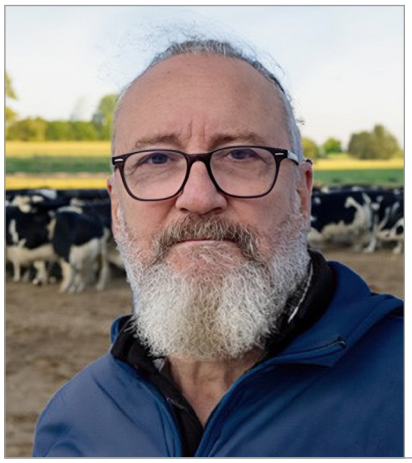
- Reduced overfeeding and feed wastage,
- Enhanced nutrient absorption and animal health,
- Lower greenhouse gas emissions from livestock,
- Alternative protein sources with minimal land and water use,
- Improved traceability and sustainability in feed supply chains.

As climate change accelerates and global populations grow, the urgency to innovate becomes greater. Precision farming and biotech are not just trends—they are foundational tools for a resilient, future-ready livestock sector.

By investing in these technologies today, producers and policymakers can help shape a food system that is not only productive and profitable, but also ethical, adaptable, and sustainable for generations to come.

About Joe Hugill

Joe Hugill specialises in talent acquisition for the ingredients sectors. With a background in Business & Finance Management from Northumbria University and 7+ years in recruitment, he focuses on animal health, nutrition, and veterinary services. Hugill drives strategic hiring solutions, client partnerships, and team leadership, ensuring exceptional matches between top talent and industry leaders. He is passionate about fostering growth through expert recruitment strategies.



EPIGENETICS AND IMMUNITY, HEALTH, AND LONGEVITY IN DAIRY COWS

Dr. Alvaro Garcia, DVM
Feeds Specialist and Nutritionist
Dellait Animal Nutrition and Health

"Epigenetic activation begins within the first few days of life. Calves receiving insufficient colostrum or nutritional restriction during critical developmental periods typically underperform later in life. Colostrum provides essential nutrients and bioactive factors for positive epigenetic programming. Inadequate colostrum intake or early-life nutritional deficiencies can alter DNA methylation, histone modifications, and gene expression, impairing metabolism and immunity, increasing susceptibility to disease, and adversely affecting adult productivity."

Ruminant nutritionists traditionally focus on fulfilling nutrient requirements to support growth, lactation, and reproduction. Contemporary nutritional science, however, reveals a deeper role for nutrients beyond simply serving as substrates, they directly influence gene expression. This nutrient-driven modulation, termed epigenetics, significantly affects immunity, health, and longevity in dairy cows.

Epigenetics (Greek: *epi-*, meaning "above," and *genetics*, meaning "origin") refers to mechanisms regulating gene activity without changing the underlying DNA sequence. Simply put, epigenetics acts like switches, turning genes on or off based on nutrient-derived metabolites. When these metabolites are abundant, beneficial genetic pathways activate; when scarce or imbalanced, critical pathways may become inactive, compromising health and longevity.

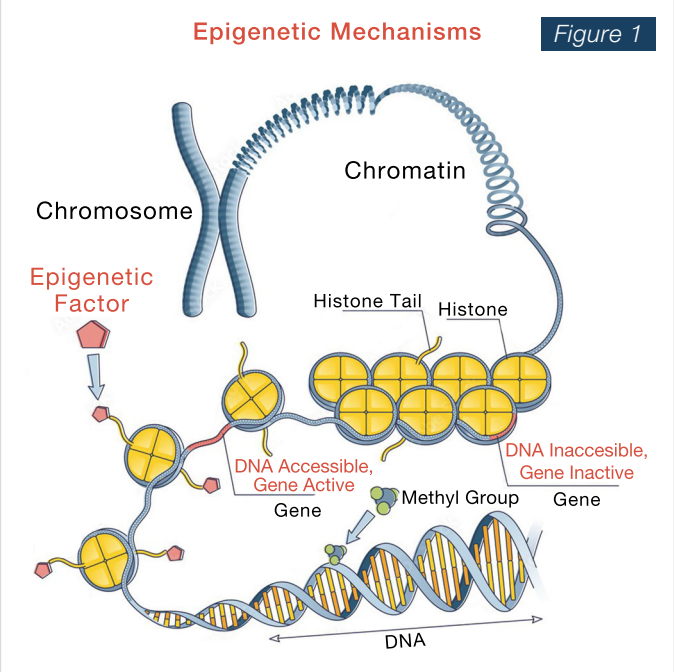
In this article, I explore practical ways to activate the genetic switches of epigenetics—simple strategies to help turn on beneficial genes through strategic feeding.

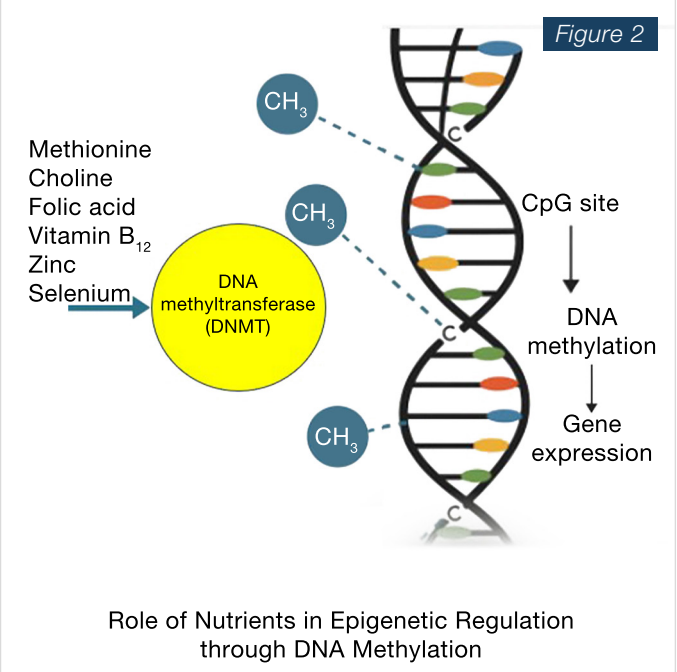
EPIGENETIC MECHANISMS EXPLAINED

Primary epigenetic mechanisms include DNA methylation, histone modifications, and non-coding RNA regulation. Adding methyl groups to DNA sites (CpG islands), typically silences gene expression. Histones, small proteins forming nucleosomes around which DNA wraps, can undergo acetylation, methylation, and phosphorylation. These modifications alter DNA packaging: Tightly wrapped DNA suppresses genes, while loosely wrapped DNA allows gene expression. Non-coding RNAs further influence gene interpretation. These epigenetic modifications are heritable and responsive to dietary conditions (Figure 1).

NUTRITIONAL IMPACTS ON EPIGENETICS

Specific nutrients, including methionine, choline, folic acid, vitamin B12, and minerals like zinc and selenium—are essential for epigenetic processes. DNA





Role of Nutrients in Epigenetic Regulation through DNA Methylation

methylation heavily depends on methyl groups provided primarily by dietary methionine, choline, and folate. The enzyme DNA methyltransferase (DNMT) transfers these methyl groups onto cytosines at CpG sites, critically regulating gene expression.

Dairy nutritionists typically supplement methionine and choline following NASEM (2021) recommendations, often unaware of their epigenetic effects. Meeting these nutrient guidelines enhances DNA methylation, suppresses pro-inflammatory cytokines, strengthens immune responses, and reduces susceptibility to diseases such as mastitis and metritis. Conversely, nutrient deficiencies disrupt methylation patterns, increasing inflammation and disease risk.

Histone modifications mediated by histone acetyltransferases (HATs) and histone deacetylases (HDACs) similarly rely on nutrients. Histone acetylation enhances gene expression, dependent on acetyl-CoA, linking energy metabolism directly to gene regulation (Figure 2).

EPIGENETIC EFFECTS ON IMMUNITY, HEALTH, AND LONGEVITY

Emerging research highlights epigenetics' significant impact on immunity and health. Proper nutrient intake activates protective immune pathways, enhancing pathogen resistance and reducing chronic inflammation. Selenium, for instance, modulates epigenetic pathways governing selenoprotein expression, essential for a stronger immunity and antioxidant protection.

Short-chain fatty acids (SCFAs) like butyrate, acetate, and propionate—produced via ruminal fiber fermentation—also influence epigenetics. Butyrate strongly inhibits HDACs, promoting anti-inflammatory expression, while acetate and propionate indirectly enhance histone acetylation by supplying acetyl groups. These SCFAs significantly impact gut health, systemic immunity, and overall animal health (Kasubuchi et al., 2015).

Epigenetic activation begins within the first few days of life. Calves receiving insufficient colostrum or nutritional restriction during critical developmental periods typically underperform later in life. Colostrum provides essential nutrients and bioactive factors for positive epigenetic programming. Inadequate colostrum intake or early-life nutritional deficiencies can alter DNA methylation, histone modifications, and gene expression, impairing metabolism and immunity, increasing susceptibility to disease, and adversely affecting adult productivity.

PRACTICAL NUTRITIONAL STRATEGIES TO PROMOTE EPIGENETIC UP-REGULATION

To positively influence epigenetic outcomes, implement these specific nutrient recommendations:

- **Methionine and Choline:**
  - o Rumen-protected methionine: 10–15 g/day (2.3–2.4% of metabolizable protein).
  - o Rumen-protected choline: 12–20 g/day, from 21 days pre- to 21 days post-calving.

- **Folate and Vitamin B12:**
  - o Vitamin B12 (rumen-protected): 0.5–1.0 mg/day during metabolic stress.
  - o Folate (rumen-protected): 2–3 mg/kg DM intake/day during transition and early lactation.

- **Trace Minerals:**
  - o Selenium: 0.3 mg/kg DM, preferably as selenomethionine.
  - o Zinc: 40–60 mg/kg DM (combination of organic and inorganic forms).
  - o Copper: 12–16 mg/kg DM.

- **Fiber for Optimal VFA Production:**
  - o Dietary NDF: 28–32% of diet DM; forage NDF: 20–24% of diet DM.
  - o Physically effective fiber (peNDF): >21%.

- **Energy Balance:**
  - o Energy density: 1.55–1.65 Mcal/kg NEL (close-up dry period), increasing to 1.70–1.75 Mcal/kg NEL post-calving.
  - o Support dry matter intake (3.5–4% of body weight/day at peak lactation).

- **Colostrum Management:**
  - o Feed 4 liters of high-quality colostrum (>50 g IgG/L) within 2 hours of birth.
  - o Ensure calves consume at least 150–200 g of IgG within the first 24 hours.

ECONOMIC AND PRACTICAL IMPLICATIONS

Epigenetic nutrition significantly impacts cow longevity beyond short-term productivity metrics like milk yield. Improved epigenetic programming reduces disease incidence, prolongs productive lifespan, lowers replacement costs, and enhances lifetime profitability. Cows managed with optimal epigenetic nutrition demonstrate increased lifetime milk production, reduced veterinary interventions, and greater farm economic sustainability.

Optimizing nutritional strategies for epigenetic up-regulation involves more than basic nutrient provision; it strategically modulates gene expression pathways essential for immunity, health, and longevity. Recognizing and leveraging nutritional epigenetics presents dairy nutritionists with powerful tools to enhance animal welfare, productivity, and economic outcomes, supporting sustainable dairy farming practices.

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Algae-Based Animal Feed and its Global Market Status

Algae continue to grow in value as a promising feed ingredient for supporting animal health, improving feed sustainability, and enhancing the nutritional value of animal products. Increasing sustainability concerns and the nutritional benefits of algae are accelerating the adoption of algae-based feed in the livestock and aquaculture sectors. With this adoption, the market is growing rapidly and its commercial value is increasing. Data from research companies indicate that the market size is expected to grow at an approximate CAGR of 5.5% between 2024 and 2034, reaching approximately 6.9 billion US dollars by 2034.

By Derya Yildiz

Algae are simple, plant-like organisms that grow in the water. They include microscopic single-celled species such as microalgae (e.g. *Spirulina, Chlorella, Schizochytrium*) and larger multicellular forms such as seaweed (macroalgae). Algae-based animal feed refers to feed products that contain the entire algal biomass as the main ingredient or various algal ones in combination with traditional feed ingredients.

Algae, which have become widely used in animal feed for various purposes, especially in recent years, are rich in protein, essential amino acids, omega-3 fatty acids (especially DHA and EPA), vitamins (A, B, E, K), minerals (iodine, iron, calcium) and antioxidants such as carotenoids. These properties make them a powerful supplement for balanced nutrition. Research shows that algae can improve growth rates, feed conversion efficiency, and immunity in animals such as poultry, pigs, fish, and ruminants. Some algae species have been re-

ported to support gut health and reduce disease outbreaks, while others contain bioactive compounds with antimicrobial, antiviral, and anti-inflammatory properties that can reduce the need for antibiotics. Increased weight gain, fertility, and product quality (e.g., omega-3-enriched eggs or milk) are also among the reasons for using algae in animal feed.

Another important factor making algae a popular ingredient is sustainability. Algae can be farmed in areas where traditional crops cannot be grown, using wastewater or saltwater, and require less land and freshwater than traditional crops. This makes algae an environmentally friendly alternative to fishmeal or soya-based feed. Environmental benefits such as a lower carbon footprint, reduced pressure on oceans due to overfishing, and more efficient land use make algae an appealing option.

In summary, algae-based animal feed offers a promising solution for supporting animal health, improving feed sustainability, and enhancing the nutritional value of animal products. As feed-related innovations advance, algae could play a significant role in creating a more resilient and environmentally conscious agricultural system.

CURRENT MARKET SIZE AND FUTURE PROSPECTS

Factors such as growing sustainability concerns and the nutritional benefits of algae are driving the widespread adoption of algae-based feed in the livestock and aquaculture sectors. This interest is also accelerating market growth. Data from recent market reports, which provide information on the current size of the market, expected growth rates, and future valuations, also support this trend.

For example, **Future Market Insights** estimates the global algal-based feed market value to be 4.46 billion US dollars in 2023 and forecasts that the market will grow at a compound annual growth rate (CAGR) of 6.7% between 2023 and 2033. According to the company's report, the total market size will reach 8.16 billion US dollars by 2033.

Global Market Insights, which estimates the market value for 2024 at 4.5 billion US dollars, also points to similar growth rates. The company forecasts a CAGR of 3.9% for the period 2025-34, with the total size reaching 6.6 billion US dollars by 2034.

Another similar forecast comes from **Persistence Market Research** analysts. According to the company's report, the global algae-based feed market, which will reach a size of 4.8 billion US dollars in 2025, will exhibit a CAGR of 4.4% between 2025 and 2032 and reach a size of 6.5 billion US dollars in 2032.

Data Bridge Market Research estimates that the algae-based animal feed market was worth 2.58 billion US dollars in 2022, will grow at a CAGR of 7.3%, and reach 4.52 billion US dollars by 2029.

Precision Business Insights, which reported that the algae-based feed market was worth 3 billion US dollars in 2023, estimates that the market will grow at a CAGR of 5.5% during the 2024-30 forecast period and reach 4.37 billion US dollars by 2030.

Although the reports differ in their forecasts, the general consensus is that there is a positive growth trend. The average of the five reports we evaluated indicates that the market size will grow at an approximate CAGR of 5.5% between 2024 and 2034 and reach approximately 6.9 billion US dollars by 2034.

FACTORS DRIVING GROWTH IN THE ALGAE MARKET

Environmental, nutritional, economic and technological factors are the main elements shaping the global algae-based animal feed market. Analysts highlight that as demand for sustainable and high-performance animal feed increases, algae-based solutions are emerging as an attractive alternative to traditional feed ingredients. They emphasize that this market will continue to grow in the coming period driven by the following factors:

1. Increasing Demand for Sustainable Feed Ingredients

The global trend toward environmentally friendly and sustainable agriculture has begun to prioritise the search for sustainable ingredients. Algae cultivation requires significantly less land, water, and resources compared to traditional crops like soya or corn. Additionally, some algae species can be cultivated using wastewater or saltwater, thereby reducing pressure on freshwater and fertile soil. As a result, algae cultivation produces a lower carbon footprint compared to traditional feed production methods, aligning with climate and sustainability goals.

2. High Nutritional Value of Algae

Algae are a rich source of essential nutrients such as proteins and amino acids, omega-3 fatty acids (particularly DHA and EPA), vitamins (A, B12, E, K), minerals (iron, iodine, calcium), and antioxidants (carotenoids, phycocyanin). This nutrient-dense profile makes algae particularly beneficial for poultry, swine, aquaculture, and ruminant feed, helping to improve growth performance, immunity, fertility, and product quality (e.g., nutrient-enriched milk or eggs).

3. Expansion of Aquaculture and Functional Feed Markets

As global aquaculture expands to meet the demand for seafood, the need for sustainable alternatives to fishmeal as feed has also increased. Algae, particularly species such as *Schizochytrium* and *Nannochloropsis*, are used as rich sources of omega-3 and protein in fish diets.

In parallel, the growth of the functional feed market, which focuses on improving animal health and performance through feed, has increased demand for algae-based additives with immunomodulatory, antimicrobial and antioxidant properties.

4. Antibiotic Reduction and Natural Feed Additives

Increasing restrictions on antibiotic use in animal production have created strong pressure for natural alternatives. Some algae species contain bioactive compounds that support gut health, reduce inflammation, and enhance immunity. This makes algae a suitable ingredient in antibiotic-free feed formulations.

5. Technological Advancements and Cost Reduction

Advancements in algae cultivation techniques, including controlled environment cultivation and bioreactor technology, along with progress in species

optimisation, have significantly increased algae cultivation efficiency and cost-effectiveness. The development of scalable algae production methods (both open-pond and closed systems) is making commercial applications more feasible. Additionally, innovations in algae processing (such as drying, extraction, and encapsulation) are improving shelf life, digestibility, and nutrient availability in feed formulations.

6. Government Support and Industry Investment

Some governments support research and financing for algae production through agricultural innovation grants, carbon credits, and sustainability incentives. Policies that encourage the reduction of antibiotic use in animal feed and promote natural feed ingredients are also increasing interest in algae-based solutions. At the same time, many animal feed companies and startups are investing in algae R&D and pilot projects to accelerate commercial adoption.

7. Consumer Preference for Sustainable Animal Products

Consumers are becoming more aware of the environmental impacts of animal agriculture. Demand for sustainably sourced meat, dairy products, and seafood is influencing feed formulation trends. Algae-based feed offers a natural and environmentally friendly alternative that enhances product quality, aligning with this shift.

CHALLENGES AND OBSTACLES IN THE ALGAE MARKET

Despite its promising outlook, the global algae-based animal feed market faces several significant obstacles that could hinder its rapid expansion. Some of the key challenges and constraints cited by analysts include:

1. High Production Costs

One of the most pressing challenges is cost. Algae production requires specialised equipment (e.g., bioreactors) and controlled environmental conditions, as well as energy-intensive harvesting and drying processes. These factors significantly increase the costs of algae cultivation and processing compared to traditional feed ingredients such as soybean meal or fish meal. These factors make algae-based feeds more expensive, especially for price-sensitive markets in developing countries.

2. Large-Scale Production Infrastructure

Although algae cultivation has been well studied in research settings, commercial-scale production infrastructure remains limited. Many algae producers operate on a small or pilot scale, leading to inconsistent supply chains and limited availability of algae for feed purposes. This issue hinders bulk purchases by large feed producers and limits market expansion.

3. Regulatory Uncertainty and Delays in Approval Processes

In many regions, regulatory frameworks for algae-based animal feed are insufficient or inconsistent. Delays in feed additive approvals, uncertainties regarding labelling and safety standards, and varying policies across countries and regions are among the regulatory challenges slowing down the international trade and commercialisation of algae-derived feed products.

4. Low Awareness and Adoption Among Farmers

Despite their nutritional advantages and benefits, there is resistance among farmers to adopt algae. Especially in rural or conservative agricultural regions, farmers remain unfamiliar with the benefits of algae-based feed. Traditional feed ingredients such as soybean meal and fish meal are more established and reliable, while algae-based alternatives may be perceived as experimental or unproven.

5. Variability in Nutritional Composition

The nutritional profile of algae can vary significantly depending on factors such as strain/species, growth conditions (light, temperature, nutrients) and harvesting methods. This variability complicates formulation and quality control processes, making it difficult to ensure consistent feed performance and reducing confidence in product efficacy.

6. Storage and Shelf-Life Limitations

Algal biomass—especially in wet or paste form—is sensitive to microbial degradation and has a shorter

shelf life compared to traditional dried feed products. While drying and encapsulation technologies can help, they increase overall cost and complexity. This limits transportability and increases the need for protective technologies.

7. Competition with Traditional Feed Ingredients

Algae-based feeds are in fierce competition with established feed ingredients such as soybean meal, corn, and fish meal. These traditional options are widely available, cost-effective, and supported by extensive research. Strong economic incentives and proven performance benefits are required to convince farmers and producers to switch to algae-based alternatives.

ALGAE-BASED FEED MARKET BY ANIMAL SPECIES

The use of algae as a sustainable and nutritious feed ingredient is increasingly widespread across various animal species. While usage levels vary depending on nutritional requirements, production systems, and economic factors, the overall trend indicates growing interest in the poultry, ruminant, swine, aquaculture, and pet food sectors.

Aquaculture is currently the largest consumer of algae-based animal feed, i.e., the market leader. The main reason for this is the need for sustainable alternatives to fishmeal and fish oil in the feeding of farmed fish and shrimp. Algae are rich in omega-3 fatty acids (EPA, DHA), which are crucial for fish health and meat quality; they enhance growth performance, immunity, and survival rates; and they reduce dependence on overfished marine resources.

With the global expansion of aquaculture, particularly in the Asia-Pacific region, demand for microalgae-based feeds is expected to grow rapidly.

Poultry farmers are increasingly using algae as functional feed additives or partial protein substitutes, but this use is still in its early stages compared to aquaculture. Improving egg yolk colour (natural pigmentation derived from carotenoids), enhancing immunity, reducing oxidative stress, improving feed conversion rates, and reducing antibiotic use are among the benefits of using algae in poultry feed.

The market for poultry is expected to expand, particularly in Europe and North America, in line with the increase in demand for organic and premium eggs.

Ruminant feeds are still a limited area for algae-based feeds due to the complex digestive systems of animals and their roughage-based feeding habits. However, various studies are ongoing on the use of algae in ruminant nutrition for specific purposes. For example, reducing enteric methane emissions (using red algae such as *Asparagopsis taxiformis*) is one such specific purpose. Studies indicate that adding red seaweed (*Asparagopsis*) to cattle feed can significantly reduce enteric methane emissions and support climate-friendly livestock farming practices.

Additionally, algae can be used to improve milk fatty acid profiles in dairy cows (e.g., omega-3 enrichment) or as mineral supplements (rich in calcium, iron, and magnesium).

In **pig** nutrition, algae are being studied as both a protein source and a gut health enhancer, particularly for piglets and weaning diets. Their richness in amino acids and vitamins, their ability to improve gut microbiota, reduce stress after weaning, and decrease the need for antibiotic growth promoters are among the reasons why algae are preferred in pig feed. Additionally, omega-3 fatty acids derived from algae contribute to better meat quality and nutritional value, making pork from algae-fed pigs a premium product in some markets.

In the niche but high-value segment of **pet food**, producers have begun using algae, particularly in premium and plant-based formulations, due to their functional and marketing appeal. Plant-based omega-3, antioxidants, and protein sources, hypoallergenic alternatives for sensitive pets, and support for skin, fur, and cognitive health are factors supporting the use of algae in pet food.

REGIONAL PERSPECTIVE ON THE ALGAE-BASED FEED MARKET

While the global algae-based animal feed market is experiencing overall growth, it exhibits significant regional variations due to different factors. Such factors as industrial development, the intensity of livestock and aquaculture farming, sustainability priorities, and the regulatory landscape shape the growth and development of algae-based feed at the regional level.

North America (the United States and Canada) is one of the most advanced regions in terms of algae-based feed research and commercialisation. The strong aquaculture sector in the region, which is particularly prominent in salmon and trout farming, is driving the demand for sustainable and functional feeds, which in turn is keeping the demand for algae-based feeds in the market alive. Additionally, the active R&D ecosystem supported by universities, startups, and government programmes (e.g., USDA), along with the growing market for pet feed using algae for omega-3 enrichment, are driving the expansion of the algae-based feed market. North America is expected to maintain its leading position in the future, driven by its technologically advanced and sustainability-focused approach.

In **Latin America**, there is growing interest in algae-based feed, particularly in Brazil, Argentina, and Chile. This is largely driven by the expanding aquaculture and poultry sectors. Research and pilot projects on local algae species are ongoing. In this regard, the region shows promising early-stage development.

Asia-Pacific is the fastest-growing region in terms of demand. The main reason for this is the rapid growth of the aquaculture industry. China is the world's largest aquaculture producer, and there is growing interest in algae as an alternative to fishmeal. India, Vietnam, and Indonesia are attracting attention with their investments in feed innovation and sustainability. Japan and South Korea are characterised by their established algae cultivation infrastructure and strong demand for premium seafood products.

High demand for fish feed, government support for sustainable aquaculture, and growing consumer awareness of environmentally friendly animal

products are factors accelerating the expansion of the algae-based feed market in the region. Although cost sensitivity and fragmented production issues persist in Asia-Pacific, analysts believe that the region is poised to become the largest market in terms of volume.

Europe, particularly the EU, is considered a technologically advanced and environmentally conscious market for algae-based feed. Strict regulations on the use of antibiotics in animal production, the Green Deal and Farm to Fork strategies promoting sustainable agriculture, high consumer demand for organic and functional animal products, and the strong presence of algae initiatives and research institutions in countries such as Germany, France, and the Netherlands are the main factors shaping the algae-based feed market in the region. Europe, where regulations are clearer, is also a leader in premium feed applications. According to analysts, this makes Europe an important region for the adoption of value-added algae feeds.

The Middle East and Africa are defined as emerging markets with limited commercial use of algae-based feeds but strong long-term potential. Increased food security and local feed production initiatives, the growth of aquaculture in countries such as Egypt, Saudi Arabia, and Nigeria, and the abundance of sunlight and coastal regions suitable for algae cultivation are considered potential drivers for the expansion of the algae-based feed market in the Middle East and Africa. In the region, pilot projects and government efforts towards sustainability are expected to create new opportunities, particularly in the aquaculture and poultry sectors.

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ANCC 2025 to focus on opportunities for future of feed in Ontario

The countdown has begun for the 9th annual Animal Nutrition Conference of Canada (ANCC) taking place May 7–9, 2025 in Niagara Falls, Ontario.

"The response to this year's conference has been fantastic — it's clear there's a real excitement for our animal nutrition community to come together in Niagara Falls for this dynamic, forward-looking event," said Holly McGill, ANCC Program Chair.

"With registrations filling up quickly, we're encouraging anyone who hasn't secured their spot to do so soon. This year's program is packed with insights that feed professionals can take straight back to the mill or farm. Whether you're looking to stay ahead of the curve, network with peers, or learn from top experts, the ANCC is ready to deliver," McGill noted.

Under this year's theme — "Practical Opportunities to Navigate the Future of Feed" — the ANCC provides a dynamic program full of valuable networking and learning opportunities.

Program highlights include:

• Use of machine learning in the modern commercial feed mill

Dr. Jennifer Ellis, University of Guelph

Explore how data-driven insights can optimize feed mill efficiency, improve sustainability, and enhance feed production.

• Practical on-farm and regional biosecurity: where are we heading?

Dr. Jean Pierre Vaillancourt, Université de Montréal

Understand what's working, what's not, and what's next in biosecurity for swine and poultry — including emerging innovations.

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Arla Foods and DMK Group unveil their intention to merge

Arla Foods and DMK Group announced their intention to merge, creating the strongest dairy cooperative in Europe. The merger brings together more than 12,000 farmers and the companies aim to become one joint cooperative that will achieve a combined pro forma revenue of 19 billion euros. With this move, the companies progress towards creating the future of dairy, enhancing nutritious, high-quality dairy production and innovation in Europe and globally, while securing a strong milk price for their owners. The merger is subject to approval from the Board of Representatives in the cooperatives as well as regulatory approval.

Jan Toft Nørgaard, Chair of Arla Foods, said: "The foundation of this partnership is formed by our shared values, and I am immensely proud of this proposed merger, which is a win-win for our cooperatives. The strength of both Arla and DMK Group lies in our shared commitment to quality and innovation, and I see DMK Group as the perfect partner in shaping a new and strengthened Arla, poised to lead in the dairy industry."

According to the announcement, the merger between Arla Foods and DMK Group represents a union of shared values and complementary strengths, creating one of the largest dairy cooperatives in Europe.

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BioMar Costa Rica secures ASC Feed Certification

One of the global leaders in sustainable aquaculture, BioMar's Costa Rica production facility achieved ASC Feed Certification, marking a significant step forward towards responsible feed production for Central America's aquaculture industry.

Located in Cañas, Guanacaste, BioMar's Costa Rica facility produces feed for shrimp, tilapia, and a variety of marine species, supplying farmers across North and Central America, and the Caribbean.

According to BioMar's statement, this certification represents a major milestone in its ongoing commitment to sustainability and strengthens its position as a trusted provider of responsible aquafeed in the region.

Jorge Vargas, BioMar Costa Rica Managing Director, commented on this achievement: "Obtaining ASC Feed Certification shows our dedication to driving positive change in the aquaculture industry. With this certification, we will be able to

provide access to ASC-compliant feed in the region and support our customer's efforts to meet the growing demand for sustainable seafood in global markets."

Read more>>

CP Foods upgrades layer chicken complex to 100% Renewable Energy model

Charoen Pokphand Foods Public Company Limited (CP Foods) upgraded its layer chicken complex in Chanthaburi province, Thailand, to a 100% Renewable Energy (RE100) model farm, aiming to reinforce its commitment to achieving Net-Zero greenhouse gas emissions by 2050.

As climate change continues to present global challenges, CP Foods is accelerating its transition to renewable energy across all production processes—feed, farm, and food—under its Agri-Tech strategy. The company's RE100 initiative is a key pillar of its sustainable development roadmap, aiming to secure long-term energy resilience and reduce environmental impacts.

The Chanthaburi farm was previously operating on approximately 80% renewable energy through biogas produced from chicken manure. It has now transitioned to full renewable energy use by integrating solar power and optimizing biogas generation. The achievement has earned CP Foods its first "RE100 Farm" certification from LRQA (Thailand), making it the company's flagship green farm. The transformation embodies the "Waste to Value" concept by converting waste into clean energy and

eliminating external pollution, according to the announcement

Somkid Wannalukkhee, Head of the Egg Business at CP Foods, emphasized that the integrated production system—housing layer barns, automated egg grading, and processing facilities in a single location—enhances efficiency and reduces logistics costs while ensuring high food safety standards. He noted that the company has implemented biogas systems at all its farms and continues to pursue 100% renewable energy use as a standard practice.

Read more>>

Dairy industry gathers for 11th edition of CDX

The Canadian Dairy XPO (CDX) reported another successful event for 2025, drawing 17,600 attendees on April 2-3 to the fully booked venue in Stratford, Ontario. Now under the ownership and management of DLG, the German Agricultural Society, the 350-exhibitor strong trade show has reaffirmed its position in its 11th edition as a must-attend event for dairy producers across Canada.

According to the announcement, the on-site survey found that 82 percent of attendees were active quota-holding dairy producers, with 51 percent reporting more than $8 million (CAD) in operational equity, with 98 percent of all producers indicating plans to return in 2026. "We couldn't be happier with the turnout," said Jordon Underhill, President of the Canadian Dairy XPO. "Despite the weather, which could have deterred many, our producers showed up in droves to participate in CDX. It truly embodies the spirit of our community and the importance of this gathering for everyone involved in dairy production."

"The success of the Canadian Dairy XPO would not have been possible without the support of our dedicated exhibitors and sponsors. Their commitment to showcasing cutting-edge products and services is vital to the growth and sustainability of the dairy industry," added Underhill.

Trevor Jones, Ontario's new Minister of Agriculture, Food and Agribusiness, used the CDX as a platform to engage in dialogue with producers and to learn about the latest developments in the dairy sector.

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BioCraft and Prefera partner to commercialize animal cell-cultured pet food

BioCraft Pet Nutrition, which describes itself as the first biotech company to develop animal cell-cultured ingredients for the pet food market, and Prefera Petfood, a specialist in premium natural wet pet food production, announced a partnership to commercialize a hypoallergenic, nutritionally complete cat food made almost entirely from cell-cultured mouse.

The partnership's debut product—a mouse "mousse"—is based on BioCraft's animal-cell cultured ingredient that not only provides the basic nutrients essential for cats and dogs, but offers additional functional advantages for pet health, including a hypoallergenic protein source and an omega-6 to omega-3 fatty acid ratio that is superior to traditional meat, according to the announcement. This forthcoming product for cats leverages BioCraft's unique cell-culture process to create functional and environmentally sustainable food that is identical to their natural small prey diet.

"Achieving a near 100 percent inclusion level of an animal cell-cultured ingredient for a final product is a game-changer for the pet food industry," said Dr. Shannon Falconer, BioCraft's founder and CEO. "Most cellular agriculture initiatives struggle to reach high inclusion levels of their ingredient in a final product; however, low inclusion levels don't accomplish the objective of reducing our reliance on intensive animal agriculture. Prefera understands this, and with BioCraft's cell-cultured ingredient has overcome this challenge."

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Kormotech enters Nigerian and Qatari pet food markets

Kormotech Group of Companies announced its entry into two new markets—Nigeria and Qatar. In Qatar, Kormotech exclusively supplies cat food. Meanwhile, demand is more diverse in Nigeria, with cat food, small-breed dog food, and food for active dogs among the most popular categories. Initially, Club4Paws products will be available through local pet stores.

With the new entry into the Nigerian and Qatari markets, Kormotech's pet food is now available in 46 countries across the globe.

Since 2019, the Kormotech Group of Companies has been expanding across the Middle East and Africa (MEA). The products are available in Turkey, Libya, Egypt, Lebanon, Jordan, Israel, Morocco, Saudi Arabia, and beyond. Over the past five years, sales in the region have grown tenfold, driven by increasing pet ownership and greater awareness of quality pet nutrition, according to the announcement. As this trend continues, the pet food market in the area is expected to grow to USD 6.46 billion by 2028.

To connect with industry partners and explore new opportunities, Kormotech Group of Companies participated in PetWorld Arabia 2025, the first and only B2B international pet exhibition in the Middle East and Africa. The event took place on April 19-20 in Dubai (UAE) and brought together key industry players from across the region.

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LvLogics introduces its innovative bin monitoring solution for feed mills

LvLogics announced it is launching an innovative bin monitoring solution in the US that allows mill operators to access their data 24/7 and eliminates the need for the dangerous practice of manual "bin dropping" (depth inspections).

According to the announcement, LvLogics' SiloSpi solution collects precise data on levels inside a bin or silo, transmitting it wirelessly to a secure cloud host. Each individual sensor uses an IoT radio protocol that has a 2-mile radius, making connectivity to the cloud via a base station very straightforward.

The SiloSpi level sensor unit is affixed to the top of the bin with a laser sensor placed inside the bin. The company points out that it is specifically designed for easy installation and reliable performance in the harsh, dusty environments found inside raw ingredients and finished product mill bins. One of SiloSpi's standout features is its air-driven self-cleaning technology, which activates only when the sensor detects dust buildup. Unlike competing solutions, SiloSpi's sensor cleaning mechanism does not involve any moving parts. This innovative self-cleaning capability ensures consistent performance over time, setting SiloSpi apart in demanding industrial applications.

LvLogics emphasizes that SiloSpi can aid the mill in effective and efficient raw materials and finished product management, avoiding production interruptions, overstocking and driving efficient logistics all the way to the farm / end user. The solution is wireless for comms and so installation is quick and easy and can be performed on bins actively in use ensuring there's no interruption to production.

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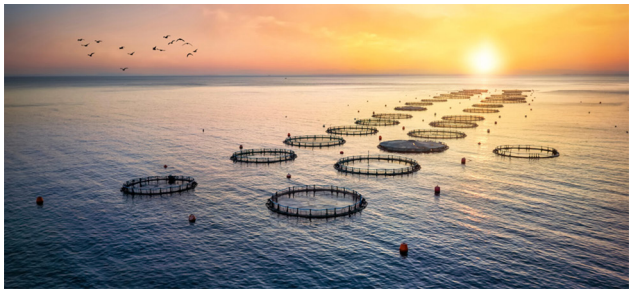
Innovasea partners with Mila to advance AI-powered aquaculture

One of the global leaders in technologically advanced aquatic solutions for aquaculture and fish tracking, Innovasea announced a new partnership with Mila, the Quebec Artificial Intelligence Institute. Together, the two organizations aim to advance AI development for sustainable fish tracking, protection and production. This partnership is expected to enable Innovasea to bolster its AI-driven innovations and talent acquisition while providing Mila students with opportunities to apply their skills toward solving real, meaningful problems in the blue economy.



"AI is transforming how we produce, track and protect marine wildlife," explained Jean Quirion, Innovasea's Vice President of Research and Development for Fish Tracking. "Our partnership with Mila will enable us to further advance our AI solutions in other aspects of our offerings and business. We are excited to collaborate with Mila to push innovation, introduce fresh ideas, and offer students hands-on experience with the latest in AI advancements."

"We are excited to welcome Innovasea to the Mila community," added Stéphane Létourneau, Executive Vice-President of Mila. "With Innovasea's major role in the blue economy, we are pleased to offer our students opportunities to work on projects that will advance marine environmental research and drive sustainable aquaculture."

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Alltech honored with four new EcoVadis sustainability medals

Alltech, a global animal nutrition company, was awarded four new medals from EcoVadis, a globally recognized provider of business sustainability assessments. The company points to the medals as being a testament to its purpose of Working Together for a Planet of Plenty® and commitment to implementing environmentally and economically sustainable solutions, fostering ethical business conduct, and prioritizing the efficient production of nutritious food.

EcoVadis evaluates companies across 21 sustainability criteria within four core themes: Environment, labor and human rights, ethics, and sustainable procurement. Its ratings are based on international sustainability standards, including the Ten Principles of the United Nations Global Compact, the International Labour Organization (ILO) conventions, the Global Reporting Initiative (GRI) standards and the ISO 26000 guidelines. More than 130,000 companies have been rated by EcoVadis.

Two Alltech facilities earned Platinum Medals, placing them in the top 1% of the more than 200,000 businesses assessed by EcoVadis:

• Alltech Coppens in the Netherlands, which develops and produces high-quality, innovative fish feed and nutritional solutions,

• Alltech's Woolfox manufacturing facility in the United Kingdom.

In addition, Alltech's global operations and its manufacturing facility in Serdán, Mexico, earned EcoVadis Silver Medals, ranking them in the top 15% of businesses assessed.

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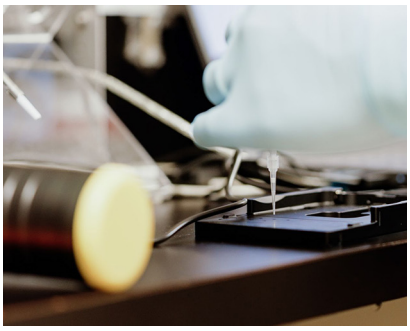
Onda secures grant to develop rapid diagnostic test kits for aquaculture

Canadian contract research organization specializing in aquaculture health, nutrition and innovation, Onda was awarded funding from the prestigious Ignition Fund. This grant will support the development of rapid diagnostic test kits designed to enhance disease detection and management in aquaculture, Onda explains.

The Ignition Fund, an initiative by Innovation PEI, is a competitive-based fund for entrepreneurs seeking startup capital for a new innovative business venture or to develop and launch a new innovative product. The fund invests seed capital that allows successful applicants to turn their ideas into tangible and viable businesses. Through this support, the Ignition Fund helps fuel the growth of innovation-driven enterprises across Prince Edward Island (PEI), Canada.

With this funding, Onda points out it will advance its work in creating user-friendly, field-deployable diagnostic kits that enable aquaculture producers to quickly and accurately detect pathogens affecting fish and shellfish health. Currently,



there is a lack of on-the-farm testing options that deliver rapid results, and Onda is seizing this opportunity to fill that gap and help farmers respond to health challenges more quickly and effectively.

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Evonik highlights sustainability benefits of portfolio

Evonik demonstrated the efficiency and sustainability advantages of its innovative animal nutrition product and service portfolio at the China Feed Industry Expo 2025, which took place in Qingdao from April 18-20.

"At Evonik, we go beyond for sustainability, collaborating closely with local customers to promote healthy and affordable feed production while reducing ecological footprints. We aim to support them further through the measurable positive impacts of our products and concepts," said Madeline Tan, Regional Head of Animal Nutrition at Evonik for Asia Pacific.

Selected highlights from Evonik that were featured at China Feed Industry Expo 2025 include:

• Sustainable Solutions: Evonik showcased how its portfolio enhances efficient and sustainable animal protein production. Notably, a comparison of life cycle assessment for MetAMINO® (DL-methionine) versus other industrially available methionine sources reveals that MetAMINO® has a product carbon footprint that is approximately 35% lower than the industry average.

• Innovative Probiotics: In a significant debut, Evonik Vland Biotech, the joint venture established in 2023 that specializes in animal gut health and functional additive solutions, introduced Ecobiol®, a poultry-focused probiotic product, marking the first registered feed-grade Bacillus subtilis product in mainland China. By improving feed conversion, reducing mortality and improving animal performance, under challenging conditions Ecobiol® can reduce greenhouse gas emissions in broiler production by up to 5%, as measured by Evonik's comparative lifecycle assessment.

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Barentz increases capacity with new investment

Barentz Animal Nutrition, a manufacturer of animal feed and proprietary products such as MegAnion® and K-Carb Plus®, announced the continued investment into its technology, equipment, and people with the addition of a new dryer to increase efficiency. This investment is expected to allow Barentz Animal Nutrition to deliver more product and value to its customers.

"The investments we have made in our Rosemount, Minnesota, USA, facility help us become a more efficient operation, providing more capacity for our growing customer base and creating a better work environment for our employees," said John DeVos, Barentz North America Animal Nutrition President.

Established in 1953, Barentz has operations in more than 70 countries with a strong presence in Europe and North America, and a rapidly growing network in Latin America and Asia-Pacific. The company sources branded specialty ingredients from leading manufacturers worldwide and its ingredient experts provide value-added technical support which includes pre-mixing, blending, ingredient formulation and ingredient testing from its customized formulation centers and application laboratories.

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FEFAC invites all industry stakeholders to its 69th Annual Public Meeting

The 69th European Feed Manufacturers' Federation (FEFAC) Public Annual Meeting, themed "New EU Vision for a More Competitive and Sustainable Livestock Economy & Outlook on Transatlantic Green Feed & Grain Trade Challenges and Opportunities", will bring together industry leaders, policymakers, and stakeholders to discuss key developments in the feed sector. The meeting will take place on May 29, 2025, from 9:00 AM to 1:30 PM at Villa Aurelia in Rome.

ASSALZOO President Silvio Ferrari and FEFAC President Pedro Cordero welcome all members and stakeholders and partners to attend the 69th FEFAC Annual Public Meeting, presenting the main theme of this edition.

Having now a confirmed program, speaker lineup, and practical information, FEFAC announced that Brigitte Misonne, Acting Director, Markets, DG AGRI, European Commission, has agreed to provide a keynote presentation on the "New Vision for EU Agriculture and Food" online. This will include a specific focus on the announced long-term EU livestock strategy while respecting planetary boundaries.

Massimiliano Giansanti, COPA President, agreed to share his key recommendations on how the New Vision should enable the livestock sector's transition to more competitive and sustainable production systems, to provide more resilient and affordable

food supplies. Roxanne Feller, European Livestock Voice President (ELV), Paolo Zanetti, ASSOLATTE President - European Dairy Association (EDA), and Marcello Veronesi ASSALZOO & FEFAC Board Member will join the 1st panel discussion to explore the opportunities for the value chain partners to contribute to the successful implementation of the new long term strategy of the EU livestock and aquaculture sectors.

Read more>>

New Research: Animal health and welfare is future of sustainable aquaculture

Aquatic Life Institute (ALI) published new research, released in the scientific journal Fishes by MDPI, that establishes an undeniable, intrinsic connection between animal health and animal welfare, asserting that the two concepts are complementary, yet distinct pillars for sustainable aquaculture. Through case studies, the research explores how farms and companies implementing welfare-forward strategies have shown measurable improvements in animal health, operational efficiency, environmental impact, and product quality.

The article, entitled "Harmonizing Animal Health and Welfare in Modern Aquaculture/Innovative Practices for a Sustainable Seafood Industry", authored by Tessa Gonzalez, Head of Research at ALI, defines animal health as the biological and physiological state of farmed species, while animal welfare encompasses their overall quality of life, including mental and behavioral well-being. The research within shows that prioritizing animal welfare is not just an ethical obligation, but a pathway to improved industry practices, public health, and environmental sustainability, and better business.

"By prioritizing practices that consider the more positive aspects of individual experience

and welfare, we not only meet an ethical imperative, but we also unlock advancements in industry standards, public health, and environmental sustainability—celebrating innovators who lead the charge toward a more responsible future," said Gonzalez. "This first edition marks the beginning of our journey, and we invite companies to collaborate with us as we grow this collection together."

Read more>>

Animistic launches aZign, new tool for researchers

Animistic, one of the leaders in animal research solutions and innovation, announced the launch of aZign™, to fill a critical gap in animal research. The company states that aZign™ empowers animal researchers with efficient tools and reliable calculations to enhance study efficiency and accuracy.

As an expert in data and data modeling, Animistic points out that aZign™ is a needed tool for the industry, saving users time and money while making research more accurate.

"Our goal with aZign™ is to bridge the gap between data and actionable insights in animal research," said Tracy Snider, CEO of Animistic. "We understand the challenges professionals face in balancing study design, resource allocation, and statistical power. aZign™ delivers intelligence-driven solutions that help researchers enhance the validity and reliability of their studies."

According to the statement, as the only tool of its kind on the market, aZign™ helps animal research-

ers save time and money by allocating pens with even distribution while ensuring the desired power for quality research results. By reducing variability in study groups, enhancing statistical power, and improving experimental design, aZign™ enables researchers to achieve more reliable and reproducible outcomes. In an industry where precision and efficiency are critical, aZign™ provides a user-friendly interface that allows stakeholders to navigate complex study designs with confidence.

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SugaRich acquires former food processing business of JD Bamber

SugaRich announced the successful acquisition of the former food processing business of JD Bamber Ltd in Preston, UK. This facility will now operate under the SugaRich brand. The company points to the acquisition as aligning with its strategic vision to expand its footprint and strengthen its position as one of Europe's leading businesses in the former foods sector.

For over 50 years, SugaRich has been at the forefront of the recovered food industry, pioneering collection methods, advanced technologies, and sustainable systems that help food manufacturers minimise waste, repurpose surplus, and reduce environmental impact.

As one of the leaders in developing the alternative feed market, SugaRich explains it is the natural choice as a supplier of feed material for inclusion in high performance livestock feeds and food producers seeking to maximise returns. Alternative feeding solutions are increasingly vital as farmers aim to enhance sustainability, boost productivity, and improve herd health to meet future challenges.

"It is clear that consolidation in the food and feed sector is accelerating, aligning with our growth strategy. We remain committed to expanding our UK presence and delivering innovative solutions for surplus foodstuffs to a broader customer base," said Alex Keogh, Managing Director of SugaRich.

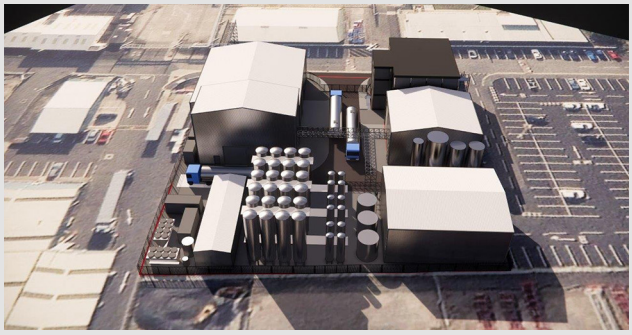
Read more>>

MiAlgae plans new omega-3 production facility in Scotland

Scotland-based biotech pioneer MiAlgae announced a major step forward in its mission to increase production volumes of its sustainable biotechnology solutions, as it submits plans for a new production facility in Grangemouth, Scotland.

MiAlgae repurposes whisky industry by-products to grow microalgae as a sustainable, cost-effective alternative to fish-derived omega-3s. The site is ideally located near distilleries and MiAlgae's customers in the Central Belt of Scotland, which will help it scale its sustainable production model.

The new facility will enable the company to address the increasing demands from aquaculture and pet food markets, which are seeking sustainable and ethical sources of marine omega-3s. MiAlgae is also exploring new markets including meat alternatives, nutraceuticals and livestock feed – sectors with significant global demand.



Douglas Martin, Founder and CEO of MiAlgae said: "Grangemouth has incredible potential for us as we look to the next stage of our growth. This location offers an ideal position to support our scaling efforts and meet the increasing demand for our 'biotech for good' solutions, with the creation of green jobs across engineering, production, and research and development. We are confident that this new facility will help build a greener future and bring high-quality, sustainable jobs to the local community."

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Further Foods signs agreement for cultivated meat pet treats

CULT Food Science Corp., a disruptive food technology platform pioneering the commercialization of lab-grown meat and cellular agriculture to reshape the global food industry, announced that its subsidiary, Further Foods Inc., signed an R&D Supply Agreement with a producer to secure a supply of cultivated meat for the development of its upcoming Noochies! line of cultivated meat pet treats, marking a major step toward commercialization.

The Noochies! team participated in the Global Pet Show, a premier industry event in Orlando, Florida, that brings together pet food innovators, distributors, and consumers. From March 26-28th, Noochies! used this platform to introduce its line of products to a global audience, highlighting the benefits of cellular agriculture and ethical pet food production. The event served as a key opportunity to establish partnerships and strengthen industry presence.

Recognizing the rising demand for sustainable pet food in Asia, Noochies! is expanding its distribution network in the region, according to the announcement. Noochies! has already received orders from a distributor in Southeast Asia and is in active discussions

with other potential partners in the region. Further Foods has initiated strategic partnerships to facilitate entry into these new markets, where consumer interest in ethical and alternative pet nutrition is increasing. CULT points out that this expansion underscores its commitment to making cultivated meat pet treats accessible on a global scale.

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Purina Institute launches webinar series for veterinarians

A working knowledge of canine and feline nutrition and a willingness to engage in conversations about pet nutrition with clients can benefit both veterinary patients and clinics. To empower veterinary health care teams in their pet nutrition discussions, the Purina Institute is continuing to host the "Creating Collaborative Care Through Nutrition Conversations" webinar series, now in its fourth year, with four sessions occurring 15 May, 17 July, 11 September and 4 December 2025.

Research shows that veterinarians are pet owners' most trusted source for nutrition advice. In addition, 78% of surveyed pet owners rated nutrition expertise as an "important" or "extremely important" factor in their satisfaction with their veterinary clinic.

"Even though veterinarians clearly play a critical role for their clients, only 1 in 5 surveyed veterinary professionals say they proactively offer nutrition advice during most client visits," said Dr. Natalia Wagemans, Global Head of the Purina Institute. "This suggests that many veterinarians may not realize how important nutrition is to their clients, and they are missing critical opportunities to counsel clients about their pet's diet."

To help address the gap highlighted by the research, the Purina Institute launched "Creating Collaborative Care Through Nutrition Conversations" webinars in 2021. Now an annual series, the webinars deliver practical advice on how veterinary health care teams can engage clients in nutrition conversations as part of medical, nutritional and behavioral management of common cat and dog health conditions.

Read more>>

BioCraft secures EU registration to sell cell-cultured pet food ingredients

BioCraft Pet Nutrition, one of the first biotech companies to develop animal cell-cultured ingredients for the pet food market, received registration from the Austrian authorities to use Category 3 Animal Byproducts (ABP) in the European Union, enabling it to begin selling ingredients to EU pet food producers.

Austrian authorities granted BioCraft the registration "for the purpose of multiplying cells for the production of pet food." There is currently no pre-market approval process in the EU for animal feed ingredients—alternative, novel or otherwise. Companies wishing to sell animal-based ingredients to pet food manufacturers must meet legal requirements to ensure that the feed ingredients are safe and become a registered user of animal byproducts in the EU. BioCraft has now met their obligation as a Feed Business Operator and notified the EU Feed Material Register.

Achieving this legal status requires both registration by authorities and a demonstration of the ingredient's safety and quality vis-à-vis a Hazard Analysis and Critical Control Point (HACCP) plan (Regulation 183/2005). A team of veterinary, food safety and food science experts, both in-house and third party, generated safety data following dossier requirements for an EU Feed Additive (Regulation (EC) No 1831/2003)—the highest standard for any material going into pet food—to demonstrate the safety and quality of BioCraft's product.

Read more>>

SugaRich strengthens its position in UK feed industry

SugaRich Ltd, one of Europe's leading providers of sustainable surplus food solutions for the food and feed sector, announced the acquisition of McGuinness Feeds Ltd, a UK-based wheatfeed merchant. The company emphasizes that this strategic acquisition enhances its market presence and ensures the continued success of a respected name in the industry.

"This acquisition marks a significant milestone for SugaRich Ltd as we continue to expand our capabilities and reinforce our position as a leader in the industry," said Andy Newton, CEO of SugaRich Ltd. "McGuinness Feeds Ltd has a remarkable history, and we are honoured to continue their legacy while leveraging their expertise to enhance our offerings. We will continue to run both AB Nutrition and McGuinness Feeds as independent businesses but use the scale of our combined infrastructure to support the feed and flour milling industries."

SugaRich Ltd and McGuinness Feeds Ltd have maintained a strong trading relationship for over 35 years, both supplying and purchasing wheatfeed. While traditionally competitors, both companies have fostered a long-standing friendship, built on shared values and a mutual commitment to serving the feed industry with reliability and excellence, the companies state.

SugaRich Ltd firmly believes that the flour milling industry will welcome this transition and continue to support the future of McGuinness Feeds.

Read more>>

US university joins global initiative to combat methane

The University of Nebraska–Lincoln in the US unveiled it is joining a new $27.4 million global initiative to reduce methane emissions from livestock by harnessing natural variation in how animals digest food. Backed by the Bezos Earth Fund and the Global Methane Hub, the effort will support research and breeding programs to identify and scale climate-efficient livestock across North America, South America, Europe, Africa and Oceania.

"This initiative is a cornerstone of a broader global push to accelerate public-good research on enteric methane," said Hayden Montgomery, Agriculture Program Director at the Global Methane Hub. "Together with the Bezos Earth Fund, as part of the Enteric Fermentation R&D Accelerator, we're building an open, coordinated foundation that spans countries, breeds and species — delivering practical solutions that reduce emissions and support farmers worldwide."

The University of Nebraska–Lincoln team, led by Matt Spangler, Ronnie Green Professor of Animal Science, will focus on collecting and analyzing methane data from beef cattle to better understand the role genetics plays in methane production and its relationship

with traits of economic importance to cattle producers. Researchers hope the effort will lead to tools that inform genetic selection decisions by beef producers.

The $2.34 million project taking place at the University of Nebraska–Lincoln is in addition to two other major research efforts at the university aimed at reducing methane emissions in livestock.

A $5 million U.S. Department of Agriculture-funded project led by Paul Kononoff, Professor of Animal Science, brings together Husker faculty and researchers from the U.S. Meat Animal Research Center to explore how genetics, gut microbiome and nutrition influence methane production in cattle.

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Brenntag introduces solutions for antibiotic reduction

An expert for innovative solutions for safe feed and pet food, Brenntag Specialties Animal Nutrition exhibited its solutions to reduce antibiotics at the 2025 Middle East Poultry Expo trade show in Riyadh, Saudi Arabia, from April 14-16. The team demonstrated how Brenntag can support the industry with sustainable and efficient feed solutions for poultry.

Muhammad Rizwan Siddiqui, Sales Manager Animal Nutrition, Brenntag Specialties Animal Nutrition said: "Poultry producers today face increasing pressure to improve efficiency while ensuring animal health and reducing antibiotic use. At Middle East Poultry Expo 2025, we showcased how our tailored feed solutions help achieve these goals. By working closely with our customers, we develop strategies that enhance productivity and sustainability in modern poultry farming."

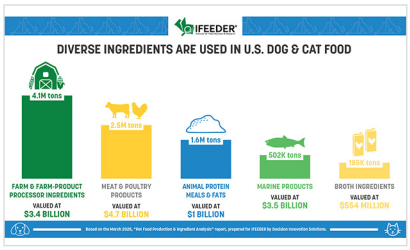
Brenntag Animal Nutrition provides a comprehensive portfolio of feed solutions designed to enhance poultry health and nutrition while reducing the need for antibiotics. With a strong focus on technical expertise and market-driven solutions, the team supports industry partners in optimizing performance and efficiency of poultry, the company points out.

Read more>>

IFEEDER report presents pet food industry by numbers

In collaboration with the American Feed Industry Association (AFIA), North American Renderers Association's (NARA) research arm the Fats and Proteins Research Foundation (FPRF) and Pet Food Institute (PFI), the Institute for Feed Education and Research (IFEEDER) unveiled a new report that quantifies the hundreds of safe ingredients used in dog and cat food diets. The report estimated that dog and cat food sales stood at $51.7 billion in 2024, with much of the 9.8 million tons represented coming from over 600 nutritious plant- and animal-based ingredients.

"The latest IFEEDER pet food consumption report showcases the essential role that U.S. pet food manufacturers play in boosting the rural economy. Through purchases of crop and animal-based food ingredients and securing needed materials and services up and down the agriculture supply chain, this report demonstrates that the pet food industry provides our pets with complete and balanced meals," said Lara Moody, Executive Director of IFEEDER. "On behalf of project partners AFIA, FPRF and PFI, IFEEDER hopes dog and cat owners will better grasp the expansive variety available in their pets' diets, and national leaders will gain a better understanding of the industry's contributions to their local economy and food security."



According to the statement, Decision Innovation Solutions (DIS) conducted the study using a recipe reverse engineering model to quantify the use of ingredients in dog and cat dry and wet foods and treats.

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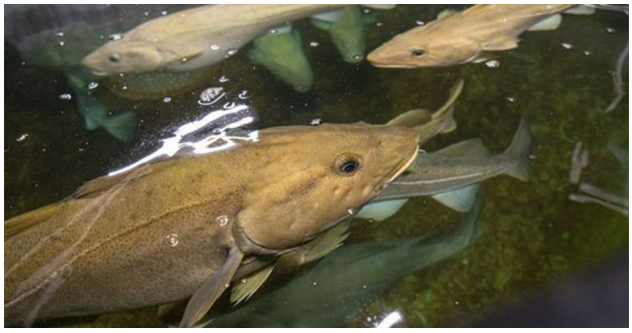
New Study: Fish nose bacteria may hold clues to marine species survival

In a groundbreaking study, revealed by Nofima, scientists revealed how climate change might influence the bacterial communities living in fish noses - a previously unexplored frontier that could have implications for fish survival in warming oceans.

The research, which was recently published in FEMS Microbiology Ecology, was led by a Norwegian and French team of scientists. This study provides the first comprehensive analysis of the nasal microbiota in two marine fish species – European seabass and Atlantic cod - two commercially relevant fish species.

The microbial communities play crucial roles in fish health, affecting everything from their ability to smell food to their immune responses.

"We know that microbiota, such as those in the skin and gut, play a crucial role in maintaining health, but the response of those residing in the nose to environmental changes remains poorly understood. Understanding how these bacterial communities respond to environmental changes is vital as we face increasing ocean warming and acidification," explains researcher Carlo C. Lazado from Nofima.



"For Norway, this is particularly relevant given the cultural and economic importance of cod fisheries, not to mention the importance of this species in the ecosystem," he continues.

The study reveals distinct bacterial profiles between the two species, suggesting different environmental adaptations. Seabass, a warm-water species, hosted different bacterial communities compared to cod, a cold-water species.

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Difagri joins forces with Alinova to strengthen its position in animal nutrition

Difagri announced that, through its holding company Bharal Developpement, the group is finalizing the acquisition of Alinova, a historic step with significant leverage for both entities. The news follows Difagri's acquisition of Neofeed in 2024, which reportedly provided the group with a top-tier technical and innovation department.

Difagri already represents a key player in feed supplements and specialties, particularly for ruminants. Following the execution of the strategic plan established in 2023, the company draws attention to this important structural progression as marking an acceleration of the project with numerous immediate synergies.

Alinova is an expert in emulsions and monogastric specialties, with development kinetics highly aligned with the Difagri project. The combination of the two entities thus creates an agile and robust leader in feed supplements & specialties, according to the statement.

"This is a synergistic operation carried out with the aim of supporting our growth. The two companies are highly complementary and embodied by shared values. Beyond allowing us to open up new product development opportunities, we are strengthening our industrial base with the added capacity provided by a spacious and flexible Alinova production site. We are now also autonomous in the highly concentrated emulsions and liquid mixes, which represent one of Alinova's recognized fields of expertise," comments Cédric de Boulogne, CEO of Difagri.

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MicroBioGen and Novonesis expand yeast partnership

MicroBioGen, an Australia-based yeast biotech company and provider of 'Yeast Innovation as a Service', expanded its existing long-term global bioethanol partnership with biosolutions company Novonesis into biochemicals amongst other products. The expanded partnership aims to leverage MicroBioGen's portfolio of yeast strains and Novonesis' R&D and commercialization expertise to provide yeast innovations for the global bioethanol market.

Geoffrey Bell, MicroBioGen CEO and Co-Founder, commented: "MicroBioGen is thrilled to be expanding our partnership with Novonesis. Both organisations are committed to delivering innovative solutions, as demonstrated by our 11-year partnership in the bioethanol industry."

"The expanded partnership demonstrates the extensive potential of our combined innovation. MicroBioGen's platform of yeast chassis are redefining what can be achieved in both GM and Non-GM applications, from 'drop-in' products to emerging industries such as biochemicals. We look forward to extending our innovative solutions to new sectors and building on the success of our collaboration with Novonesis on Innova® yeast products in the bioethanol industry," he added.

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AgriLivestock & Feed Taiwan 2025 to unite innovation and sustainability

From September 3 to 5, 2025, at TaiNEX 1 in Taipei, AgriLivestock & Feed Taiwan (part of Taiwan Smart Agriweek) will be returning to showcase the latest technologies and innovative solutions that address current challenges in the livestock industry. Co-located with AgriFresh Taiwan – the dedicated cold chain logistics show – the two events join forces to create a sustainable product journey, aiming to enhance farm-to-fork operations across the livestock industry.

With growing utilization of AI and internet of things (IoT) in the livestock sector, the event invites both international and domestic exhibitors to demonstrate the latest innovations in the field. From AI-based farm management systems, precise feeding equipment, to post-harvest handling & preservation technologies for livestock products. Allowing visitors to meet, connect, and engage with livestock solutions provider companies who will demonstrate their innovative technologies that are shaping the industry.

In collaboration with research institutions, academia, and media, the event brings together livestock experts & speakers across Asia to address current industry challenges and trends. Conference attendees will benefit from in-depth discussions with expert panels, fostering valuable onsite collaborations and networking.

AgriLivestock & Feed Taiwan introduced an exclusive program for overseas buyers, enhancing the procurement experience with benefits such as two-night accommodations, VIP reception services, pre-scheduled meetings, and additional premium services. In addition, a newly launched industry association buyer program that aims to offer a seamless experience for association members.

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Alltech Coppens highlights 2024 sustainability milestones

A global specialist in developing and producing high-quality, innovative nutritional solutions for fish, Alltech Coppens published its 2024 Sustainability Report. This report aims to offer an overview of the company's commitment to sustainability and demonstrate its mission of Working Together for a Planet of Plenty®, as well as its journey to help improve the health and performance of people, animals and plants through nutrition and scientific innovation.

Through the careful management of resources, as well as its scientific research and partnerships with customers, Alltech Coppens explains it is contributing to a more sustainable aquaculture industry. The 2024 Alltech Coppens Sustainability Report highlights how the company is researching, developing and commercialising better alternatives and working with partners around the world to spearhead sustainable developments.

"We at Alltech Coppens feel a strong responsibility to sustainability," said Ronald Faber, CEO of Alltech Coppens and Global Aqua Lead for Alltech. "Our mission is clear: to produce fish feeds responsibly to support safe food production while conserving our natural resources. We are dedicated to continuing our efforts in this journey towards an environmentally sustainable and ethical world."

"Sustainability is not a checkbox for us," echoed Guido Crolla, Manager of Procurement, Sustainability and IT at Alltech Coppens. "It's embedded in every decision we make, from raw material selection to the way we power our research centre. Our goal is to continuously reduce our environmental footprint while helping our customers do the same."

Read more>>

PawCo and Harvard collaborate for AI-optimized pet food platform

One of the leaders in premium dog nutrition in the US, PawCo Foods announced a strategic partnership with the Harvard Data Analytics Group (HDAG), marking a groundbreaking chapter in PawCo's journey to disrupt the pet food industry and end the dominance of unhealthy options from established players. According to the statement, this partnership accelerates the development of PawCo's new product line, fully generated by their AI platform and verified by board-certified animal nutritionists, to deliver the healthiest pet food in the industry.

The Harvard Data Analytics Group (HDAG) is a non-profit student organization at Harvard that helps organizations strategically leverage advanced data analytics to drive innovation and growth. By collaborating with HDAG, PawCo aims to supercharge its AI platform's capabilities, leveraging combined expertise to extract billions of data points and

mine deeper insights from thousands of scientific source materials and nutritional datasets – far more than traditional research approaches can achieve.

PawCo points out that this partnership strengthens its data-driven methodology, which has already proven remarkably efficient, enabling the company to develop 11 distinct nutritional formulations in just two years, an innovation timeline that typically takes up to 10 years for traditional pet food companies.

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Alltech continues partnership of mentorship program for WFA

Alltech announced the continuation of its partnership with Expana's Women in Food & Agriculture (WFA) Mentorship Program. Applications are now open for new mentors of any gender and for female mentees from across the global food and agriculture sector. Since its launch in 2021, WFA has successfully matched more than 1,500 professionals, creating meaningful relationships that foster career growth and leadership development in the food and agriculture sectors. The free-to-join program is dedicated to supporting women across the global food and agriculture sector by providing invaluable mentorship opportunities and has proven to be a beacon of support for women seeking guidance, advice and networking opportunities in their careers.

The initiative not only empowers women at various career stages but also addresses the critical shortage of mentors across the industry, a known barrier to career progression, according to the announcement. This growing initiative encourages individuals with a range of experience and backgrounds to apply to be a mentor, helping to address this sector-wide challenge.

Elisabeth Mork-Eidem, Global Chair of WFA, commented: "Each year, we see the extraordinary impact that mentorship can have, not just on individual careers but across organizations. This programme is a key part of our WFA mission to ensure women in agrifood are empowered, supported, and heard."

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BENEO holds inauguration ceremony for its new pulse-processing plant

A manufacturer of functional ingredients for food, feed and pharma and member of the Südzucker Group, BENEO officially inaugurated its first pulse-processing plant after a construction period of just one and a half years. The opening is the result of an investment of around €50 million by the Südzucker Group in its site in Obrigheim, Rhineland-Palatinate in Germany. Here, pulses such as the local faba bean are processed into ingredients for food and feed production.

Up to 25 new jobs will be created at the new plant, which has been built next to the existing BENEO site where its sugar replacer Isomalt and the smart carbohydrate PalatinoseTM (isomaltulose) are produced, on an area of around 4,000 square metres – about half the size of a football pitch. According to the announcement,

sustainability has been a key focus for the new development, with the plant production running entirely on electricity from renewable energy sources. Additional power is generated by a rooftop photovoltaic system and waste heat from production is used to heat the building, while the pulse processing requires no water.

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