Feed Additive

INTERNATIONAL MAGAZINE FOR ANIMAL FEED & ADDITIVES INDUSTRY

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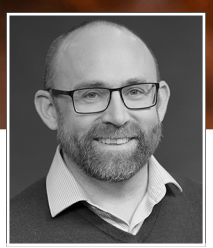
Issue Focus:
Animal Intestinal Health

Market Report:
Feed Probiotics and Global Market Status



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EDITOR **Derya YILDIZ**

The Key to Animal Welfare and Production Performance

The gut is a complex ecosystem that harbors trillions of microorganisms known as microbiome. These microorganisms play a crucial role in digestion, nutrient absorption, immune function and overall animal health. Therefore, gut health in livestock farming is considered to be the cornerstone of welfare and productivity.

A healthy gut microbiome helps break down complex nutrients, making them available for absorption. This efficient digestion leads to better feed utilization, lower feed costs and increased weight gain. In addition, healthy intestines support a strong immune system, enabling animals to better resist diseases and infections, thus reducing the need for antibiotics and supporting a sustainable production system.

On the other hand, poor gut health can lead to a range of problems, including malnutrition, increased sensitivity to disease and behavioral changes due to discomfort or pain. Focusing on gut health therefore represents a paradigm shift that emphasizes the interlinked nature of health, welfare and productivity in livestock production.

With the understanding of the key role of gut health on the rise, research has made significant progress, especially in recent years. Scientists are investigating the composition and function of the gut microbiome, identifying key microbial species that contribute to optimal health, and developing strategies to manipulate the gut microbiome for beneficial outcomes. Supplements such as probiotics, prebiotics and synbiotics are being closely monitored for their potential to improve gut health and enhance livestock performance. Similarly, enzymes, organic acids and plant extracts that can improve nutrient digestibility and modulate the gut environment are some of the supplements being evaluated for gut health.

In summary, as we continue to face global challenges such as food security, climate change and animal welfare concerns, it has become a necessity to prioritize gut health to build a sustainable livestock system without compromising productivity.

To help producers with this challenge, experts have discussed the factors that pose risks to gut health and solutions to address them. The details are in our magazine...

Enjoy your reading.

See you in the next issue...

Feed Additive

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EUROTIER 2024: TRENDS IN LIVESTOCK FEED TECHNOLOGY

Prof. Heinz Bernhardt
Head of EuroTier Innovation Award Jury
Technical University of Munich

Taking place 12-15 November in Hanover, Germany, EuroTier is the world's leading platform for innovations in livestock solutions for cattle, pig and poultry farming. The exhibition, which has more than 2,100 exhibitors, also presents innovative feed concepts as well as international feed products and feeding systems. EuroTier is organized by the DLG (German Agricultural Society), a non-profit organization that aims to further practical farm knowledge among farmers.

For the coveted EuroTier Innovation Awards, DLG has appointed an independent jury to evaluate the livestock innovations that have been registered for an innovation award.

The winning solutions – four gold and 21 silver medals – reflect the key trends in livestock farming today and many are in the feed area.

Awards won in the feeding area include:

EuroTier gold medal:

The innovation CalfGPT from Förster-Technik enables voice-controlled, AI-aided data management in the care of calves for the first time and therefore makes calf management, including feeding, significantly easier.

Use of the CalfGPT application via in-ear headphones simplifies operation on the farm. Users can obtain a specific digital overview of their calf groups during other activities in the barn, such as littering or feeding, which saves time and can be achieved 'hands-free'.

EuroTier Silver medals:

Zinpro® IsoFerm® is a blend of branched-chain, volatile fatty acids whose unpleasant odour has been masked and which can therefore be used as a feed supplement. Depending on a cow's metabolic situation, increased fibre digestion and protein synthesis in the rumen are possible, which is reflected in an increase in the milk yield and improved animal health.

The Siloking heavy-duty magnet, which is installed in a housing, can be removed together with the adhering foreign bodies from the feed mixer wagon and the foreign bodies can therefore be removed with significantly less risk of injury.

The Urban SipControl monitors key feeding process parameters for calves and automatically adapts the length and flow rate to the individual animal during the drinking process.

The 'Easyfill' feeding bucket lid produced by HIKO makes hygienic calf feeding easier, even when using a MilkTaxi, and significantly reduces the entry of dirt and flies.

Rodents are a well-known problem, as they not only consume stored grain and animal feed, but can also contaminate it, causing potential diseases. HyCare Digital from MS Schippers combines tried-and-tested methods of rodent deterrence with a digital success and reporting structure, and therefore enables targeted, documented rodent management without placing an unnecessary strain on nature and the environment.

The innovations can be seen at EuroTier 2024.

KEY TECHNICAL TRENDS RELATED TO FEED

Robotics On the Rise Internationally

The use of robots is prevalent in livestock farming in Europe, intensified by AI. A main aspect is the use of robots to reduce the workload, helping to compensate for labour scarcity. An increase in work efficiency and quality can be observed.

As part of EuroTier 2024, the "Barn Robot Event" feed pushing robots for dairy housing will be presented. In a dedicated area in Hall 13 visitors will be able to learn how automatic feed pushers can support cattle farmers in their work.

Improvement of Emission - Feeding Solutions

One goal that is traditionally pursued intensively in feeding is to minimise the emission of environmentally relevant substances like nitrogen and phosphorus. In addition to classic approaches such as optimising the amino acid composition of the ration, using suitable enzyme supplements or employing efficient probiotics, ration components with particularly high availability or digestibility, could make an important contribution in the future. The minimisation of the emission of greenhouse gases such as methane must also be considered when thinking about "environmentally relevant excrement" in cattle feeding. This field continues to develop steadily. In the area of Methane-reducing additives, further products appear to be reaching market maturity.

Technological Trends in Pig Farming

The nutritional condition of the sows is an important factor for the economic success of a piglet producer. In this case, advanced systems for automated condition assessment can enable customised feeding. The goal is to improve the well-being of sows and reduce piglet losses by further developing the floor surfaces of farrowing pens and evolving exercise and free-range pens. There have also been developments in the area of feeding technology, such as in dry feeding and portion feeding systems, as well as in feeding systems for suckling piglets, where these are designed to ensure improved hygiene.

Technological Trends in Dairy Farming

Closed housing with flexible boxes and pen partitions for single, double and group housing offer new opportunities for greater animal welfare, efficiency and also acceptance by consumers and politicians. In the field of automation, automatic feeding will become more of a focus, as it has a great deal of potential. Sensor technology, especially in the area of intelligent, camera-based animal monitoring, and the resulting possibilities, offer further options for herd management that can be used to optimise quality milk production.

Technological Trends in Poultry Farming Include "Larvae Snack Bars"

Poultry farmers are currently facing a number of challenges: further improvement in animal welfare and animal health.

An improved rearing aviary and the combination of a laying aviary with a rearing aviary can ensure greater animal welfare for laying hens. The welfare of the chicks is also considered. For example, a larvae snack bar is designed to keep the animals occupied while providing them with high-quality protein.

INHOUSE FARMING – FEED & FOOD SHOW EXPLORES ALTERNATIVE FEED

At EuroTier the Inhouse Farming – Feed & Food Show has several highlights relating to feeding, including the focus on insects.

How does the automated breeding of insects as high-quality protein feed work on the farm? How can this be used to realise circular economy approaches? What are the challenges of industrially breeding insects as a food source? Exhibitors and experts explore these questions in Hall 24.

EuroTier 2024 has more than 2100 exhibitors across 13 halls, including three halls dedicated to animal health and feed solutions.

Cargill expands capabilities with acquisition of two feed mills in US

To grow with the ag retail and large ranching/farming segments in the western and central regions of the US, Cargill announced the acquisition of two feed mills from Compana Pet Brands – one in Denver, Colorado and the other in Kansas City, Kansas, USA. With the addition of the two facilities, Cargill explains it is better positioned to expand the production and distribution capabilities of its Animal Nutrition and Health business in the US. The transaction finalized on Sept. 3, 2024. Terms were not disclosed.

"These two feed mills are a perfect fit for our Cargill Animal Nutrition and Health business in the US to better position us for long-term growth of our full portfolio and serve a range of customers, from the larger farmer/rancher to the local retailer who sells horse treats and pet food," says Mariano Berdegue, Senior Vice President for Cargill's Animal Nutrition & Health Americas business.

With the Denver mill acquisition, Cargill welcomes more than 35 employees. The mill has dedicated packing lines, which allows for growth with ag retail customers who serve the backyard/hobby farmer and pet owner segments. Cargill points out it will also be able to meet the needs of large farming and ranching operations in the region with the expanded capacity and some additional investments in the operation. The goal is to make this facility a modernized, flagship feed mill.

Read more>>

dsm-firmenich opens new premix and additives facility

Innovators in nutrition, health and beauty, dsm-firmenich announced the opening of its new Animal Nutrition & Health premix and additives manufacturing plant in Sadat City, Egypt. Formally inaugurated on 12 September 2024, the company explained that the facility reflects its commitment to meet increasing demand from mid-range and large livestock farms and feed millers for premixes and innovative feed additives. The new production unit serves customers in Egypt, the Middle East, Southern Europe and Africa. By enhancing supply reliability and delivering top-quality products, it is expected to offer dsm-firmenich's customers greater peace of mind—underscored by the firm's commitment to excellence.

According to the company's announcement, the new facility, covering an area of 10,000 square meters, is equipped with modern infrastructure and advanced technology from Bühler Technologies, incorporating an integrated plant control system with

bar coding. With an annual production capacity of 10,000 tons, the plant is designed to meet the highest standards of production efficiency, food safety, quality, and environmental sustainability. It adheres to the highest international quality and safety standards applicable to specialty feed ingredients.

The plant processes a diverse range of specialized animal nutrition products, including vitamins, minerals, and innovative feed additives.

Read more>>

New trial: Animal nutrition intervention improves vaccine efficacy

Cargill, through its work leading the USAID-funded TRANSFORM project, partnered with West Bengal University of Animal and Fishery Sciences in India on a broiler trial that resulted in enhanced growth performance, improved vaccine efficacy, and reduced pathogen levels from animal nutrition.

The trial, detailed in the scientific journal Animals, is the first time an animal nutrition intervention has been reported to show an impact on infectious bursal disease vaccination efficacy in broilers. The study evaluated two animal nutrition interventions: Bacillus subtilis (a probiotic) and Saccharomyces cerevisiae fermentation product (SCFP, a postbiotic).

Cargill shared that the key findings include:

• Enhanced Growth Performance: SCFP improved feed conversion ratio, allowing broilers to gain the same weight with less feed. Both additives increased VH:CD, indicating a larger intestinal surface area for nutrient absorption.

• Improved Vaccine Efficacy: SCFP increased antibody titers (the measurable response to either a vaccine or a disease) following Newcastle disease and infectious bursal disease virus vaccinations, suggesting better protection.

• Reduced Pathogen Levels: SCFP effectively reduced antimicrobial-resistant ESBL-Enterobacteriaceae and Salmonella sp., marking the first report of a dietary supplement reducing antimicrobial-resistant Enterobacteriaceae in poultry.

Read more>>

Brenntag opens new facility for animal nutrition solutions

A prominent player in chemicals and ingredients distribution, Brenntag Specialties announced the opening of a new facility for animal nutrition solution products. The production includes animal nutrition products based on "Neubacid Soft" technology, allowing feed producers to no longer have to compromise between safety and efficacy but helping animal performance and fitting in non-antibiotic diets.

The state-of-the-art facility was completed in July 2024 and started full-scale operations in September. The company explains that the site in Mouscron, Belgium is in a strategically valuable geographical location: logistically well connected - close to ports and highways - and close to the customers, in the heart of the region to be supplied. While mixing and blending capabilities have now been consolidated in Mouscron, the site in Grez-en-Bouère, France, will also continue to operate as a central storage hub for the French animal nutrition sector.

The Mouscron facility significantly enhances Brenntag's flexibility and capacity, leading to improved delivery capabilities and larger purchasing volumes - particularly advantageous in times of raw material shortages, according to the announcement. The new facility has been built to the highest quality standards and has already received GMP+ certification, ensuring that all operational processes meet the stringent requirements of the Animal Nutrition industry.

Read more>>

dsm-firmenich secures market approval for Bovaer in South Korea

dsm-firmenich announced that Bovaer®, its innovative methane-reducing feed additive, has received market approval for use with beef cattle in South Korea, making it the first product the country has approved for this purpose. The company points out that the approval marks a significant step towards more sustainable agriculture in South Korea, allowing farmers to effectively and immediately reduce methane emissions, a potent greenhouse gas.

As a signatory of the Global Methane Pledge, South Korea is committed to a substantial reduction in methane emissions by 2030. The approval of Bovaer® aligns with South Korea's proactive approach, which includes a comprehensive framework to support farmers in transitioning to sustainable practices, and a recently launched low-methane feed program. With 3.6 million beef cattle, including the renowned Hanwoo breed, dsm-firmenich explains that Bovaer® offers an effective solution that could greatly advance these national sustainability goals.

Research has shown that Bovaer® can greatly reduce methane emissions with just a quarter teaspoon of the additive per cow per

day. According to the announcement, this innovation not only supports South Korea's environmental commitments but also enhances the sustainability of its beef production, benefiting the entire supply chain from farmers to consumers.

Read more>>

Inspired Pet Nutrition acquires UK based pet food producer

Inspired Pet Nutrition (IPN), the independent UK pet food company controlled by CapVest Partners LLP, announced the acquisition of Butcher's Pet Care (BPC), one of the leading manufacturers of high-quality wet pet food. The terms of the deal, which is expected to be completed in the fourth quarter of 2024, were not disclosed.

BPC was founded in 1983 and is one of the UK's leading wet pet food manufacturers, providing wet dog and cat food products under three brands: Butcher's dog food, offering affordable high-quality, naturally nourishing food for dogs; Blink!, a premium natural wet cat food brand; and Classic, an affordable, natural, complete cat food brand. The award-winning company also manufactures own-label pet food for a range of customers, including multiples and specialist pet shops, and holds an established position in Poland, where Butcher's is reportedly the #2 dog food brand. BPC operates a well-invested 385,000 sq ft manufacturing and distribution facility located in Crick, Northamptonshire, England.

IPN also announced it will appoint Arthur van Benthem as CEO of the enlarged group, which will have combined gross sales of approximately £350 million, predominantly comprising branded products. van Benthem will lead IPN's ambitious growth strategy and has extensive experience working with management teams and private equity owners to grow and develop international businesses. With a background in sales & marketing, he has held executive leadership roles across several markets in EMEA, USA, and the Asia/Pacific region with companies such as Unilever, the Coca-Cola Company, Royal Friesland Campina, Imperial Brands and most recently Dunlop.

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When it comes to optimal gut health, the microbiome should function like an orchestra playing in perfect harmony. Conducting this orchestra is Symphiome™, a unique first-of-its-kind Precision Biotic. Symphiome™s unique mode of action increases metabolic functions intrinsic to the bird's microbiome that detoxify unabsorbed amino acids and leaked host protein independent of the microbiota composition.

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Improves Welfare

Reduces Emissions

Aids Nutrient Utilization

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dsm-firmenich

Nestlé Purina invests £150 million to upgrade UK factory

Nestlé unveiled an investment of more than £150 million to upgrade its Nestlé Purina PetCare factory in Wisbech, UK. The Cambridgeshire factory is home to some of the UK's favorite pet food brands including Felix, Gourmet and Winalot and the multi-million-pound upgrade works are already underway with completion expected in early 2025.

The series of developments funded by the investment include upgrading existing production lines with modern technology and machinery, a re-vamp of facilities for the factory's 600 workers and initiatives to improve energy efficiency and to help reduce carbon emissions over the coming years.

The investment means the factory has been able to recruit 40 new skilled roles, focused on optimizing and maintaining the new technology being introduced as part of the upgrades. Nestlé Purina is also investing in skills training for existing employees as part of the programme.

Richard Watson, CEO of Nestlé UK & Ireland, says: "We are very proud of our British manufacturing network with around 3,500 people employed in factory-based roles across the UK.

"This investment reflects the great work being done by our teams to position the UK as a market with significant manufacturing expertise and capability and where targeted investment, like the upgrades at Wisbech, can contribute to the growth of our business here and around the world."

Jez McInerney, Nestlé Purina's Wisbech Factory Manager, explains: "Purina is committed to creating top quality nutrition for the nation's pets – but it's certainly not all we do. We work tirelessly to do more of what matters beyond the bowl as well, for pets, for the people who love them and the planet. None of this would be possible without the fantastic work of the project team and everyone who's based here in Wisbech.

Read more>>

Biochem brings together stakeholders of ruminant sector in Turkey

Biochem, which produces and supplies feed additives for the animal nutrition sector with the motto "Feed Safety for Food Safety®", brought together the important stakeholders of the ruminant sector operating in India, Middle East and Africa (IMEA) at the seminar organized in Izmir, Turkey. The seminar on "New Approaches in Calf Health and Dairy Nutrition" was held at Hyatt Regency Hotel.

At the seminar, Biochem Ruminant Product Manager, Dietary Feed Supplements, Miriam Deppe provided valuable information on the importance of colostrum management in newborn calves, the place of probiotics in intestinal health and electrolyte replacement in cases of diarrhea. Dr. Bernhard Landwehr, Biochem Animal Nutrition Specialist, presented the importance of energy balance and

dry period management. Biochem Product Manager, Toxin Management, Dr. Cornelia Becker shared the risks posed by mycotoxins in dairy farming, the strategy behind the fight against mycotoxins and Biochem's approach to this issue with the guests attending the seminar.

Read more>>

Anpario acquires animal health and nutrition products producer Bio-Vet

A wholly owned subsidiary of Anpario plc, the independent manufacturer of natural sustainable animal feed additives for health, nutrition, and biosecurity, Anpario Inc. completed the acquisition of Bio-Vet Inc.

Bio-Vet was incorporated in 1996, and is based in Barneveld, Wisconsin, United States. As one of the leading producers of animal health and nutrition products combining the latest research and real-world experience, Bio-Vet strives to deliver innovative solutions to farmers. Predominantly supplying the US dairy market, Bio-Vet's solutions focus on supporting the animal's natural body systems to improve health and profitability for the farmer, a standard which fully aligns with Anpario's own vision and value proposition. Bio-Vet achieved sales of $8.2 million for the year ending 31 December 2023 and becomes a wholly owned subsidiary with its 30+ employees, customers and suppliers welcomed into Anpario.

Regarding the merger of the two companies, Dr. Nate Haas, President of Bio-Vet, sees great potential to cooperatively impact the food animal sector: "We are excited for the opportunity to unite our team with a company that shares our values, culture,

and innovative outlook to help provide solutions to optimize animal performance. Anpario represents the ideal partner with which to join forces to capitalize on our 30+ year history of excellence in agricultural technology. We look forward to what's in store as Bio-Vet and Anpario grow together into the future".

Read more>>

Adisseo recognized for its sustainability performance by EcoVadis

Bluestar Adisseo Company (BAC) was awarded a silver medal by EcoVadis once again, with an improvement of 2 points compared to last year. According to the announcement, this recognition places BAC among the top 4% of companies rated by EcoVadis in the Manufacture of prepared animal feeds industry and among the top 15% of all companies rated by EcoVadis.

Through online questionnaires, document reviews and interviews, EcoVadis, a global corporate social responsibility (CSR) rating agency, comprehensively assesses companies' performance in the 4 themes of Environment, Labour & Human rights, Ethics, Sustainable procurement.

"This improved Ecovadis rating reflecting Adisseo's continued progress on CSR is an encouragement for all our teams to deliver more solid results in the future…" said Hao Zhigang, CEO and Chairman of Adisseo.

Read more>>

Skretting and Zooca Calanus launch marine juvenile food

Norway-based company aiming to feed people and animals sustainably through Calanus finmarchicus, Zooca Calanus and Skretting introduced Ignis, their marine juvenile food. With the introduction of the product, Skretting customers have access to fresh, canned Calanus finmarchicus.

Calanus finmarchichus is a tiny marine copepod rich in essential nutrients. This abundant resource offers marine juveniles high-quality nutrition, promoting efficient feed intake and digestion, according to the announcement.

Ignis, manufactured by Zooca Calanus, was recently introduced during Larvi 2024, which took place from September 9-12 in Ostend, Belgium. Present at the launch were Hogne Abrahamsen, Zooca Calanus group CSO, Eamonn O'Brien, Global Product Manager LifeStart from Skretting, and Dr. Philippe Dhert, Senior Researcher from Skretting. After learning about the effects of Ignis in shrimp nursery, attendees had the opportunity to experience the product in a "touch and feel" session.

According to the companies, the-ready-to-use copepods offer a new level of convenience, as well as opportunities to refine larval production and shrimp broodstock feeding. "R&D results have shown that, when used during the transition period, shrimp fed with Ignis had a higher survival rate. We also observed that the shrimp larvae were immediately attracted to the copepods, and that water turbidity was not impacted," said Dr. Dhert.

"Our partnership with Zocca Calanus aligns with our mutual dedication to drive positive change in the aquaculture industry, and underscores our shared vision for a more sustainable future. We look forward to introducing this innovation to the market together and making a lasting impact on the global aquaculture landscape," explained O'Brien.

Ignis will be made available through the Skretting network and is currently being rolled out in European hatcheries, with more countries to follow.

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Resilience:
Thriving through Challenges

Adisseo, Your Partner in Problem-Solving,

By focusing on enhancing animal resilience and offering comprehensive and tailored solutions to combat stressors, Adisseo aims to be your trusted partner in addressing the challenges of modern animal farming.

ADISSEO
A Bluestar Company

Ajinomoto Co. and Danone sign MoU to reduce greenhouse gases

A global company with the specialties in the business of food and amino acids, Ajinomoto Co., Inc. and Danone announced a global strategic partnership aimed at reducing multiple sources of greenhouse gases (GHG) emissions from the milk supply chain. This initiative utilizes Ajinomoto Co's solution AjiPro®-L, an innovative lysine formulation, which in addition to aiding in the absorption of the amino acid, is reportedly also highly cost-effective and a broad-ranging GHG reduction method in the market. As a part of Danone's "Partner for Growth" program, both companies are working collaboratively to reduce GHG emissions from milk production.

Danone's partnership with Ajinomoto Co. provides it with yet another tool to reduce emissions from dairy farming. Ajinomoto Co's solution AjiPro®-L effectively delivers lysine, an essential amino acid, to the cow's digestive system, where it can be absorbed as a nutrient. According to the statement, the innovative product plays a pivotal role in reducing feed costs for farmers and reducing a broad spectrum of GHG emissions from the industry. This helps not only to reduce the amount of high-protein, high-cost feed, such as soybean meal, which contains excessive amino acids, in the diet

while maintaining milk production, but also to reduce the carbon footprint (e.g., carbon dioxide generated during the cultivation and procurement) associated with procuring soybean meal as a protein source by approximately 20%. Additionally, it decreases nitrous oxide emissions from manure by approximately 25%.

Read more>>

China drives 40% of global growth in seafood consumption

According to a recent RaboResearch report, China is poised to drive 40% of the global growth in seafood consumption to 2030. This tremendous growth, fueled by China's economic prosperity, large population, and high seafood demand, could transform China into a USD 29 billion market for seafood imports. Higher-value seafood should benefit, driven by a growing upper-middle class and e-commerce expansion.

"China's economic prosperity, coupled with its population of 1.4 billion consumers and a high affinity for seafood, positions it as the most promising growth market for seafood this decade," says Novel Sharma, Seafood Analyst at RaboResearch. Chinese seafood consumption is expected to grow by 5.5 million metric tons through 2030, outstripping local supply. "We expect China to seek resources beyond its borders to ensure adequate supply and close the widening gap between demand and supply by the decade's end."

The forecast for China's seafood demand for the

remainder of the decade is a combination of volume- and value-driven growth. "We anticipate that urbanization, the growth of upper-middle-class consumer groups, and the expansion of e-commerce channels will drive a trend toward demand for higher-value seafood in the long term," continues Sharma.

"If this pivot to higher-value seafood continues, value-driven consumption growth will likely outpace volume-driven growth, with China potentially emerging as a USD 29 billion seafood import market by 2030, creating ample opportunities for global seafood exporters."

Read more>>

Orffa strengthens its presence in Asia

One of the global leaders in animal nutrition, Orffa publicized that it is expanding its presence in Asia, focusing on delivering cutting-edge science driven feed additive solutions to enhance animal health, productivity, and sustainability.

Stating that Asia's dynamic market offers significant growth opportunities, the company additionally announced the appointment of Ramakanta Nayak as Orffa's new Managing Director for the Asia-Pacific region. With his in-depth knowledge of the local market, Nayak will spearhead the company's initiatives to provide science driven feed solutions that address the specific needs of Asian livestock producers.

Orffa explains its three key focus areas as:

1. Gut Health & Immunity: A healthy gut is essential for thriving animals. Our solutions support a balanced gut microbiome, enhancing nutrient absorption, reducing pathogenic pressure, and boosting the immune system.

2. Feed Efficiency: We offer innovative solutions to maximize feed utilization, helping to reduce feed costs and promote more sustainable animal production.

3. Mineral Nutrition: Our comprehensive mineral nutrition solutions are designed to ensure optimal animal health and performance.

"Whether you're looking to enhance gut health, improve feed efficiency, or optimize mineral nutrition, we have the expertise and products to support your goals," explains Orffa, emphasizing that its local specialists are equipped to tackle a wide range of challenges specific to the region.

Read more>>

October 2024

PetCo and VAFO Group unite for future of pet market

PetCo Group, one of the leading producers of premium pet foods based in the DACH region (Germany, Austria, Switzerland), and VAFO Group, one of the European market leaders in the premium pet segment, announced a new strategic partnership. The agreement brings together two successful family-owned businesses with a combined annual turnover exceeding 600 million euros, providing a solid foundation for sustainable growth in the DACH region. The partnership aims to leverage synergies within the two companies, expand their respective product portfolios, and strengthen their market presence. PetCo Group will continue to operate independently in Vienna under the leadership of its founders, Stefan and Katharina Miklauz.

The alliance between PetCo Group and VAFO Group marks an important milestone for both companies, with PetCo Group bringing unique expertise in the distribution and marketing of pet products. Together, the companies aim to further expand their market position in the DACH region while promoting sustainable growth.

Pavel Bouška, Chairmain of the board of VAFO Group, explains: “When it comes to our strategy for

growth in the DACH region, the partnership with PetCo Group makes perfect sense. Together, we can leverage synergies to further strengthen our innovation capabilities, bring us even closer to our customers, and enrich our portfolio with strong brands.”

According to Stefan Miklauz, managing director of PetCo Group, the new alliance will help shape the future of the pet industry: “With VAFO Group, we’ve gained a strong strategic partner who shares our values. Not only will this partnership help us expand our presence in the DACH region, it will also allow us to establish new standards for the pet industry as a whole.”

Read more>>

Nutriment acquires its 3rd pet food company of 2024

Premium pet food producer The Nutriment Company (TNC) acquired its 3rd pet food company of 2024: PETMAN. A brand of Hundt Tiefkühlprodukte und Dienstleistungen GmbH & Co. KG, PETMAN is one of the pioneers in the German Biologically Appropriate Raw Food (BARF) industry based in Wuppertal. Known for its innovative approach to natural pet food, the supplier offers a wide range of high-quality products for dogs, cats, fish and reptiles. With the acquisition of PETMAN, TNC aims to enhance its capabilities in this segment and further expand its reach in the German market.

"Petman is a great company that, compared to many other competitors in the market, has always had a consistent focus on customer satisfaction rather than a purely product-oriented mindset. This fits perfectly with The Nutriment Company, where we combine both – vertically integrated operations and production capabilities, but always based on customer needs," says Anders Kristiansen, CEO of The Nutriment Company.

Read more>>

SCIENTISTS SAY:

Choline is a **Required Nutrient** for Essentially Every Cow

Even in very high-producing cows, we saw a milk response of approximately 2,3 kg/cow/day after supplementation.

-Dr. Heather White,
Tri-State Dairy Nutrition Conference, 2023

Choline dramatically increased colostrum yield – an 85% increase in our study.

-Dr. Barry Bradford,
Tri-State Dairy Nutrition Conference, 2023

Is choline essential or required? I think it's required and we should be framing out a requirement in our nutrition models.

-Dr. Mike Van Amburgh,
Cornell Nutrition Conference, 2022

Certainly, Rumen-Protected Choline appears to have some new opportunities to be placed in high- producing dairy cow rations and may impact animal health during the transition.

-Dr. Mike Hutjens,
Mikehutjens.com

Choline plays an important role in metabolic health. Multiple studies have shown ReaShure's impact on transition cow health.

-Dr. Marcos Zenobi,
Research Study from 2018

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Dr. Eckel starts 2024 World Tour in Azerbaijan

German company focused on animal welfare, Dr. Eckel Animal Nutrition started its 2024 World Tour with a conference in Baku, Azerbaijan. Bringing together over 100 professionals from Eastern Europe, the Middle East and North Africa, the gathering marked the beginning of a series focused on the future of sustainable animal production. Participants expressed their enthusiasm for the innovative approaches discussed, praising the dynamic atmosphere, valuable insights and the opportunity to contribute to a truly enriching exchange.

The event was not only a platform for cutting-edge presentations but also an opportunity for participants to engage in vibrant discussions, making the gathering a unique and memorable experience, according to the press release. Attendees contributed to lively conversations that highlighted the importance of sustainability in the livestock industry. As the guests emphasised, the World Tour conference was a rare opportunity to witness forward-thinking innovations that will drive the future of livestock production. In particular, the knowledge shared on phytogenics, according to the feedback, provided strategic insights that would undoubtedly contribute to future success.

The Dr. Eckel team was particularly honoured by the presence of Tarlan Asgarov, Head of the Livestock Organization and Monitoring Department at the Ministry of Agriculture of the Republic of Azerbaijan, as well as Heiko Schwarz, Deputy Head of Mission at the Embassy of the Federal Republic of Germany in Azerbaijan; and Aytekin Sirayzade, Acting / Deputy Executive Director of the German Chamber of Foreign Trade in Azerbaijan.

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EW Nutrition to celebrate 20th anniversary at EuroTier

The German-headquartered international animal nutrition company, EW Nutrition publicized that it will make EuroTier the center of its 20-year anniversary in November. With Hannover close to its North German roots, EW Nutrition chose November 13 to celebrate this milestone.

Jan Vanbrabant, CEO of EW Nutrition sees this as an opportunity to recognize the company's achievements – market-leading solutions in gut health, feed quality, digestibility and more – and to look ahead. "With so much in the pipeline, both in development and acquisitions, we feel we're having a real growth spurt right now."

After starting out with IgY technology, where it remains as one of the market leaders to this day, EW Nutrition very soon grew its capabilities with its own R&D, scale-up and production, as well as with important product and technology acquisitions. The company explains that it is now channeling its efforts toward bringing new solutions to unsolved or novel market challenges.

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*Patent FR2207447 filed on 20/07/2022; **Schulthess et al., 2023. Proceedings of the 14th ESPHM, accepted. Safglucan® is a registered trademark of Lesaffre et Compagnie.

ForFarmers and team agrar merge feed operations

A European company that offers feed solutions to the livestock farming industry, ForFarmers and team agrar, a compound feed producer and agricultural products supplier and a part of the DLG Group, announced their agreement to combine their feed operations in Germany. The joint venture, which will continue under the name ForFarmers team agrar, has a comprehensive feed portfolio across various species. This agreement is subject to applicable regulatory approvals from the relevant authorities, according to the statement from the companies.

ForFarmers and team agrar have been working together for a long time in Germany via their joint venture HaBeMa, a company active in trading, storage and transshipment of raw materials and compound feed production in Hamburg, Germany. The agreement to expand this joint venture is therefore a logical next step, according to the companies.

The 50/50 joint venture entails ForFarmers' and team agrar's feed activities and employees in the relevant legal entities in Germany: the joint venture concerns ForFarmers' feed activities in Germany with approximately 250 employees and team agrar's feed activities in Germany that has approximately 130 employees. It involves eight feed production sites, three terminals and the vehicle

fleet. The current HaBeMa joint venture, that has 130 employees, is also part of the joint venture.

Out of scope of the joint venture agreement are the activities in Germany of the ForFarmers' brands ForFarmers Thesing, Pavo, Reudink, CirQlar and Vleuten as well as DLG Group's non-feed activities, organic feed, Vilofoss activities, construction and energy activities in Germany.

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FEFAC updates sustainability commitments

The European Compound Feed Manufacturers' Federation - FEFAC published its 4th Feed Sustainability Progress Report, providing an overview of its 2023 activities and deliverables in relation to the five ambitions that were included in the FEFAC Feed Sustainability Charter 2030, released in September 2020. These five ambitions jointly provide a comprehensive approach on how the European Feed Industry can contribute to the development of more sustainable livestock and aquaculture value chains. The past year was marked by discussions on the implementation of the EU Deforestation Regulation and the views on Open Strategic Autonomy for feed ingredients, while the FEFAC Annual Event in June 2024 was largely dedicated to market & regulatory drivers to increase the circularity and reduce carbon emissions of EU livestock production.

In the 4th Progress Report, FEFAC also looks forward and included new commitments pertaining to each of the five ambitions for the years towards 2030. FEFAC explained it considers that the initial commitments it included in the original Feed Sustainability Charter 2030 publication have been successfully delivered on and were subject to an update.

"Our updated commitments are well-timed with the start of the new, 2024–2029 legislative mandate of the European Commission. We demonstrate that that the European feed industry is setting its own objectives to boost sustainable feed production and look forward to engage with policy makers on these topics," says FEFAC President Pedro Cordero.

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Techna celebrates 60th anniversary with new ambitions

One of the key players in animal nutrition, Techna celebrated six decades of expertise and innovation in animal nutrition and natural health. Founded in 1964, the France-based company pointed out that it evolved with the demands and needs of the market, while remaining true to its core values. Today, Techna continues to invest significant human, financial and technological resources in research and innovation, in order to offer efficient and sustainable nutritional solutions to the animal production industry. Its aim is to support its partners in improving their performance, while helping them to meet the food challenges of tomorrow.

Techna is now one of France's leading animal nutrition companies, and boasts a global presence with 8 subsidiaries on several continents. With 320 employees, including 100 outside of France, the company continues to grow, with sales of €85 million, and aims to exceed €90 million by 2025. Techna has conquered a record share of the French animal nutrition market, now accounting for 40% of rabbit feed volumes (using Techna technology), 10% of pig feed, 20% of ruminant feed and 20% of poultry feed, with particularly remarkable performances in turkey (65%) and broiler (30%), according to the company's statement.

Techna, which has also become a major player on the international scene with a strong presence acquired over the years, shared the following examples of its market share: 10% of dairy cow feed volumes in Ireland, 40% of poultry feed in Morocco, 20% of ruminant feed in Tunisia, 30% of aquaculture feed in Turkey.

Read more>>

Norwegian authorities gather to ensure aqua feed from sustainable sources

Skretting Norway's sustainability and public affairs manager Leif Kjetil Skjæveland was appointed as one of nine people who will provide technical and strategic advice to the Norwegian government's social mission on sustainable feed. The national social mission aims to ensure that all feed for farmed fish and livestock comes from sustainable sources by 2034.

According to a statement by the Norwegian government, food security is under pressure due to population growth, increased strain on land and resources, climate change, and more uncertain supply chains. It also emphasizes that the global food systems account for over one-third of current greenhouse gas emissions, with the production of fish feed and livestock feed constituting a significant portion of these emissions.

In response to this, the government launched a targeted mission on sustainable feed. Targeted missions are innovative and ambitious projects where there is an identified need for research and development to interact with regulatory and policy changes to solve specific challenges within a given timeframe. The mission is a collaboration between the Ministry of Trade and Fisheries, the Ministry of Agriculture and Food, the Ministry of Health and Care Services, the Ministry of Climate and Environment, and the Ministry of Education.

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What would happen if all cows were suddenly gone?

The official theatrical trailer has been released for "World Without Cows", a new documentary that examines the multifaceted and often surprising ways cattle impact our world. Through interviews with those on the frontlines of agriculture and environmental science, "World Without Cows" explores the cultural and economic significance of cows, their role in nourishing the world and their impact on climate.

Prompted in part by the prevailing negative — and unscientific — narrative surrounding cattle, this compelling exploration was led by Michelle Michael and Brandon Whitworth, two journalists who travel the world telling stories about agriculture. Three years ago, they set out on an adventure that took them to more than 40 locations around the world — from the American heartland to Kenya, India, Brazil and beyond — as they sought to answer a seemingly simple question, "Are we better off in a world without cows?"

Along the way, they tapped into a global network of agricultural and environmental scientists, farmers, ranchers, academics and other experts who offered an up-close look at the impact of cows on our world and the potential consequences of their removal. What they found was far from simple: When it comes to cows, it's not black and white. Humanity's reliance on cattle is more complex than often realized, and so, too, are the conversations at global and local levels about their role in enabling people and planet to thrive.

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Louis Dreyfus Co. breaks ground on specialty feed production line in China

One of the leading processors of agricultural goods, Louis Dreyfus Company (LDC) celebrated the groundbreaking ceremony for its new specialty feed production line in Tianjin, China, as part of the group's strategic plans to diversify revenue through value-added products.

Located on a 11,000m2 plot of land near LDC's existing Tianjin oilseeds crushing plant, the new specialty feed production line will reportedly focus on producing fermented soybean meal, expanding LDC's presence in China's rapidly growing specialized feed protein market, expected to grow at a 7% compound annual growth rate (CAGR).

"Through this investment, we aim to provide the local livestock and poultry farming industry with high-quality specialty feed proteins that can contribute to more efficient livestock farming, by helping to improve the health status and growth rate of several animal species," said Shengshu Huang, LDC's Chief Technology Officer for Animal Nutrition in North Asia.

According to the announcement, the facility will adopt a technology enhancing feed protein content, palatability and digestibility through synergistic fermentation by multiple probiotic strains.

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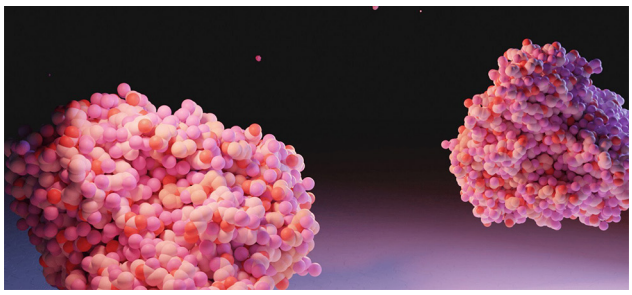
Novus and Ginkgo Bioworks team up to develop innovative feed additives

Intelligent nutrition company Novus International and Ginkgo Bioworks, a cell programming and biosecurity platform, announced their new partnership to develop advanced feed additives designed to meet the evolving needs of the animal agriculture industry. By utilizing Ginkgo Enzyme Services, Novus will work with Ginkgo to build more efficient enzymes that can be produced cost-effectively.



With the agricultural sector facing heightened volatility, including rising feed costs and tightening margins, Novus states that it is committed to supporting its customers by optimizing the health and performance of livestock. This partnership aims to bring cutting-edge technologies to market, enhancing the sustainability and efficiency of animal production systems. These innovations are intended to improve the overall well-being of chickens, pigs, and cows, thereby supporting producers in delivering nutritious and affordable animal products to consumers.

Abishek Shingote, Associate VP of Global Strategic Marketing, Technology, and Innovation at Novus, highlighted the partnership's potential: "With the challenges and volatility facing the agriculture industry, a multifactorial approach is needed for producers to meet their financial goals and end customers to continue to enjoy nutritious and affordable meat, milk, and eggs. This multifactorial approach requires advanced technologies combined with application knowledge. The partnership with Ginkgo Bioworks puts Novus on the path to create innovative technologies that support health and performance consistency in chickens, pigs, and cows. The products we're working to develop came out of conversation with Novus customers and deep analysis of industry needs. Innovation is at the heart of Novus. Sustaining thriving livestock is a challenge, especially against economic, environmental and regulatory headwinds. We make it our mission to find new and novel ways to support our stakeholders and the industry."

Read more>>

Novus introduces new feed solution that prioritizes dairy farmers' income

USA-based company Novus introduced its latest intelligent nutrition product – NEXT ENHANCE® CGO Feed Solution – that supports greater returns on feed investments while providing a safeguard for feed inventories.

According to Novus' statement, NEXT ENHANCE® CGO Feed Solution is scientifically shown to help dairy farmers get more out of forage by optimizing dry matter intake per kilogram/pound of milk produced while maintaining milk production and body weight/condition.

"High feed costs continue to cut into profits for our dairy customers. Our goal in developing this product was to positively impact profits by affecting how much dry matter farmers feed their herds," says Ricardo Teles, Global Ruminant Solutions Senior Manager. "With NEXT ENHANCE® CGO we're maximizing a dairy farmer's income over feed cost. We see a consistent reduction in dry matter intake without negative impacts on milk production or the cow's body weight or body condition. In fact, in some instances, we've seen a boost in production."

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Skretting Norway becomes climate winner for 3rd year

The Climate Index, which is prepared by the accounting firm PwC, is an annual overview of the climate impact and reporting of the largest companies in Norway. While nine companies were climate winners last year, the Climate Index 2024 shows a doubling: 18 of the 100 largest companies in Norway meet the strict requirements, and for the third year in a row, Skretting announced that it is among the climate winners.

"We are of course pleased to maintain our position as a climate winner in Norway. But we are also pleased that far more of the large companies outside the seafood industry now meet the requirements of the Climate Index, even though we wish that all 100 were climate winners. That's what it takes," says Leif Kjetil Skjæveland, Head of Sustainability at Skretting Norway.

This year's climate winners, in addition to Skretting, are Atea, Europris, Møller Mobility Group, Vinmonopolet, Storebrand, NG Group, Schibsted, Veidekke, Bewi, Norske Skog, Yara, Elkem, Norsk

Hydro, KLP, Salmar, Skanska Norway and Sparebanken Vest.

The companies that PwC selects as climate winners must meet the Paris Agreement's minimum requirements for emission cuts and demonstrate transparent, clear and consistent climate reporting over the past three years. This is 48% lower than the base year 2018, against which Skretting Norway measures its climate performance. The majority of the almost halved climate footprint of Skretting feed is reportedly related to raw material production.

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Volac and Wilmar joint venture launches new product for dairy cows

The joint venture of Volac and Wilmar International, Volac Wilmar Feed Ingredients extended its range of rumen-protected fats with the launch of a new product formulation called Mega-Fat 70.

According to Dr. Richard Kirkland, Volac Wilmar's Global Technical Manager, Mega-Fat 70 is a calcium salt formulation with 70% palmitic (C16:0) and 20% oleic (C18:1) fatty acids with specific benefits to both farmer and feed mill alike.

"The Megalac range of rumen-protected fats contains a range of calcium salt and high-melting point products in prilled form with differing concentrations of C16:0 and C18:1 fatty acids. The Mega-Fat 70 formulation falls in the middle of the portfolio, offering the key benefits of the range in a single product," explains Dr. Kirkland.

"Aside from the direct energy supply from fat, the blend of fatty acids is the primary determinant of the type of response achieved when fat supplements are included in dairy diets. The two key fatty acids we are interested in for dairy fat supplements are palmitic and oleic acids. Palmitic acid is a very effective milk

fat booster, whereas oleic acid is beneficial to improve body condition score, fertility and diet fat digestibility, which further increases energy supply, and different formulations can be targeted to meet particular objectives on-farm," he expresses.

Read more>>

ANIMAL INTESTINAL HEALTH

- Supporting gut health starts with stomach acidification
  Giseli Heim, Selko
- Harnessing the microbiome to enhance poultry health and food safety
  Dr. Richard Murphy, Alltech
- Locking in Gut Integrity: How Butyrate secures optimal health
  Arno Duchateau, Impextraco
- Impact of feed quality on animal health and productivity
  Dr. Yun-Mei Amy Lin, Anitox
- Lipopolysaccharides – The internally generated threat
  Bryan Miller, Volac
- Citrus Extract Supplementation: A way to increase endogenous butyric acid concentration in the gut
  Julia Laurain, Nor-Feed
- Know your profitability killer – Metabolic and sterile low-grade intestinal inflammation
  Dr. Attila Kovács & Dr. Fernando Trajano Lima, Innovad
- Value of investment in and maintenance of an intestinal integrity program
  Dr. Alastair Thomas, Elanco
- Seaweed supports improved intestinal health and resilience
  Dr. Ian Hutchinson, Ocean Harvest Technology
- Better gut health for better returns: Enhancing dairy production with postbiotics
  Dr. David Harrington, nu.ance Biotechnology
- Manage enteric infections to improve the health and livability of pigs
  Dr. Lucas Rodrigues, Zinpro Corporation

SUPPORTING GUT HEALTH STARTS WITH STOMACH ACIDIFICATION

Giseli Heim
Global Product Manager Gut Health
Selko

"Organic acids (OA) have shown promising results when it comes to ensuring that nutrients in the diet are digested by animals and not by pathogenic bacteria, in a two-part strategy: One strategy is to control pathogenic microbiota in the first part of the GIT and thus reduce the harmful bacteria reaching the hind gut. The second strategy is to improve nutrient digestion, especially protein, so that less food for pathogenic bacteria reaches the hind gut."

You've probably heard the phrase, "you've got to feed the beast," but who wants to feed harmful bacteria? Feed ingredients can either feed the animal and result in improved performance or serve as nourishment for harmful microbiota in the gastrointestinal tract (GIT) that can lead to reduced performance and even diarrhoea.

Organic acids (OA) have shown promising results when it comes to ensuring that nutrients in the diet are digested by animals and not by pathogenic bacteria, in a two-part strategy: One strategy is to control pathogenic microbiota in the first part of the GIT and thus reduce the harmful bacteria reaching the hind gut. The second strategy is to improve nutrient digestion, especially protein, so that less food for pathogenic bacteria reaches the hind gut. Did you know that *E. coli* loves undigested protein?

Research studies have demonstrated that blends of OA support multiple functions inside the animal that promote better digestion and absorption of nutrients. These functions include reducing the pH in the GIT (Table 1), promoting digestive enzyme activity, altering intestinal morphology (Table 2), and optimizing nutrient digestibility, among others. Furthermore, the specific combination of OA works to support the gut microbial balance by enhancing the growth of beneficial bacteria and inhibiting pathogenic bacteria. Inhibiting the growth of harmful bacteria increases nutrient availability for the animal.

WATER ACIDIFIER – OA CAN ALSO BE APPLIED VIA WATER

Trouw Nutrition developed a complete portfolio of feed additives based on blends of OA that support animals' stomach acidification and gut health. Selko® Al*pH*a, a Selko® water acidifier (SWA), is a synergistic blend of OA applied via water. SWA is a blend of free and buffered OA that effectively reduces and stabilises water pH. Inside the animal, it supports protein digestion by reducing the pH in the stomach. The multi-function SWA also supports a stable intestinal microbiota and helps sustain animals' health so that they can deliver optimal performance.

OA SUPPORT STOMACH ACIDIFICATION – WHAT STUDIES SHOW

Animals' digestive enzymes degrade feed nutrients into absorbable molecules. Both the activity of these enzymes and the microbiota population in the GIT are influenced by pH. The conversion of pepsinogen into pepsin, the enzyme that digests protein, is pH dependent, and the conversion process occurs rapidly when the pH is between 2.0-3.5.[1] A low pH - below 4- delivers a bacteriostatic effect against many pathogenic bacteria including *E. coli, Salmonella*, and *Clostridium*. Young animals' present special challenges as their GITs are still immature, especially in terms of pH. Below, we look at some OA studies Trouw Nutrition conducted involving broiler and piglet diets.

Broilers: In the week following hatch, the secretion and activity of digestive enzymes and the surface area for absorption are limiting factors. These limitations are overcome as the birds grow older. Different authors have observed that the GIT pH undergoes changes during the production cycle.[2,3] The pH in the crop, gizzard, proventriculus, and small intestine slowly declines from day 0 to day 7. This decline is followed by an increase from d 14 to d 42. Although digestive secretions and HCl production are expected to increase as the bird ages, the pH increase beyond day 14 is probably a reflection of the broiler's increased consumption of feed with neutral pH. The feed's buffer capacity is also a major determinant of intestinal pH.

Trial takeaway: A 35-days study performed by Trouw Nutrition tracked the GIT pH of broilers and showed that the SWA reduced the pH in the crop, proventriculus, and duodenum (Table 1).

Piglets: In suckling piglets, the principal source of stomach acidity is the bacterial fermentation of the lactose in sow's milk into lactic acid (which inhibits HCl secretion). However, at weaning, the stomach pH is high, often above pH 5.0. In the first weeks after weaning, HCl production is not yet sufficient, and pepsin activity only begins to increase when piglets reach 5-6 weeks of age (5.7 vs 17.0 U/g of mucosa).[4,5] Factors causing this situation include the piglet's dietary change from milk to solid feed (reduction of lactic acid and slow production of HCl), the change in the pattern of feed intake (consumption of large meals at

infrequent intervals), and the high buffering capacity of the feed. Newly weaned piglets require a relatively low stomach pH (around 3) for the digestion of plant- and animal-derived proteins (other than milk).

Trial takeaway: A meta-analysis of three studies conducted by Trouw Nutrition shows that piglets receiving SWA saw a reduced stomach pH (Table 1).

As noted earlier, a high stomach pH can impede digestion of feed ingredients. The undigested nutrients can ferment in the hindgut where surviving pathogens have a greater opportunity to colonise the digestive tract. Ultimately, these conditions may result in diarrhoea. If the stomach pH is not lowered, pathogenic bacteria (as *E. coli*) dominate while beneficial bacteria (such as *Lactobacillus*) decline. On the other hand, a low stomach pH favours the growth of *Lactobacillus*, which inhibits the colonisation and proliferation of some harmful bacteria, such as *E. coli*.[6]

Table 1. pH in the GIT of broilers and piglets after receiving OA via water

	Control	OA / SWA*
Broilers[1]		
Day14		
Crop	4.91[b]	4.58[a]
Proventriculus	4.55[b]	4.27[a]
Duodenum	5.66[b]	5.47[a]
Day 35		
Crop	5.38[b]	4.67[b]
Proventriculus	5.06[b]	4.33[b]
Duodenum	6.23[b]	5.58[b]
Piglets[2]		
Day 42 post-weaning		
Stomach	3.58[y]	3.10[x]
Proximal small intestine	5.78	5.59
Distal small intestine	6.80	6.84

In the same row, [a,b] P<0.05, [x,y] P = 0.07.
**OA (organic acids) SWA (Selko® water acidifier – Selko® AlpHa).*
[1]1 L/1000 L water from day 1-35. [2]Meta-analysis of 3 studies, 1.4-2.0 L/1000 L water day 1-42 post-weaning.

Trial takeaway: In a 35-days study involving weaned piglets, a significantly lower percentage of animals supplemented with an SWA had a faecal score of 3 and 4 (pasty and liquid faeces) compared to piglets in the control group (10.7 vs 4.4%, P < 0.05).

INTESTINAL MORPHOLOGY: A GOOD INDICATOR OF A HEALTHY GUT

The small intestine is responsible for the final digestion and absorption of nutrients. Villi are critical components of the small intestine, and their geometry provides an indicator of its absorptive capacity. The villus height (VH) and the crypt depth are useful criteria for assessing intestinal health and function.[7] Furthermore, changes in villi surface area may enhance predisposition to malabsorption, enteric infections, and diarrhoea.[8]

Trial takeaway: In two different studies conducted with broilers and piglets, it was observed that supplementation of a SWA resulted in higher VH (Table 2).

Table 2. Villous height (µm) of broilers and piglets after receiving OA via water

	Control	OA / SWA*
Broilers, d 14[1]		
Duodenum	1050.8[a]	1260.5[b]
Jejunum	481.4[x]	596.7[y]
Ileum	431.3[a]	548.1[b]
Piglets, d 49 post-weaning[2]		
Duodenum	372.4[x]	492.5[y]

In the same row, [a,b]P<0.05, [x,y]P = 0.07.
**OA (organic acids), SWA (Selko® water acidifier, Selko® AlpHa). [1]1 L/1000 L water from day 1-35.*
[2]1 L/1000 L water for 49 days post-weaning.

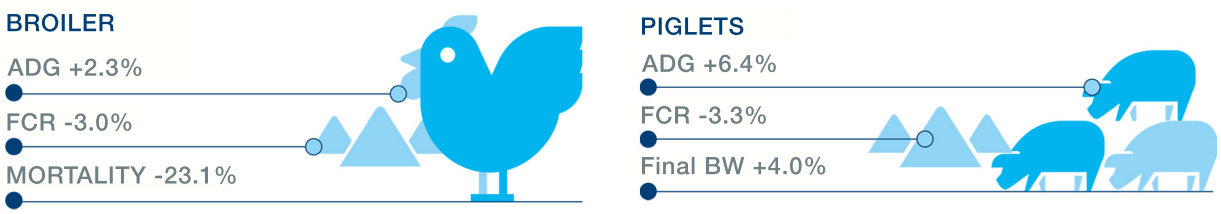

Figure 1. Zootechnical performance of broilers and piglets when receiving Selko® AlpHa. Broiler: data of 20 trials carried with more than 600,000 birds in 12 countries. Piglets: data of 21 trials carried with more than 9,000 piglets in 7 countries.

The studies described above – and many more conducted at Trouw Nutrition research centers and on commercial farms around the globe – demonstrate that OA blends can support gut health, along with better protein digestion, resulting in growth of broilers and piglets (Figure 1).

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About Giseli Heim

Giseli Heim is veterinarian and holds a master's degree in Veterinary Science (Swine Reproduction – Brazil) and a PhD in Animal Science (Swine Nutrition – Ireland). She works for Trouw Nutrition for seven years, starting from Global Marketing Swine, joining Nutreco Africa as Swine Specialist and finally finding her passion as Product Manager Gut Health. Giseli Heim is originally from Brazil and has been living in Ireland, Spain and finally The Netherlands.

HARNESSING THE MICROBIOME TO ENHANCE POULTRY HEALTH AND FOOD SAFETY

Dr. Richard Murphy
Research Director
Alltech

"Dietary supplements, which focus on enhancing and optimizing gut microfloral diversity to aid intestinal health and decrease the animal's susceptibility to disease, can be broadly classed as either prebiotics or probiotics. Over the past number of years, a focus has been placed on identifying how nutrition can benefit the gastrointestinal microflora. In particular, there has been an emphasis on understanding how enhancing microbial diversity influences health and performance."

Gut health and its management is an intricate and complex area governed by numerous factors, including nutrition, microbiology, immunology and physiology. When gastrointestinal health is compromised, nutrient digestion and absorption are affected, feed conversion becomes reduced, and susceptibility to disease is heightened, ultimately resulting in a negative economic impact.

UNDERSTANDING THE ANIMAL'S MICROBIOME

The community of microorganisms in the gut is referred to as the "microbiome" and is recognised as a very diverse community of bacteria, fungi, protozoa and viruses. Its diversity varies along the different regions of the gastrointestinal (GI) tract, with some regions having less tolerable conditions and containing reduced microbial diversity in comparison to regions more favorable to microbial growth.

The gastrointestinal microbiome plays a vital role in nutritional, physiological and immune functions. Poor intestinal health is associated with increased pathogen colonization and susceptibility to infectious disease, and it leads ultimately to poor weight gain and increased mortalities.

Within the GI tract, there are multiple interactions between the host, intestinal environment and microbial cells, in addition to feed components. These interactions underline the critical role of the microbiota in the health and well-being of the host, although the exact manner in which this is achieved is not yet fully understood.

THE ROLE OF MICROFLORAL DIVERSITY IN REDUCING PATHOGENS IN CHICKEN

The diversity of the microbiome plays a critical role in gut health, with beneficial microbes forming a protective barrier lining the gut. This barrier prevents the growth of pathogenic bacteria such as *Salmonella, Campylobacter, Clostridia* and *Escherichia,* among others.

There are numerous theories on how the beneficial microbes prevent pathogen colonization. Some suggest that potential attachment sites on the gut cells become occupied, thereby reducing the opportuni-

ty for attachment and colonization by pathogens. Another proposed mechanism is that the intestinal microbiota secrete compounds such as volatile fatty acids, organic acids and natural antimicrobials that either inhibit the growth of, or make the environment unsuitable for, less favorable bacteria.

Recent research has demonstrated that increased intestinal microfloral diversity correlates with increased resistance to pathogen colonization. In essence, the greater the diversity of microbes within the GI tract, the lower the risk of pathogen colonization.

By enhancing overall microfloral diversity, it is possible to reduce the abundance of pathogens, including those that impact host health as well as those associated with food safety.

Dietary supplements, which focus on enhancing and optimizing gut microfloral diversity to aid intestinal health and decrease the animal's susceptibility to disease, can be broadly classed as either prebiotics or probiotics. Over the past number of years, a focus has been placed on identifying how nutrition can benefit the gastrointestinal microflora. In particular, there has been an emphasis on understanding how enhancing microbial diversity influences health and performance.

Ultimately, the goal with nutritional intervention is not only to control pathogens detrimental to host health, but also to reduce the transmission of pathogens through the food chain.

UTILIZING PREBIOTIC MANNAN-RICH FRACTION TO ENHANCE MICROFLORAL DIVERSITY

From a nutritional standpoint, many feed supplements are focused on stabilizing the gut microflora to aid intestinal health and decrease the animal's susceptibility to disease.

Of the functional ingredients currently in use for microbial control, mannan-rich fractions (MRFs) isolated from the yeast cell wall are widely used in animal nutrition and have been shown to improve animal performance in a manner that suggests they are a viable non-antibiotic alternative.

MRF products, most of which are derived from the cell wall of the yeast *Saccharomyces cerevisiae*, have

been commercially available since the early 1990s. Since 1999, their use in animal feed has become more prominent, mainly due to the European ban on prophylactic antibiotic growth promoters in animal feed. Given their ability to bind to and limit GI tract colonization by gut pathogens, MRFs have proven to be an effective solution for antibiotic-free diets as well as providing support for immunity and digestion.

The effects of MRF supplementation on health and performance have been studied comprehensively, and they show that MRFs have proven effective at improving weight gain and feed conversion efficiencies as well.

Newer studies have focused on the effects of MRFs on the overall bacterial community of the gut - not just on specific bacteria - and such work has shown that supplementation with MRF can significantly enhance the diversity of the intestinal microflora. These studies have also demonstrated that such changes in diversity are associated with decreased abundance of food safety pathogens such as *Salmonella, Campylobacter* and *E. coli*.

CONCLUSIONS

The challenges of modern production practices can restrict the diversity of the gastrointestinal microflora, in some instances resulting in an unhealthy imbalance that can lead to the development of a vicious cycle of pathogen colonization and recolonization. By improving the overall microbial diversity within the gut, we can aim to optimise gut microflora, thereby enhancing resistance to pathogen colonization and reducing the abundance of microbes detrimental to food safety.

Improving our understanding of how changes in the composition of the bacterial community in the GI tract might contribute to host health and performance is critical. However, it is only through looking at this composition of the bacterial community as a whole, rather than looking at specific beneficial or detrimental bacterial species, that we can begin to understand the specific and reproducible effects of nutrition on the microbiome.

About Dr. Richard Murphy

Dr. Richard Murphy is the Research Director at the Alltech European Bioscience Centre in Dunboyne, Ireland. He earned a bachelor's degree in biochemistry in 1994 from the National University of Ireland, Galway. Subsequently, he earned a research scholarship from Alltech and his doctorate in the Department of Biochemistry at the National University of Ireland, Galway in 1999.

Dr. Murphy maintains strong links with numerous universities and research institutions and has been appointed as an adjunct professor on the faculty of science and health studies at Dublin City University. He has also served as an external examiner for undergraduate degree programs and sits on the board of management of the National Institute for Cellular Biology at Dublin City University.

His current research activities are diverse and include peptide biomarker detection, molecular fingerprinting of microbial populations, antimicrobial resistance, biogas production and transcriptional control, and regulation of protein production.

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LOCKING IN GUT INTEGRITY: HOW BUTYRATE SECURES OPTIMAL HEALTH

Arno Duchateau
Global Product Manager
Impextraco

For many challenges in the animal industry, the underlying cause is an impaired gut integrity. Pigs and poultry species benefit from rapid intestinal development and an established gut integrity as a basis for overall gut health and zootechnical performance. Since butyric acid has numerous benefits for the gut barrier functioning, butyrate-based additives are key ingredients in livestock diets for a healthy start and prolonged productivity.

In animal nutrition a lot of attention is given to strategies that optimize gut health by focusing on establishing a stable and diverse gut microbiome. However, in many practical situations where diet changes, antibiotic reduction and environmental stressors influence performance, maintaining gut integrity – or the physiological functionality of the intestinal barrier – may have a more immediate and significant impact on animal performance and welfare.

WHY GUT INTEGRITY SHOULD BE A PRIORITY

Evidently, our industry has a central focus on gut health as dysfunctional gut is directly correlated with suboptimal animal performance, lower profit for farmers and integrators, decreased animal welfare and well-being and increased environmental impact. Simultaneously, other factors, such as the increasing nutritional requirements due to improved modern genetics, cost-reduction and focus on sustainability, put a lot of pressure on gut health by pushing our industry towards using more circular raw materials, less antibiotics and increased animal welfare. In this article we would like to emphasize two strategies for influencing and improving gut health. One is focusing on the bidirectional interaction between a healthy microbial population and the intestinal environment and underlying gut immunity. The other is related to the physiological role of the gut, being the barrier structure, with all its functionalities and immune system. In most practical situations, this second strategy, hereafter referred to as gut integrity, seems to be primordial for preventing further development of intestinal disorders.

The intestinal barrier is a complex system that consists of tight epithelial cells, a mucus layer and gut immunity to prevent harmful pathogens and toxins from entering the bloodstream. Moreover, gut integrity implies a full development and proliferation of the epithelial barrier, so that it is able to produce sufficient digestive enzymes, absorb nutrients and restore physical damage to the gut barrier. As this structure is only one cell thick, its integrity is easily compromised, which leads to increased intestinal permeability (leaky gut), pathogenic colonization and systemic inflammation. Hereby, for

many challenges in the animal industry, the underlying cause is an impaired gut integrity. Hence, protecting a healthy gut barrier should be a priority before you try to steer or modify the gut microbiome. Furthermore, every individual animal or subspecies has its specific gut microbiome, while the intestinal structure is similar. Hence it is complicated to steer the gut microbiome of the entire flock or herd towards the same optimal outcome.

To elaborate on the importance of gut integrity, let's highlight two important challenges in animal husbandry. Firstly, weaning is a crucial step in the life of pigs. They are removed from the sow, put in a new group and given solid feed for the first time. This is highly stressful and leads to intestinal dysbiosis and post-weaning diarrhea in the first days after weaning. Stress lowers feed intake, stomach acid production and triggers inflammation. Piglets need to eat to stimulate stomach functioning and digestive enzyme production. Hence stress after weaning lowers nutrient digestion and especially protein digestion. Next, undigested protein can be fermented in the hindgut leading to pathogenic growth, i.e. ETEC, and diarrheal incidence. In other words, insufficient protein digestion is usually the triggering factor for post-weaning diarrhea. Consequently, improving gut functioning and increasing feed intake as soon as possible after weaning is crucial to overcome this challenge.

Secondly, heat stress is an environmental stressor that has an impact on gut health by inflammation and lowering gut integrity. On the one hand, the stress response results in pro-inflammatory signals that cause intestinal damage. On the other hand, the lower blood flow to internal organs increases oxidative stress and results in ROS formation. This leads to the destruction of tight junction proteins and a leaky gut. Moreover, heat stress decreases the antioxidant response in other animal body cells (e.g. liver), including decreased expression of antioxidant enzymes. In conclusion, the impact of heat stress on gut health can be lowered by improving gut integrity and lowering oxidative stress in the intestinal tract.

HOW NUTRITION INFLUENCES GUT INTEGRITY

Gut integrity is heavily influenced by animal nutrition. Especially in modern farm practices, the root cause of intestinal disorders is via suboptimal feed formulations. Local economic challenges put a lot of pressure on least-cost formulations resulting in substitutions of high-quality ingredients with local and cheaper byproducts. This comes with a risk of nutrient digestion, antinutritional factors and/or external factors like micro-organisms and mycotoxins. These risks can impair the integrity of the gut, by generating inflammation and destroying the tight junction proteins. Hence optimizing feed formulations for protein, fat and starch digestibility and monitoring antinutritional factors and mycotoxins are essential. Apart from the formulation, the budget for supplementing feed additives might also be limited. Unfortunately, intestinal health is such a wide topic that a lot of feed additives claim intestinal health benefits. Therefore, it is not easy for nutritionists to compare one with another. A wide range of additives, i.e. essential oils, probiotics, prebiotics, focus on antibacterial effectivity or steering the gut microbiome to control common gut health problems. However, there are only a few options that target gut integrity directly, i.e. SCFA, like butyric acid, antioxidants, functional amino acids and certain minerals, like zinc. From this selection, butyric acid is most interesting as this SCFA has an influence on all aspects of the gut barrier. Hereby,

it is a necessary basis to achieve overall gut health in animals. Butyrate aids in gut development for young animals and in maintaining it in adult animals. On top of this, it can be combined with the above-mentioned feed additives that focus on the gut microbiome for a total solution.

BENEFITS OF BUTYRATE ON GUT INTEGRITY

The benefits of butyric acid on gut health are numerous. In summary, they can be categorized into 3 groups of action, namely: nutrient efficiency, modulation of immunity and indirect antimicrobial action. Next to intestinal health, more and more human research suggests that butyric acid ameliorates liver functioning and cardiovascular diseases. All these functions originate from a local effect as 95% of the available butyric acid is utilized by the epithelial cells and gut associated immune system. Only a small percentage reaches the liver and might enter the bloodstream. Intestinal absorption occurs mainly via transporters, either via protons or sodium coupled transport. Within the epithelial cells, butyric acid is metabolized into ATP and used as a direct energy source. Moreover, immune cells have specific receptors for butyric acid resulting in anti-inflammatory or immune modulating effects.

Table 1. Butyrate's role in gut integrity

• Nutrient efficiency
• Modulation of gut immunity
• Indirect antimicrobial action

Firstly, when epithelial cells have more energy their proliferation and differentiation increases resulting in longer villi and more digestive enzyme production. In practice, this results in rapid intestinal development in young animals and persistent nutrient digestion and absorption in older animals, for example calcium absorption in laying poultry species.

Secondly, butyrate downregulates inflammation by strengthening the gut barrier with tight junction's proteins and by modulating the immune response. Butyrate is known to stimulate the specific immunity and to prevent the non-specific immunity from overreacting. Next, butyrate can induce regulatory T-helper cells which have a central role in suppressing inflammatory responses. Butyrate is also known for inducing an early maturation of the immune system, which is vital for preventing intestinal diseases in young chickens and piglets.

Thirdly, butyrate has an indirect antimicrobial function. The antibacterial effect is low compared to other SCFA or MCFA, but butyric acid upregulates the host primary defense responses for production of antimicrobial peptides. Simultaneously, butyric acid creates unfavorable conditions by changing the local pH in the hindgut. Moreover, one specific mechanism in *Salmonella* is studied extensively. Butyrate can alter the bacteria's genetic expression resulting in less transcription of 'invasion' genes. This lowers *Salmonella*'s ability to invade and colonize its host. In practice this results in lower shedding of the bacteria, but not in eradicating it from the intestinal tract.

THE IMPORTANT ROLE OF BUTYRATE IN BROILERS AND PIGLETS

The speed at which broilers are raised comes together with various intestinal challenges, ranging from immunity, absorptive and digestive capacity to intestinal dysbiosis. The fact that butyrate has a positive influence on all these aspects makes it an almost necessary solution throughout the production cycle of these animals. Butyrate stimulates the adaptive immune response, which is vital for broil-

ers who start with just some maternal immunity. On the other hand, butyrate reduces inflammation, which is a universal response to all stress factors broilers must deal with. Moreover, broilers must deal with a continuous high feed intake, and thus absorptive capacity is crucial to achieve their genetic potential. Simultaneously, opportunistic pathogens, for example *Salmonella*, are waiting in the gut microbiome to generate dysbiosis and disease. Butyrate limits the virulence of this bacterium by modifying its genetic expression and strengthening the host's defense responses.

Butyrate is naturally present in the hindgut of broilers by bacterial fermentation, but for intestinal development and gut integrity it should be administered via feed to target the small intestinal part from duodenum up until ileum. Usually, butyric acid is supplemented as fat coated salts of butyric acid at a dosage of roughly 500 – 1500 g/T in poultry diets depending on age, species and farm conditions. An experimental trial with 720 Ross® 308 broilers showed that supplementing 1500-1000-500 g/T BUTIFOUR® CCB in broiler diets increased villus length and eventually final body weight significantly.

Weaning is a crucial step in the life of pigs. As described above this is coupled with intestinal dysbiosis and post-weaning diarrhea in the first weeks after weaning. The best management strategy is to stimulate feed intake, thus overcoming the weaning dip, and creating a healthy gut with a developed immune system and gut microbiome. Butyrate fits in both categories. All above mentioned effects, i.e. promotion of the intestinal barrier, modulation of

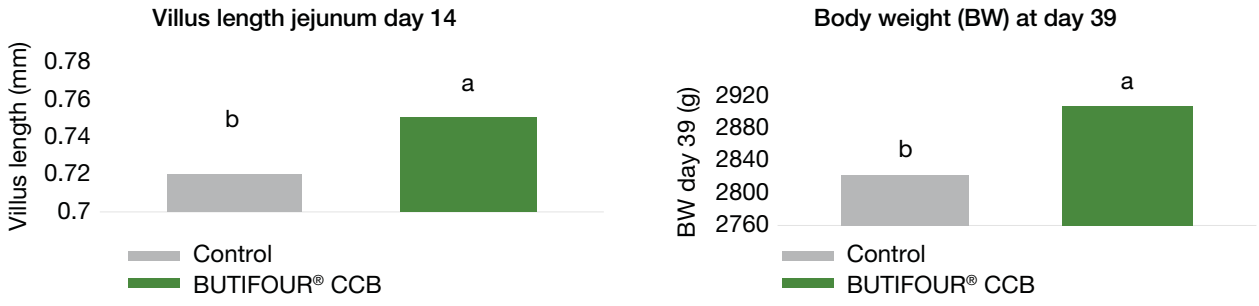


Figure 1. Butifour® CCB improves villi development and zootechnical performance in broiler chickens.

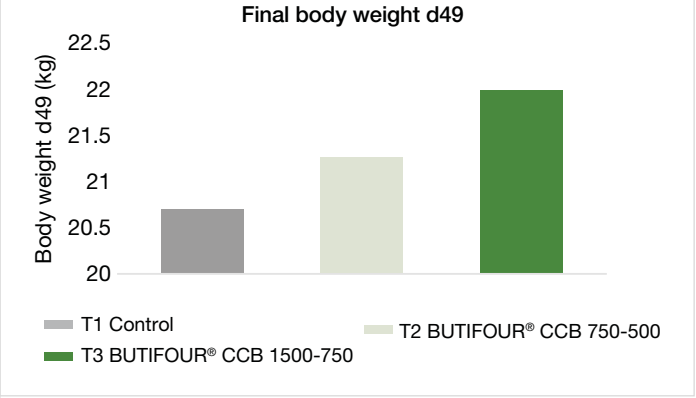
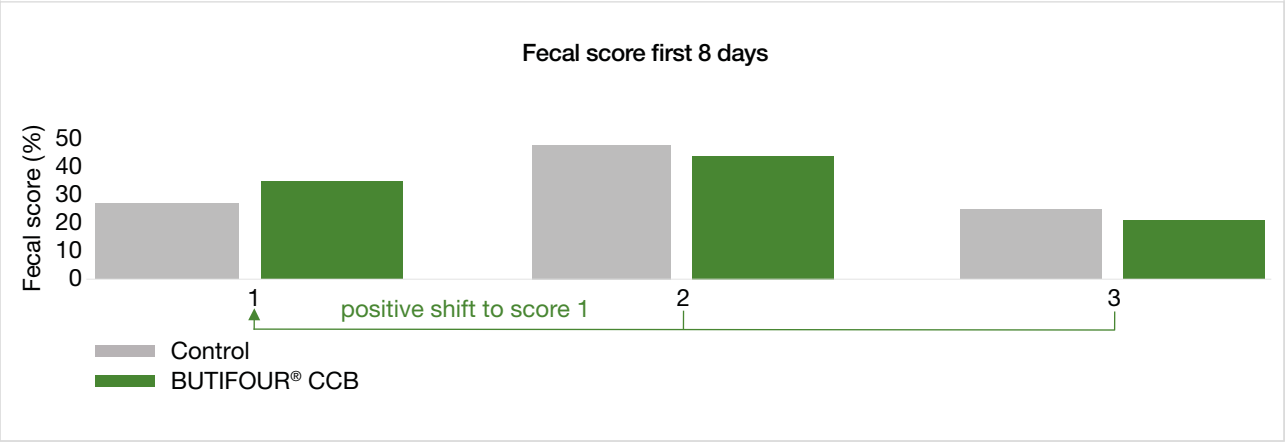


Figure 2. Butifour® CCB improves body weight and reduces diarrheal incidence in weaned piglets.



the immune system, improving digestion and absorption of nutrients, contribute to lowering weaning diarrhea, while the typical odor of butyrate stimulates feed intake by the piglets.

In conclusion, the use of a butyrate source in starter diets is common. Moreover, butyrate can be combined with other short or medium chain fatty acids for total antibacterial protection. The advised dosage is 750 -500 g/T for piglet starter diets or double the dosage depending on the farm conditions. A trial in an experimental farm in Belgium showed a dose response on body weight at day 49 of age, when piglets were supplemented with 750-500 g/T or 1500-1000 g/T BUTIFOUR® CCB. Another trial with weaned piglets showed an improvement of the fecal score indicating less weaning diarrhea problems. Weaning diarrhea often starts from a (protein) digestive problem, hence this explains why butyrate improves the incidence of weaning diarrhea by improving gut integrity, nutrient efficiency and by reducing gut inflammation.

In summary, different animal species benefit from rapid intestinal development and established gut integrity as a basis for overall gut health and zootechnical performance. Since butyric acid has numerous benefits for the gut barrier function, butyrate-based additives are key ingredients in livestock diets for a healthy start and prolonged productivity.

About Arno Duchateau

Arno Duchateau is a master in bioscience engineering who graduated in 2019 at the University of Leuven (Belgium). Since 2020, he has been working as Global Product Manager in the specialty feed additives division at Impextraco focusing on gut health and mycotoxin solutions. Here, he provides technical support to business partners, customers and colleagues as well as managing different product brands from development to marketing and sales.

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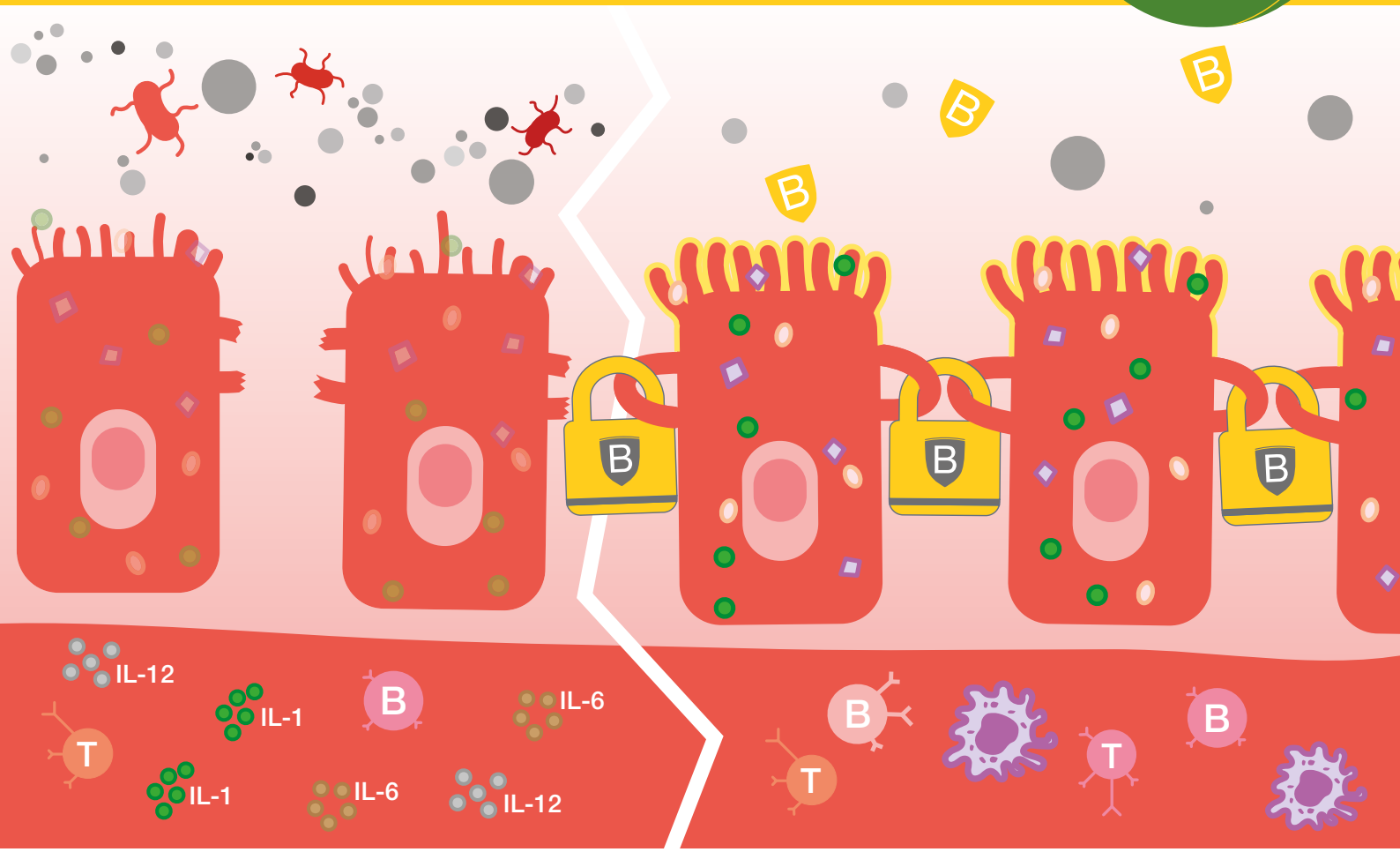

Impextraco®
Optimizing feed ingredients

IMPACT OF FEED QUALITY ON ANIMAL HEALTH AND PRODUCTIVITY

Dr. Yun-Mei Amy Lin
Technical Director
Anitox

"Preventing and controlling feed-borne pathogens is vital for the health and productivity of our production systems, as the introduction and spread of pathogens can compromise intestinal integrity, leading to inflammation, dysbiosis and increased disease susceptibility. An integrated feed biosecurity approach is essential for keeping the feed safe."

A high-quality feed includes essential elements like balanced nutrients, excellent digestibility, and safety. The quality of feed significantly influences the overall health of poultry and swine by providing essential nutrients that support growth and physiological functions, including maintaining a functional immune response. In contrast, poor-quality diets can lead to nutrient deficiencies and introduce harmful contaminants such as pathogens, toxins, and chemical residues. These contaminants can compromise animal health, cause dysbiosis, and negatively impact overall health and productivity.

FEED BIOSECURITY CHALLENGES

Feed contamination and recontamination can occur from various steps within the feed supply chain, from sourcing raw materials, storage, to transporting finished feed. Pathogen contamination by bacterial, fungal and viral organisms negatively impacts the microbial quality and compromises feed biosecurity. Understanding the types of pathogens that can contaminate feed and their effects on animal health is crucial for developing effective management strategies.

For instance, *Salmonella* in poultry is frequently associated with animal feed and poses significant health risks to both animals and humans. *Salmonella*-positive ingredients are more prevalent in animal-based products. However, plant-based ingredients can also be contaminated from storage, transportation, or handling. Since there are no trading rules specifically addressing *Salmonella* in these ingredients, implementing an effective monitoring program to screen incoming ingredients carefully remains the most responsible approach to prevent *Salmonella* from entering the system.

Although we may encounter limitations in sourcing ingredients, preventive measures and treatments applied to these ingredients can prevent the pathogen from entering our production system.

Another feed-source pathogen, *Clostridium perfringens*, can cause subclinical symptoms that affect the uniformity and performance of the flock, while clinical symptoms lead to necrotic enteritis and high mortality rates. *Escherichia coli* is often a food safety concern in poultry and enterotoxigenic

strains (ETEC) are a particular problem in piglets and can lead to enteric colibacillosis, characterized by severe, watery diarrhea and dehydration, which can further cause acidosis and sudden death.

Fungal contamination in feed, particularly mycotoxins such as aflatoxins, fumonisins, deoxynivalenol (DON), and zearalenone (ZEN), can lead to a variety of problems. These include damage to the liver, kidneys and intestines, which can affect metabolism and nutrient utilization, ultimately impacting the animal's growth performance. Additionally, these toxins can weaken the immune system, making animals more susceptible to illness, and cause reproductive issues by disrupting hormonal balance.

Viruses were not considered a risk in swine feed until it was confirmed that porcine epidemic diarrhea virus (PEDV), porcine reproductive and respiratory syndrome virus (PRRS) and African swine fever virus (ASFv) could survive in feed and feed ingredients. The risk from avian influenza virus (AIV) seems lower compared to swine viruses, but feed biosecurity measures, such as regular screening and hygiene management, remain important.

PEDV primarily targets the intestinal lining, resulting in diarrhea, dehydration, and malnutrition. PRRS compromises the immune system, leading to secondary gut infections and impaired nutrient absorption. ASFV, being more systemic, inflicts severe internal damage, including hemorrhagic enteritis. In poultry, HPAI disrupts intestinal health through inflammation and immune suppression, reducing nutrient uptake. These viruses significantly diminish animal performance and increase mortality rates. Transmission through contaminated feed underscores the importance of stringent biosecurity measures, making effective feed biosecurity essential.

SOLUTIONS TO MITIGATE FEED-SOURCE PATHOGEN IMPACT

Addressing the challenges posed by pathogens in animal feed is essential for ensuring the health and productivity of poultry and swine. To mitigate these risks, a comprehensive strategy which encompasses routine testing of ingredients and finished feed, robust vaccination program, stringent biosecurity measures and rigorous hygiene practices throughout the feed supply chain is required. Additionally, the use of feed treatments, such as UV irradiation, thermal treatment and chemical treatments can significantly reduce the introduction and spread of pathogens within the animal production system.

Tailoring vaccination programs to farm conditions can provide lasting immunity and protect livestock from disease outbreaks. However, there is no silver bullet or one-size-fits-all solution to mitigating feed-source pathogen impact on animal health,

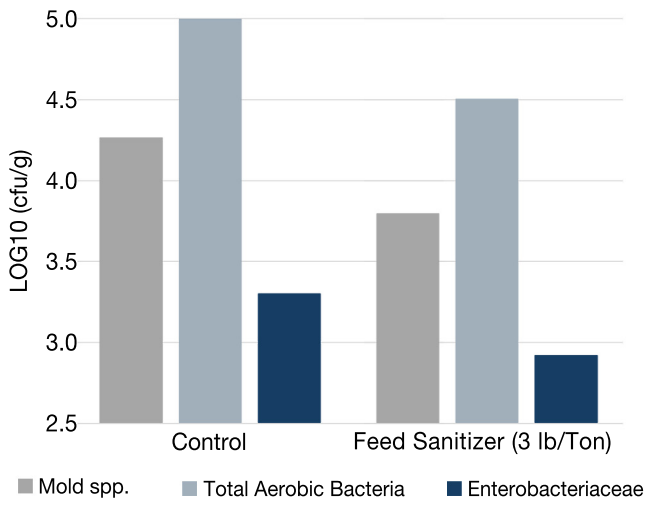

Figure 1. Feed sanitation reduces the microbial load of feed

requiring a carefully implemented, strategic multi-prong approach. Feed sanitizers, such as Termin-8® and Finio®, offer an effective solution, providing long-term protection against recontamination.

Studies have shown that formaldehyde-based sanitizers significantly reduce *Salmonella* contamination and keep feed pathogen-free for extended periods. By protecting feed throughout production and transport, feed sanitizers strengthen biosecurity and ensure clean feed reaches animals.

SUCCESSFUL PATHOGEN MITIGATION STRATEGIES

The effect of sanitized feed on broiler performance was assessed at Colorado Quality Research. The results indicate that feed sanitation significantly reduces the microbial load in the diet. Even under a clinical challenge with necrotic enteritis, broilers fed sanitized feed showed reduced mortality rates and less impact on performance.

In swine, chemical mitigants like feed sanitizers have proven effective against various viruses. Studies confirm that pigs consuming treated feed exhibit lower infection rates compared to non-treated controls.

By leveraging advanced feed safety technologies and monitoring systems, we can effectively reduce microbial loads, which is crucial for maintaining gut health.

Preventing and controlling feed-borne pathogens is vital for the health and productivity of our production systems, as the introduction and spread of pathogens can compromise intestinal integrity,

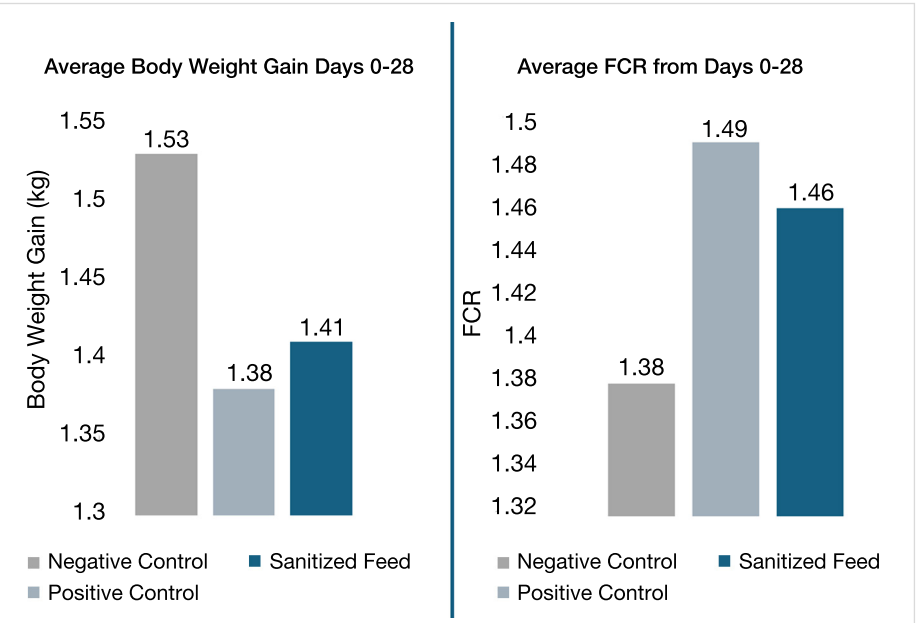

Figure 2. Broilers challenged with clinical necrotic enteritis and fed a sanitized diet experienced a reduced impact on performance

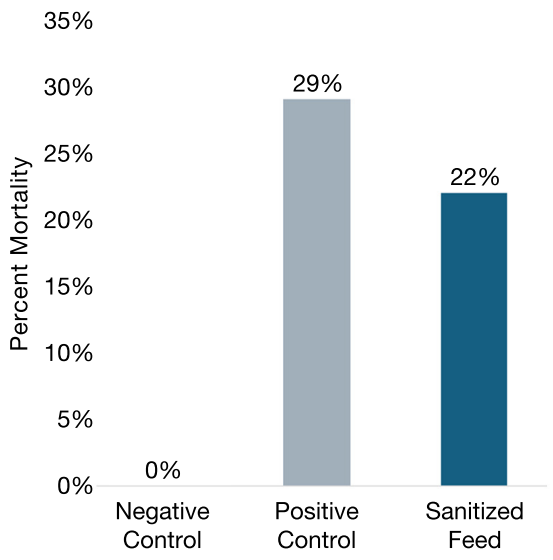

Figure 3. Broilers challenged with clinical necrotic enteritis and fed a sanitized diet experienced a reduced impact on mortality from days 17 to 28

leading to inflammation, dysbiosis and increased disease susceptibility. An integrated feed biosecurity approach is essential for keeping the feed safe. This must include quality control for raw materials, improved feed storage and handling, good housekeeping and biosecurity measures.

By implementing comprehensive pathogen control programs, farmers can effectively mitigate risks, ensuring healthier animals and improved productivity.

About Dr. Yun-Mei Amy Lin

Dr. Yun-Mei Amy Lin, received her Ph.D. in Poultry Science from North Carolina State University and has over five years of industry experience. Her extensive academic background and professional experience have equipped her with a deep understanding of the complexities of animal and poultry science. Dr. Lin is deeply passionate about food sustainability and dedicated to ensuring the highest standards in animal health and safety.

LIPOPOLYSACCHARIDES – THE INTERNALLY GENERATED THREAT

Bryan Miller
Technical Business Manager – North America
Volac

"The lipopolysaccharide content of the gut increases during acidosis and managing diets to reduce clinical and subclinical acidosis is beneficial. Increasing fibre content and reducing easily fermentable carbohydrates can reduce the likelihood of excess short-chain fatty acids or, in the case of clinical acidosis, lactic acid. However, energy requirements to maximise milk or muscle production may limit the extent to which diet manipulation can be employed."

The body has several physical barriers against "external" threats, including the skin, the respiratory linings, and the digestive tract. Of these three, the digestive tract faces the most potential threats, not only from ingested substances but also from what develops *in situ*, such as the growth of micro-organisms, the toxins they produce, and even the remnants of those that die within the tract. Both non-pathogenic and pathogenic bacteria commonly reside within the Gastrointestinal (GI) tract, with species like *Salmonella* and *E. coli* being typical examples of Gram-negative (G-) bacteria. This means that their cell walls do not retain the dye used during Gram staining. When Gram-negative bacteria lyse (both pathogenic and non-pathogenic), their cell walls break into segments that contain "endotoxins" composed of Lipopolysaccharides (LPS). Unfortunately, these LPS are highly reactive and send strong signals to the immune system, resulting in a pronounced inflammatory response. Lipopolysaccharides bind to TLR4 receptor sites, triggering a cascade of reactions that culminate in the production of pro-inflammatory cytokines. Furthermore, the absorption of LPS has been shown to reduce feed intake, exacerbating the issue, as animals experience increased energy requirements while available dietary energy decreases, leading to the utilisation of body lipids and a potential decline in body proteins.

When the digestive tract is in a state of healthy homeostasis, the number of bacteria is kept "in check" and the host is able to cope with the endotoxins produced (due to natural bacterial cell death). However, disturbances in the diet or the diet itself can stimulate bacterial growth. Conditions such as subclinical and clinical acidosis can also cause excess death and lysis of bacteria. Diet composition can influence absorption; for instance, the lipid portion of LPS can combine with dietary fats, leading to increased absorption (Kelly et al., 2012). Additionally, factors such as heat stress and certain mycotoxins can weaken the cell-to-cell connections and the integrity of the gut, allowing greater absorption of LPS present in the digestive tract.

Aside from its role in inflammation, LPS also has effects that can exacerbate or increase the risk of other metabolic diseases. Dairy cows infused with LPS show dose-dependent reductions in serum calcium concen-

trations (Waldron et al., 2003). Elevated plasma LPS concentrations are associated with a decrease in blood calcium and magnesium due to an increase in IL-1β (Gray et al., 2007), which may contribute to milk fever.

LPS can also impact lipid metabolism. Research by Chirivi et al. (2022) demonstrated that LPS can reduce the antilipolytic effects of insulin, leading to dysregulation of lipolysis. This is particularly important for transition cows that require effective regulation of fat release and storage due to general negative energy balance and potential declines in liver function.

HOW CAN THE LPS THREAT BE REDUCED?

The lipopolysaccharide content of the gut increases during acidosis and managing diets to reduce clinical and subclinical acidosis is beneficial. Increasing fibre content and reducing easily fermentable carbohydrates can reduce the likelihood of excess short-chain fatty acids or, in the case of clinical acidosis, lactic acid. However, energy requirements to maximise milk or muscle production may limit the extent to which diet manipulation can be employed. Including buffers and certain yeast products can help mitigate acidosis and increase rumen pH. Yeast can compete for soluble carbohydrates that could otherwise be used by *Streptococcus bovis* and *Lactobacillus* to produce lactic acid; additionally, yeast may encourage the growth of *Megasphaera eldenii*, which can convert lactic acid into butyric acid (Amin and Mao, 2021).

Feed additives can also be used to reduce the growth of Gram-negative (-) bacteria, such as *E. coli* and *Salmonella* species. Yeast cell wall products have demonstrated an ability to bind live bacteria, thereby reducing their ability to grow and reproduce. Feeding fructo-oligosaccharides supports the growth of probiotic or beneficial bacteria, which can reduce pathogenic bacterial growth by controlling the micro-environment around the microvilli through competitive inhibition.

The growth of Gram-negative bacteria and subsequent LPS production can never be entirely eliminated. However, the effects of LPS can be mitigated through feed ingredients that help maintain healthy homeostasis, support the growth of probiotic bacteria, and promote intestinal integrity, thereby limiting the growth and prevalence of harmful bacteria. Additionally, specific inorganic compounds (such as aluminosilicates) and organic compounds (such as components of yeast cell walls) can bind LPS, preventing both their absorption and their ability to stimulate inflammation.

Although LPS presents a genuine threat to animal production, their effects can be mitigated using specific feed additives and practical management strategies to reduce the associated risks.

References are available upon request.

About Bryan Miller

Bryan Miller has been in the feed industry for over 35 years in feed mill management, product development (including authoring patents) and technical services. For most of the past 10 years he has focused on gut and liver health, including mycotoxin remediation.

CITRUS EXTRACT SUPPLEMENTATION:

A way to increase endogenous butyric acid concentration in the gut

Julia Laurain
Marketing Director
Nor-Feed

"Citrus extracts have demonstrated their ability to modulate animals' microbiota, stimulate the production of SCFAs and thus improve feed efficacy. However, the effect of citrus extracts supplementation through the feed can differ a lot, depending on the citrus based product used."

Intestinal health plays a vital role in ensuring the optimal development of animals. S**hort-chain fatty acids** (SCFAs), such as **butyric acid**, are particularly important due to their beneficial impact on the **intestinal microbiota**. These compounds help **preserve intestinal integrity** and **enhance feed digestibility**, thus improving feed efficiency. Therefore, increasing the concentration of SCFAs in the intestinal tract presents a promising strategy to **improve animal health** and production performance.

A study by Nor-Feed, a company based in France, was carried out aiming to assess the effect of supplementing broiler chickens with a **standardized natural citrus extract** (SNCE) on SCFA levels in the intestine, with a specific focus on butyric acid, a key SCFA in promoting intestinal health.

This trial was conducted on **1344 one-day-old** male **broiler chickens** (Ross 308). Broiler chickens were equally divided into **2 groups**. The **control group**, composed of 16 replicates of each 42 birds, fed with **a standard diet**. The **SNCE group**, composed also of 16 replicates of 42 birds each, fed a **standard diet** supplemented with **250 ppm of standardized natural citrus extract**. The **butyric acid content** in caeca was **measured** at **day 12** and at **day 34**.

Results showed that **SNCE supplementation** significantly **increased** the percentage of **caecal butyric acid content** at d12 (14.39%) compared to control group (12.32%). At d34, the percentage of butyric acid was still numerically higher in SNCE group (14.75%) compared to the control group (13.21%), but the difference was not significant. Therefore, these trial results show that SNCE supplementation allows to **increase endogenous butyric acid** rate in caeca.

The composition of SNCE may explain the observed effects. Key compounds in SNCE, such as **pectic oligosaccharides, naringenin**, and **hesperidin**, are well known for **promoting** the **growth of bacteria** that produce. Based on these findings, SNCE appears to be a promising solution for **enhancing digestive health** in young birds.

A CHARACTERIZED AND STANDARDIZED CITRUS EXTRACT SOLUTION TO ENSURE GROWTH PERFORMANCES

Citrus extracts have demonstrated their ability to modulate animals' microbiota, stimulate the pro-

duction of SCFAs and thus improve feed efficacy. However, the effect of citrus extracts supplementation through the feed can differ a lot, depending on the citrus based product used. Indeed, common citrus extracts used in animal nutrition are not standardized, which can lead to high heterogeneity regarding their effects on animal performance.

Nor-Spice AB®, a natural citrus extract to improve feed efficiency, has already proven its efficacy in many species. Through two meta-analyses for pigs and poultry, **Nor-Spice AB®** has been shown to be an effective and repeatable prebiotic for improving animal growth. In these trials, **Nor-Spice AB®** increased the average daily gain (ADG) of pigs and poultry by 11.7% ($p<0.001$) and 5.5% ($p<0.01$) respectively.

In Poultry, 17 trials were conducted under different conditions around the world. For each trial, a control group was compared to a trial group in

which the control feed was supplemented with 250 to 400 ppm **Nor-Spice AB®**.

In Pigs, 10 trials were conducted and confirmed the positive effects of **Nor-Spice AB®** in piglets. Each trial had 2 groups of piglets, one group received a standard diet and the other group received the same standard diet supplemented with 250 ppm **Nor-Spice AB®**.

References are available upon request.

About Julia Laurain

Julia Laurain graduated as an Agricultural Engineer (Msc) in 2008 from ENSAIA in Nancy (France). She began her career in Valorex, where she started to develop her skills in dairy nutrition and project leading in France and during a mission in US with Stonyfield Farm. In 2012, she joined Olmix group, first as a mycotoxin risk product manager for North Europe before managing the animal care technical team in Europe. From 2017 to 2022 she held the global position of Mycotoxin Risk product manager. In June 2022 she joined Nor-Feed marketing team as Product Manager, since September 2022 she has been managing the marketing service including product strategy and communication.

Dr. Attila Kovács
Global Intestinal Health Category Manager
Innovad

Dr. Fernando Trajano Lima
Global Poultry Technical Manager
Innovad

KNOW YOUR PROFITABILITY KILLER

Metabolic and sterile low-grade intestinal inflammation

"The relationship between feed and metabolic or sterile intestinal inflammation in poultry is complex but understanding it is crucial for maintaining optimal health and productivity. By understanding the impact of nutrient composition, feed quality, and processing, poultry producers can develop effective strategies to manage and mitigate intestinal inflammation."

Intestinal health is paramount in poultry production, directly affecting growth rates, feed efficiency, and overall health.

While pathogenic infections are a well-recognized cause of intestinal inflammation, another less obvious but equally significant cause are the metabolic and sterile intestinal inflammation. This type of inflammation arises from dietary factors and metabolic disturbances rather than direct microbial infection like in the pathological inflammation. Understanding how feed and different feed ingredients influences this condition, can help in devising strategies to improve poultry health, productivity and the much-needed profitability.

NUTRIENT COMPOSITION AND ITS EFFECTS

Taking the earlier into consideration, it is safe to say that the composition of poultry feed is critical in managing intestinal health. Let's look at some examples:

Excess dietary fats can disrupt the balance of fatty acids in the body, leading to increased production of pro-inflammatory cytokines. These molecules play a role in the body's immune response but, when overproduced, they can cause metabolic inflammation.

Certain **anti-nutritional factors** present in plant-based feeds can contribute to sterile intestinal inflammation. Lectins and phytates, commonly found in grains and legumes, can interfere with nutrient absorption and cause irritation to the gut lining.

Non-starch polysaccharides (NSPs) increase the viscosity of the gut contents, impeding nutrient absorption and altering the gut microbiota composition. This alteration can lead to dysbiosis, a microbial imbalance that favours pathogenic bacteria, thereby inducing inflammation. This reaction belongs more in the pathologic type of inflammation, however, together with the metabolic intestinal inflammation they can decrease performance and in the same time affect profitability. While the lesions of the pathological inflammation can be seen with the naked eye, the ones caused by the metabolic intestinal inflammation can be seen only under the microscope.

Dietary imbalances, particularly the oversupply of nutrients such as excessive protein intake, provide increased substrates for existing bacteria, including *Clostridia* and other pathogens, facilitating their proliferation. This overabundance can lead to enteric diseases, subsequent inflammation, and metabolic disorders. Also, elevated protein levels in the gut result in an excess of nitrogenous waste, which is converted into ammonia. This condition fosters high fermentation rates in the hindgut and supports the growth of additional pathogens. The resultant exacerbated inflammatory state heightens the risk of developing metabolic disorders.

Deficiencies or excesses in micronutrients like vitamins and minerals can compromise immune function and gut health, leading to sterile inflammation.

RESEARCH FINDINGS AND NOVEL APPROACHES

Recent research has shed light on the mechanisms and management of chronic low-grade intestinal inflammation. Innovad, in partnership with Texas A&M University and USDA, has been at the forefront of this research. They have identified novel non-invasive biomarkers for chronic intestinal inflammation and developed new models to study its spatial and temporal patterns.

For instance, it was found that inflammation affects the duodenum and jejunum early in life, while the ileum is compromised at a later stage. This insight is crucial for developing targeted interventions (Figure 1).

Furthermore, real production environments were used to study chronic intestinal inflammation, providing more realistic insights compared to tradition-

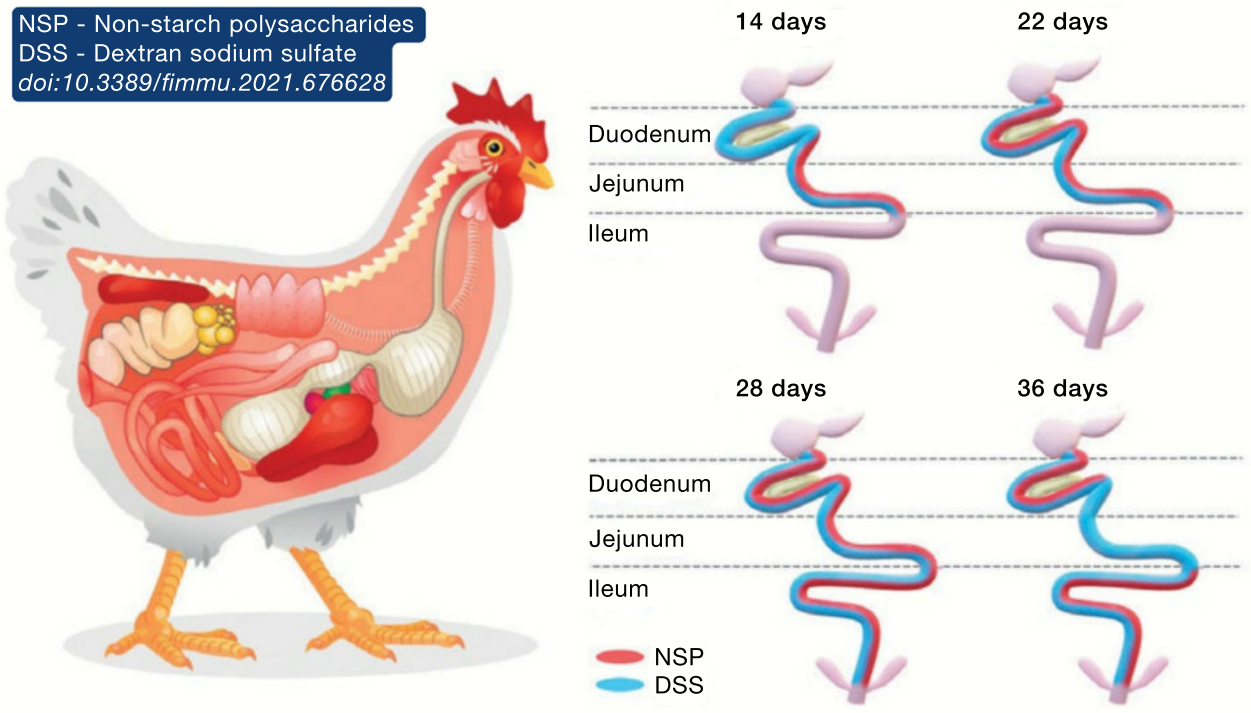

Figure 1. Inflammatory response in the gut days 14-36.

al experimental setups. This approach revealed that oxidative stress triggers a persistent inflammatory response, extending well beyond the initial trigger and resulting in cumulative damage over time.

MANAGEMENT AND MITIGATION STRATEGIES

The negative impact of feed on metabolic and sterile intestinal inflammation can be mitigated through a combination of four strategies:

1. Optimizing Feed Composition

Incorporate ingredients with anti-inflammatory properties, such as fatty acids, antioxidants and certain plant extracts. The toolbox is very versatile and offers several options. Understanding them and testing them in real life conditions makes the difference between profit and loss on the farm.

2. Quality Control

Use fresh, high-quality ingredients: Ensure proper storage and handling of feed to avoid contamination with mycotoxins and other harmful substances.

3. Supplementation

Supplement with intestinal health supporting products. The market is offering several solutions, you just have to make sure that these are working in real, commercial conditions, not only in low pressure, clean facilities.

Add digestive enzymes to improve nutrient absorption and reduce the impact of anti-nutritional factors.

4. Monitoring and Adjustments

Conduct regular health and performance assessments to detect early signs of inflammation. Chronic intestinal inflammation can be detected only microscopically, so make sure to analyse it accordingly.

Tailor diets based on specific needs and stress periods to minimize metabolic stress and inflammation.

CONCLUSION

The relationship between feed and metabolic or sterile intestinal inflammation in poultry is complex but understanding it is crucial for maintaining optimal health and productivity.

By understanding the impact of nutrient composition, feed quality, and processing, poultry producers can develop effective strategies to manage and mitigate intestinal inflammation.

We have commercial products that offer a holistic approach ensuing healthier flocks, better performance, while reducing the reliance on antibiotics and ultimately leading to more sustainable poultry production and better profits.

About Dr. Attila Kovács

Dr. Attila Kovács is a veterinarian, holding a masters in animal pathology and human health from the University of Veterinary Medicine in Cluj-Napoca, Romania. Dr. Kovács practiced his small animal veterinary skills as well, during his studies, when he was working as a veterinary assistant in Lake Tahoe, California, USA.

For the last 14 years, he has been working in the animal feed additive industry. Currently, he holds the position of Global Category Manager Intestinal Health with the company Innovad®, being responsible for the product portfolios directly related to intestinal health.

About Dr. Fernando Trajano Lima

Dr. Fernando Trajano Lima graduated in Veterinary Medicine in 1991 from the Faculty of Veterinary Medicine of Lisbon. He started his career at Provimi as a generalist Technical Assistant and later Commercial Technical Manager for Poultry, (1991-2011), Technical and Commercial Manager at Zezere (2011-2012), Poultry Technical Director at Biomin 2013-2021 (EMEA-Europe, Middle East and Africa), Director of Poultry and Performance Solutions at DSM (2021-2023) and is currently Global Technical Director for Poultry at Innovad. He currently lives in Switzerland and globally supports production, diagnostics and clinical and additive solutions in poultry farming.

VALUE OF INVESTMENT IN AND MAINTENANCE OF AN INTESTINAL INTEGRITY PROGRAM

Dr. Alastair Thomas
Senior Director Technical Services
Elanco

"A tailored intestinal integrity program offers several benefits crucial to poultry flocks' health, productivity, and overall performance. One of the primary advantages of such a program is improved feed conversion ratio (FCR), which optimizes gut function and nutrient absorption. Birds with healthy intestinal linings can convert feed into body mass more efficiently, improving FCR. Reducing the feed required achieves optimal growth and can significantly lower operational expenses."

Necrotic enteritis (NE) is one of the world's most significant and costly diseases in the poultry industry. The rapidly fatal intestinal disease can have mortality rates as high as 50%, endangering flock welfare and causing severe economic losses[1]. The economic toll of NE on the global broiler industry is substantial, with an estimated $5-6 billion spent annually due to increased mortality, decreased productivity and treatment costs[2].

For producers, NE prevention is paramount in protecting flocks and sustaining revenue growth. A well-structured intestinal integrity program offers an opportunity to accomplish both objectives. A proactive approach allows producers to reduce their reliance on medications, improve feed conversion rates and boost the overall productivity of their operations. Producers can optimize flocks' productivity and well-being by maintaining a healthy gut through a comprehensive intestinal integrity program.

UNDERSTANDING NECROTIC ENTERITIS

NE, caused by the naturally occurring bacterium *Clostridium perfringens*, primarily affects 2–5-week-old broilers and 7–12-week-old turkeys[3]. While typically harmless in small numbers, *C. perfringens* can increase under certain conditions such as dietary changes, immune suppression or intestinal damage. The increase in bacteria results in a release of toxins, creating lesions in the gut, impairing the bird's ability to absorb nutrients and causing diarrhea, lethargy and, in severe cases, sudden death. The risk of illness from NE during such a critical growth period compounds the economic impact.

Several factors predispose birds to NE outbreaks in poultry populations, including dietary changes, immunosuppression and intestinal damage from coccidia. Dietary components such as high levels of non-starch polysaccharides (NSPs) from grains like wheat, rye and barley increase digestive viscosity and promote bacterial overgrowth in the gut, making birds susceptible to NE[4]. Environmental stressors such as immunosuppressive diseases, poor housing conditions or abrupt dietary changes can also

compromise intestinal health, making birds more liable to develop NE as well.

Diagnosing NE can be challenging for producers, as birds affected by the disease may demonstrate nonspecific symptoms such as ruffled feathers, diarrhea and decreased appetite. The disease often progresses quickly, with early mortality frequently related to concurrent coccidiosis. Diagnosis typically involves post-mortem examination, revealing characteristic lesions in the small intestine. The rapid onset of NE highlights the critical importance of proactive management strategies to maintain intestinal health.

BENEFITS OF A STRONG INTESTINAL INTEGRITY PROGRAM

A tailored intestinal integrity program offers several benefits crucial to poultry flocks' health, productivity, and overall performance. One of the primary advantages of such a program is improved feed conversion ratio (FCR), which optimizes gut function and nutrient absorption. Birds with healthy intestinal linings can convert feed into body mass more efficiently, improving FCR. Reducing the feed required achieves optimal growth and can significantly lower operational expenses.

Birds with healthy gut integrity have stronger immune systems and lower mortality rates. Flocks with robust intestinal health are less susceptible to infections like NE and coccidiosis. This enhanced immunity means flocks expend less energy fighting diseases and more energy on growth and production. By strengthening gut health, producers may see improved welfare metrics, fewer losses in flocks and reduced costs.

Focusing on prevention rather than treatment enables producers to significantly lower medication and treatment costs. Lessening the labor involved in treating sick birds makes operations more efficient and cost-effective. This is particularly crucial in No Antibiotics Ever (NAE) production systems. As consumer demand for antibiotic-free poultry grows, producers seek preventative gut health measures like proper nutrition, probiotics and good management practices. These proactive methods can help producers maintain profitability while adhering to consumer and regulatory demands.

DATA-DRIVEN DECISION MAKING

Intestinal integrity programs are effective when supported by advanced monitoring tools. The Intestinal Integrity Index (I^2), for example, assesses the intestinal health of flocks based on flock-level health and performance data, enabling producers to monitor gut health metrics over time. Tools like the I^2 Index are valuable in identifying trends and potential issues early, such as signs of intestinal disease, and enable producers to adjust feeding strategies, environmental conditions or health protocols to prevent disease outbreaks. The data provided by advanced monitoring tools allows for quantifying the economic impact of gut health on flock performance, helping producers measure the return on investment from preventative health measures. Additionally, producers' adoption of these tools is beneficial in supporting, informing and evaluating other concurrent industry efforts to drive economic sustainability and profitability.

Investing in and maintaining an intestinal integrity program is critical to achieving optimal productivity and profitability in the poultry industry. This proactive approach helps prevent diseases like necrotic enteritis, reduces reliance on antibiotics and enhances overall flock health and efficiency. Leveraging data-driven decision-making tools, like the I^2 Index, empowers producers to make informed, timely interventions that lower mortality and treatment costs, creating significant savings over time. While implementing a comprehensive intestinal integrity program may require initial investment, the long-term benefits of proactive intestinal health management are a best practice and a necessity in today's competitive poultry industry.

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About Dr. Alastair Thomas

Alastair Thomas, Ph.D., is a Senior Director of U.S. Poultry Technical Services and Nutritional Health at Elanco. Thomas provides specialized feed additive and microbiology technical support to the poultry technical and marketing team for animal health product groups and services.

SEAWEED SUPPORTS IMPROVED INTESTINAL HEALTH AND RESILIENCE

Dr. Ian Hutchinson
Technical Director
Ocean Harvest Technology

"A considerable body of literature exists to demonstrate the range of bioactive compounds in seaweed, and their applications in animal feed. As strong evidence has accumulated in recent years for the prebiotic effects of seaweed polysaccharides, animal producers are realising the potential benefits of enhancing populations of beneficial gut bacteria on intestinal health and animal performance."

Macroalgae (seaweed) are an important source of functional ingredients for animal nutrition, due to their diverse nutritional composition, and their high content of bioactive compounds such as polysaccharides, pigments, peptides and polyphenols. Various published reviews have summarised the anti-inflammatory, antioxidant, prebiotic and antimicrobial properties of macroalgae (Xie et al., 2023, Gonzalez Meza et al., 2023, Morais et al., 2020), demonstrating the wide range of applications in animal feed.

A SUSTAINABLE SOURCE OF BIOACTIVE INGREDIENTS

Utilising blends of whole seaweeds in animal diets enables producers to realise the benefits of the variety of bioactive compounds in macroalgae, whilst also reducing the environmental footprint of animal feed. Seaweed requires no fresh water, land use or fertiliser for growth, and so compares very favourably to terrestrial feed ingredients (Duarte et al., 2017). In cases where wild seaweed is harvested from algal blooms, the environmental impact is even more favourable, due to the recycling of nutrients derived from land-based agricultural run-off.

MULTIPLE MODES OF ACTION TO SUPPORT GUT HEALTH

The use of seaweed polysaccharides as prebiotics in animal nutrition has been comprehensively described in the literature (Makkar et al., 2015, O'Sullivan et al., 2010). Furthermore, studies have demonstrated the prebiotic effects of whole seaweed blends, positively influencing the profile of the gut microbiome in swine (Hutchinson 2023), and the cecal microbiome of broilers (Sands, 2022) to enhance gut health and animal performance. The improvements in intestinal health achieved as a result of seaweed supplementation have also been shown to be cost effective. Feed costs per kg of liveweight gain were reduced in nursery pigs supplemented with a blend of whole seaweeds, compared to those supplemented with a number of other gut health additives, including phytogenic ingredients and yeast cell wall extracts (Hutchinson, 2023).

Recent research has identified further benefits of macroalgae supplementation on gut health, beyond the strong prebiotic effects detailed above. Initial *in vitro* studies conducted by Ocean Harvest Technology confirmed the potential for OceanFeed™

seaweed blend to bind three important pathogens (*Clostridium perfringens, Escherichia coli* and *Salmonella Enterica* serovar Typhimurium) and form agglomerates, with binding efficiencies of 60%, 42% and 76%, respectively. The agglomeration capacity demonstrated in this work shows how supplementation of animal diets with blends of macroalgae can contribute to the inhibition of pathogenic colonisation in the digestive tract, supporting improved gut health and animal performance.

REDUCING THE NEGATIVE IMPACTS OF NECROTIC ENTERITIS IN BROILERS

In order to further develop this hypothesis, Ocean Harvest Technology engaged Southern Poultry Research Group to conduct a Necrotic Enteritis Challenge trial at their facility in Georgia, USA. In this study, a total of 400 Ross 308 broilers were fed one of 4 dietary treatments for the duration of the 28-day trial;

- Negative Control (NC, standard commercial diet)
- Challenge Control (CC, NC + Necrotic Enteritis challenge)
- CC + OFP 2.5 kg/t (Challenge Control + 2.5 kg/t of OceanFeed Poultry seaweed blend)
- CC + OFP 5.0 kg/t (Challenge Control + 5.0 kg/t of OceanFeed Poultry seaweed blend)

The challenge model consisted of ~750 oocysts E. maxima on day 14 of the study, and Clostridium strain on Days 19 and 20 of the study, using 1.0 mL of a 1.0 x 108 CFU/mL combination by gavage, as previously published by Hofacre, et al. (1998). The trial was established as a completely randomised block design, with 10 birds per pen, and 10 pens per treatment. The diets were formulated according to NRC guidelines with feedstuffs commonly used in the U.S. Rations were fed ad libitum from date of chick arrival to the conclusion of the trial. Birds and feed were weighed on days 0, 14, 22, and 28 of the study to evaluate performance metrics. Date and removal weight was recorded on all birds culled or found dead, and a gross necropsy was performed on all dead or culled birds to determine the bird sex and probable cause of death.

A very strong challenge resulted in high mortality in the Challenge Control Group, of 49%. Supplementation with 5 kg/t OFP significantly reduced mortality to 33%, whereas mortality in birds supplemented with 2.5 kg/t OFP was intermediate to these groups at 44%, and 0% mortality was observed in the Negative Control group. Feed intake, liveweight gain and feed conversion ratio for the entire 28-day trial period are shown in Figure 1. Liveweight gain in

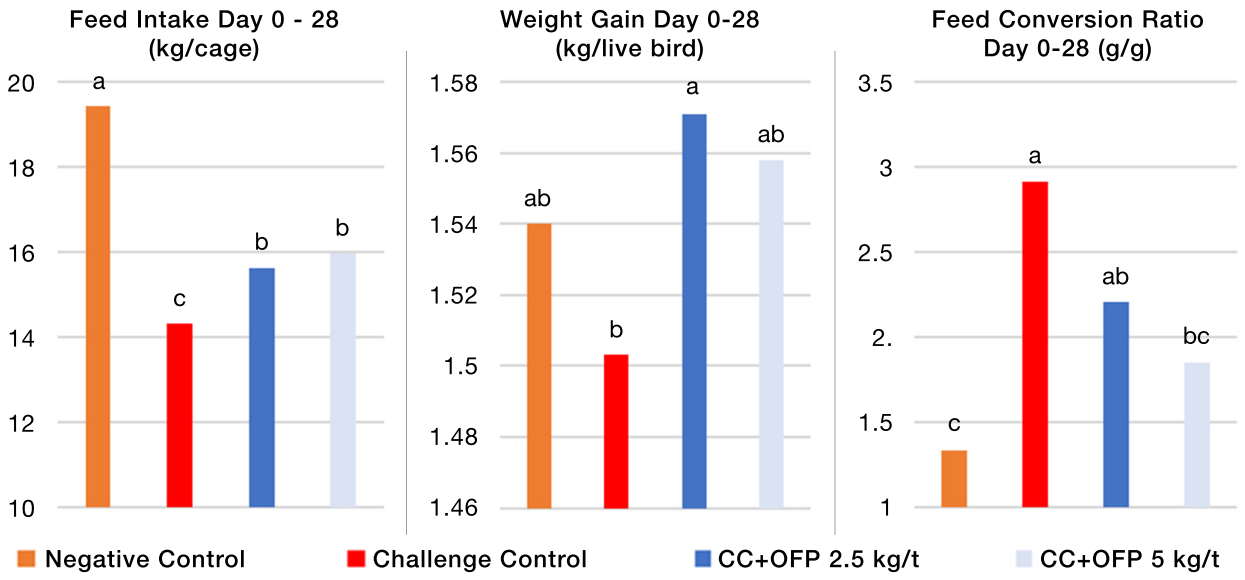

Figure 1. Feed intake, weight gain and feed conversion ratio of broilers under a Necrotic Enteritis Challenge
[abc]Values within the same row not sharing superscripts denote significance differences (P ≤ 0.05).
CC+OFP.2.5 kg/t, CC with 2.5 kg/tonne OceanFeed Poultry; CC+OFP 5 kg/t, CC with 5 kg/tonne OceanFeed Poultry;

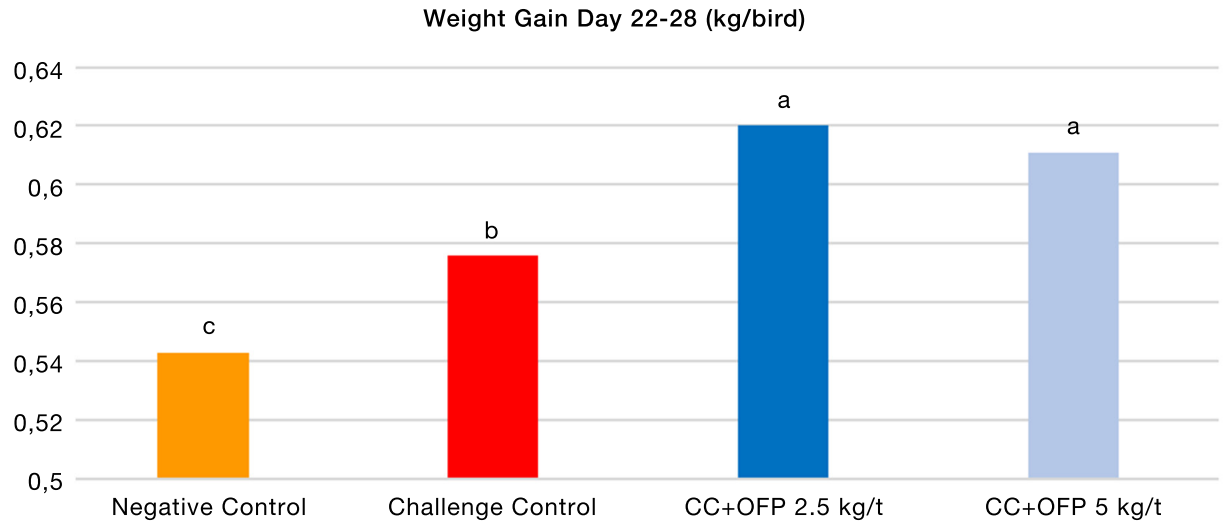

Figure 2. Weight gain and feed conversion ratio of broilers following a Necrotic Enteritis challenge
[abc]Values within the same row not sharing superscripts denote significance differences (P ≤ 0.05).
CC+OFP.2.5 kg/t, CC with 2.5 kg/tonne OceanFeed Poultry; CC+OFP 5 kg/t, CC with 5 kg/tonne OceanFeed Poultry;

birds supplemented with 2.5 kg/t OFP was significantly greater than those in the challenged control group. Feed intake was significantly greater in both OFP groups compared with the challenged control group. Feed conversion ratio in birds supplemented with 5 kg/t OFP was significantly lower than birds in the challenge control group, and was not significantly different compared with birds in the unchallenged control group.

The performance of the birds after the strong challenge (from day 22 to day 28 of the study) had subsided is shown in Figure 2. Birds supplemented with OFP demonstrated an enhanced recovery and compensatory growth following the challenge, with both the 2.5 kg/t and 5 kg/t supplemented birds having significantly higher weight gain compared with the negative control and challenge control groups. These results show that OceanFeed Poultry had a significant impact on minimising the negative consequences of Necrotic Enteritis, and demonstrate new mechanisms by which seaweed blends can support enhanced intestinal health in broilers.

SUMMARY

A considerable body of literature exists to demonstrate the range of bioactive compounds in seaweed, and their applications in animal feed. As strong evidence has accumulated in recent years for the prebiotic effects of seaweed polysaccharides, animal producers are realising the potential benefits of enhancing populations of beneficial gut bacteria on intestinal health and animal performance. Recent research conducted by Ocean Harvest Technology has demonstrated additional benefits beyond these prebiotic effects, mediated through agglomeration of pathogens in the intestinal tract, and possible stimulatory effects on the immune system.

About Dr. Ian Hutchinson

Dr. Ian Hutchinson is Technical Director at Ocean Harvest Technology, having previously worked for 9 years in the feed additives and premix industry. In his role as Technical Director, Ian is responsible for developing and driving the Ocean Harvest Technology's research and development agenda as well as customer technical support and product trials.

Better gut health for better returns: ENHANCING DAIRY PRODUCTION WITH POSTBIOTICS

Dr. David Harrington
Director of Product Management
nu.ance Biotechnology

Modern dairy production is facing a series of unprecedented challenges. Postbiotics are an emerging technology that offers a stable, quick and focused solution to help manage intestinal health in ruminants, improve performance and health and contribute to reducing their environmental footprint.

Modern livestock production is facing unprecedented challenges including disease outbreaks, restrictions on antibiotic usage, environmental volatility, economic pressure and increasing scrutiny for sustainability and environmental footprint. Ruminants themselves are methane producers, a gas which has a 28 times greater global warming potential than carbon dioxide, so balancing rumen health to help manage the environmental footprint is of increasing concern. Given the multitude of factors that can affect livestock production, maintaining a healthy digestive system and good gut health is essential for ruminants to both perform efficiently and minimize their environmental impact.

RUMINANT DIGESTIVE SYSTEM

Unlike monogastric animals, the ruminant digestive system is designed to ferment feedstuffs via its four-chambered stomach and generate energy precursors for use. However, in the young animal (pre-ruminant) the digestive system is simpler, and the rumen, reticulum and omasum are undeveloped until the switch from milk to solid feed. This typically creates a different focus for the management of intestinal health based on life stage. In the pre-ruminant the targets include improved early immune resilience, establishing a healthy lower gut microbiota and preparation of the developing stomach for fermentation. In the older animal, the focus tends to be maintenance of intestinal health and rumen function for efficient nutrient use and health status.

The management of ruminant intestinal health requires a multi-factorial approach using a range of tools including management, breeding, biosecurity, vaccination, nutrition and feed additives. Feed additives is a broad category and in the last few years, postbiotics have gained momentum as an additive of choice.

POSTBIOTICS – PRACTICALITY AND EFFICACY

Postbiotics are defined as 'a preparation of inanimate micro-organisms and/or their components that confers a health benefit on the target host' (Swanson *et al.,* 2020). The preparation can be metabolites alone or include the dead microorganisms or cellular fractions and can be based on eukaryotic, prokaryotic organisms, or both. Typical candidate microorganisms for the production of post biotics include yeast such as *Saccharomyces*, Bifidobacteria, lactic acid bacteria and fungi.

Postbiotics confer a number of benefits over other biotics such as pre- and postbiotics. Prebiotics are a feed source for bacteria and need to selectively stimulate the growth of beneficial bacteria. Probiotics need to become active in the intestinal tract and produce metabolites to exert their effect; this takes time. In the case of postbiotics, these limitations are reduced. Benefits of postbiotics include:

1. Fast acting - postbiotics already contain the active components for prebiotic and probiotic effects
2. Flexible targeting – by combining different starting microorganisms and growth conditions, the metabolite profile of the postbiotic can be tailored for more specific responses or focused on different livestock species
3. Safe – there are no live organisms in postbiotics and only recognised, safe organisms should be used for fermentation to avoid risk of toxins
4. Stable – since there are no live organisms, postbiotics have greater tolerance for different environmental, feed processing conditions or application routes as well as a longer shelf-life.

A fundamental step in the development of a postbiotic is the selection of the starting microorganism(s). What is the metabolite profile that is needed to deliver the response required in the animal? The screening profile can then be established to identify the best candidate, and production conditions tailored to maximize growth and metabolite yield whilst ensuring the starting organism is safe. Care needs to be taken with inactivation and purification to ensure the metabolite profile is not adversely affected.

POSTBIOTIC COMPOSITION AND ACTIVITY

The composition of a postbiotic depends on several factors including the starting microorganism, method of inactivation and purification. For example, the physical breakdown of yeast and bacteria will yield quite different cellular fractions e.g. mannan oligosaccharides and beta-glucans versus peptidoglycans (from gram positive bacteria), teichoic acids, and surface layer proteins. Positive effects of the cellular fractions on the host include immune modulation e.g. peptidoglycans from *Lactobacillus salivarius* acts on the IL-10 pathway to induce intestinal regulatory T-cells (Fernandez *et al.,* 2011) or S-layer proteins (SLPs) from *L. kefir* have been shown to inhibit Salmonella invasion in Caco-2/TC-7 cell lines (Golowczyc *et al.,* 2007).

Furthermore, while the metabolite profile from these organisms can differ, they can be broadly categorized as primary metabolites, such as amino acids, enzymes, vitamins, and organic acids, and secondary metabolites such as exopolysaccharides, alkaloids, terpenoids, peptides, and others. These secondary metabolites have a wide range of properties including antioxidant, immune response regulation, antimicrobial, nutritional and neural and hormonal regulation.

nu.biom – A POSTBIOTIC BUILT FOR INTESTINAL HEALTH

The nu.biom range of postbiotics (nu.ance biotechnology, Switzerland) was developed from the very beginning with a species specific, problem specific approach. Proprietary microbial strains were selected and screened using a combination of approaches including genomics, metabolomics and *in*

vitro assays to determine the optimum combination of organism for the target profile, intestinal microbial modulation for enhanced nutrient digestion. Further refinement via in vivo assays was then undertaken. A 3-stage manufacturing process including liquid and solid fermentation and purification is used to produce a unique postbiotic combination for ruminant intestinal health, nu.biom BOS.

POSTBIOTICS EFFECTS IN ADULT RUMINANT GUT HEALTH

The composition of ruminal microbiota can be influenced by bacterial postbiotics, leading to increases in cellulolytic bacteria with a contemporaneous increase in VFA (Izuddin *et al.*, 2019), although ruminal pH is less affected. The addition of postbiotics e.g. yeast-based, can help maintain rumen microbial communication during rumen challenge, for example during periods of ruminal acidosis (Guo *et al.*, 2024). Furthermore, reductions in levels of the shiga toxin producing *E. coli* in rumen fluid have been demonstrated following the application of postbiotics (Aditya *et al.,* 2022), indicating the importance of postbiotics as a tool in the One Health approach.

The inclusion of postbiotics in ruminant diets has demonstrated a number of benefits for intestinal health. Improved rumen structure such as increased rumen papillae allows for increased nutrient absorption and stimulates the production of SFCA which help enhance fermentation. In the lower gut, postbiotics support a balanced microbiota, helping to lower *Enterobacteriaceae* populations and stimulate mucosal immunity. Further benefits such as upregulation of tight junction proteins to improve intestinal integrity and upregulation of anti-inflammatory cytokines for immune modulation have also been shown. In dehorned calves, animals fed nu.biom BOS had 15% lower dehorning would scores while their inflammatory response to *E. coli* and Salmonella lipopolysaccharide was significantly lower than non-supplemented animals.

Udder health can also benefit from dietary supplementation with postbiotics. lactobacillus-based postbiotics, for example, have been shown to evoke a localised IL-8 response in the udder in response to *Streptococcus* infection and significantly reduce somatic cell counts (Mathur *et al.*, 2022). nu.biom BOS, has been shown to enrich the milk microbiota

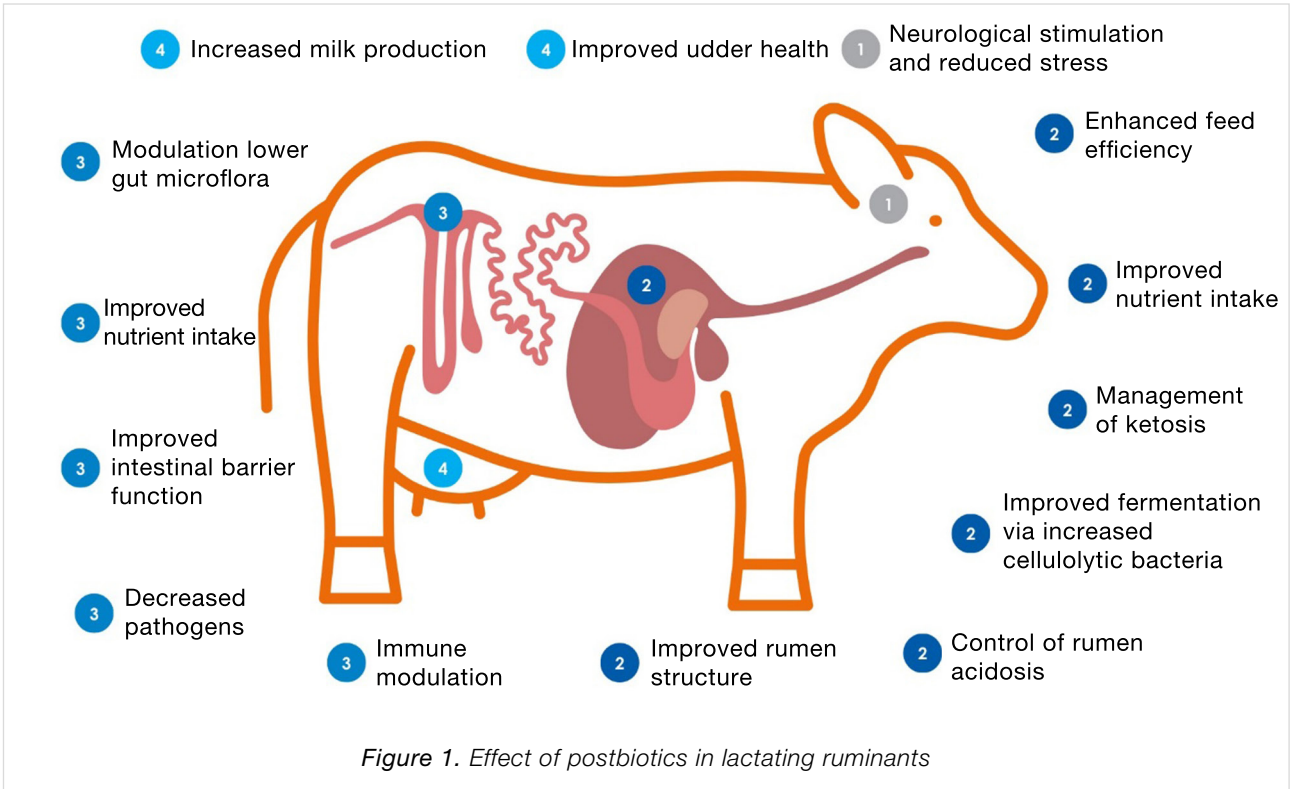

Figure 1. Effect of postbiotics in lactating ruminants

with higher levels of Lactobacilli and laboratory and field studies in lactating ruminants including cows, sheep and goats have all shown substantial reductions in somatic cell counts and improved udder health.

nu.biom BOS BOOSTS DAIRY PERFORMANCE

Milk production and quality is sensitive to intestinal health. Poor gut health leads to reduced efficiency of nutrient use and rumen imbalance resulting in poor performance, increased incidence of disease and potentially mortality. Efficient nutrient digestion is important to maintain gut microbial homeostasis and avoid conditions such as acidosis, hypoglycaemia or diarrhea. In a field study of 9 Italian dairy farms (average 320 cows/ farm), the supplementation of TMR with nu.biom BOS (6-10 g/ head/day) resulted in improved fibre digestion (Figure 2). In the laboratory, supplementation of dairy cow diets with nu.biom BOS has also been shown to significantly increase crude protein digestibility and neutral fibre digestibility (Vicente *et al.*, 2024).

In lactating goats, nu.biom BOS supplementation resulted in significantly lower methane output per kg of milk produced (14.3 versus 11.3 g/kg, control and nu.biom BOS, respectively), coinciding with a 21% increase in ruminal propionate suggesting an effect of nu.biom BOS on the ruminal microbiota and improved efficiency (Fernández *et al.*, 2023). Given methanogenic archaea use anywhere from 2-12% of gross dietary energy, modification of the ruminal microflora by nu.biom BOS helps to offset this potentially compromised feed efficiency.

Improved nutrient digestion was also associated with increased milk production observed across all 9 farms compared to the historical average (Figure 3).

Figure 2. Changes in faecal appearance before (left) and 2 weeks after (right) feeding nu.biom BOS

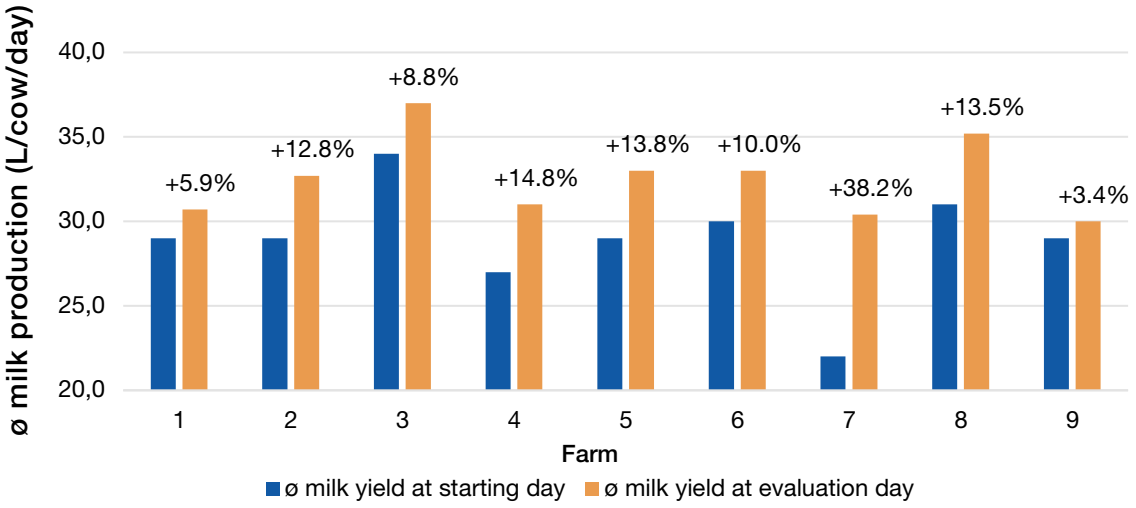

Figure 3. Average milk production at study start and end across 9 Italian dairy farms

Milk production increased from 1 to 8 litres/cow/day, with an average increase of 13.5% in a shorter interval (181 versus 195 days pre-nu.biom BOS). In a laboratory study using 12 Friesian dairy cows, animals fed nu.biom BOS (8 and15 g/cow/day, pre calving and calving, respectively) for 105 days had significantly increased milk production, kg fat/day and kg protein/day ($P<0.05$) versus controls (Vicente *et al.*, 2024).

SUMMARY

Modern dairy production is facing a series of unprecedented challenges and the scenario is unlikely to change anytime soon. Producers need to rely on a toolbox of approaches to help them maximize efficiencies and economic returns. Postbiotics are an emerging technology that offers a stable, quick and focused solution to help manage intestinal health in ruminants, improve performance and health and contribute to reducing their environmental footprint. nu.biom BOS is at the forefront of this technology, using proprietary strains and production techniques to develop species-specific and production-specific postbiotics to address the needs for the modern dairy farmer.

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About Dr. David Harrington

Dr. David Harrington is the Director of Product Management for nu.ance Biotechnology (Switzerland). He has over 25 years working in the animal health industry in the development and commercialisation of biologicals and feed additives for livestock.

MANAGE ENTERIC INFECTIONS TO IMPROVE THE HEALTH AND LIVABILITY OF PIGS

Dr. Lucas Rodrigues
Discovery Researcher - Swine
Zinpro Corporation

"If a pig is in a nutrient-compromised situation, pathogens will have more of an opportunity to do more damage to the gastrointestinal tract and cause leaky gut. Adding the right zinc to nursery diets, along with optimal sanitation practices is key to keeping a pig's immune system working, especially during weaning."

Weaning is one of the most stressful events for pigs in their lifetime and enteric infections are common challenges that arise during this phase of production. They are associated with the gut of a pig and the bacteria that cause enteric infections are often endemic, meaning that they are commonly found in a pig barn. This typical occurrence is largely due to the comingling of weaned nursery pigs from multiple sow farms, each with its own microenvironment.

In addition, in the first 72 hours post-weaning, pigs will experience stress from transportation, co-mingling and transitioning from a sow's milk to grain-based diets. Feed intake also takes time to ramp up post weaning. All these factors put pressure on the gut, creating the opportunity for pathogenic bacteria to establish, proliferate and cause challenges.

ENTERIC INFECTIONS HAVE A NEGATIVE IMPACT ON SWINE GUT HEALTH

Pathogenic bacteria such as *E. coli*, Lawsonia, dysentery and *salmonella* are common disease pressures during this critical time. Each bacteria impacts the gut in a variety of different ways. For example, *E. coli* will attack the tight junctions in the gut and cause a breakdown of the integrity of the intestinal barrier resulting in leaky gut, a condition that allows bacteria to pass from the intestinal tract into the circulatory system causing other infections.

Lawsonia, another bacteria, can cause hyperplasia, or a rapid increase in the number of enterocytes that line the villi of the gut. This leads to a thickening of the mucosal wall and results in the malabsorption of nutrients causing diarrhea and a weaker immune status.

MITIGATE ENTERIC INFECTIONS WITH SANITATION AND THE RIGHT ZINC

If a pig is in a nutrient-compromised situation, pathogens will have more of an opportunity to do more damage to the GI tract and cause leaky gut. Adding the right zinc to nursery diets, along with optimal sanitation practices is key to keeping a pig's immune system working, especially during weaning.

Feeding performance trace minerals such as Zinpro® zinc has been known to limit the impact enteric bacteria has on swine gut health by supporting gut integrity and immunity, resulting in less mortality.

Years of proven research has demonstrated that feeding Zinpro zinc helps weaned pigs mount a more robust immune response and recover from encountered challenges more quickly. Zinpro® Performance Minerals® can also help maintain feed intake during a disease challenge, which allows a pig to use more nutrients for its immune function and growth. Ensuring adequate feed intake will help maintain average daily gain and reach finishing body weight more efficiently and in fewer days to ensure optimal throughput and overall wellbeing.

However, we know that nutrition is only one piece of the puzzle. Another key factor to ensure nursery pigs have the best opportunity to thrive is by following proper sanitation procedures. Bacteria can be present in the barn environment and keeping pens clean can help minimize health challenges from enteric infections.

Remember to have procedures in place for all employees that state,

- Buildings should be thoroughly washed, disinfected and have adequate time to dry between fills.
- All fecal material and all organic matter on the slats are cleaned off.
- Feeders can also be a vehicle for enteric bacteria and they should be properly cleaned between fills as well.

About Dr. Lucas Rodrigues

Lucas Rodrigues received his DVM and MSc degrees from the Federal University of Minas Gerais (UFMG, Brazil) and completed his doctoral degree at the Prairie Swine Centre and the University of Saskatchewan in Canada. Rodrigues joined Zinpro Corporation in 2022 as a Discovery Researcher for Swine. His current role includes product development and support, directing and coordinating research studies and providing training for internal employees and external customers.

Wendeline Wouters, the Antioxidant Category Lead at Cargill Animal Nutrition and Health: "In terms of feed costs, a vitamin E supply disruption can – like we have seen recently – lead to skyrocketing prices. Because vitamin E is so important to managing the balance of oxidants and antioxidants in the body, farmers must either accept the high vitamin E prices or look to innovation to mitigate the rising costs."

BOOST ANTIOXIDANTS AND REDUCE FEED COSTS

Animal husbandry is competitive, and farmers are challenged to manage costs while maintaining high performance. The price volatility of feed ingredients, such as the important antioxidant vitamin E, pressures farmers and feed formulators to find cost-effective solutions without compromising animal health and performance. Cargill's Micronutrition and Health Solutions business supports farmers and feed formulators to overcome these challenges with its Proviox™ 50 solution – to combat oxidative stress and reduce feed costs.

We interviewed Wendeline Wouters, the Antioxidant Category Lead at Cargill Animal Nutrition and Health, to explore these challenges and find out how they can be turned into opportunities.

What is oxidative stress, and how does it challenge farmers and their animals?

Oxidation is a natural condition in the body where reactive oxygen species (ROS), also known as free radicals, are produced. These oxidants can be harmful to animals if present for too long or in high concentrations, in the form of oxidative stress. When an animal is under oxidative stress, ROS can react with its cells, such as immune or tissue cells, negatively impacting their function.

In farm animals, oxidative stress can be amplified by genetic and environmental factors. Genetically, animals selected for elevated metabolic rates and better performance are more prone to inflammation and oxidative stress. Environmentally, factors like higher population densities on farms, reduced med-

ication programs, and extreme weather contribute to increased oxidation. These conditions amplify oxidative stress and the production of oxidants.

To prevent harm, oxidants must be detoxified by antioxidants. If not managed, high concentrations or prolonged periods of oxidative stress can cause significant damage to the animal and a decrease in performance and product quality.

At Cargill's Micronutrition and Health Solutions (MHS), we have had great success mitigating this stress with our cost-efficient Proviox™ 50 solution.

What is Proviox™ 50, and how does it improve oxidative status and support animal performance during periods of increased stress?

To combat oxidative stress, antioxidants that neutralize ROS are essential. These antioxidants naturally occur in various components at different levels. We've developed Proviox™ 50 as a specific blend of plant-derived polyphenols with high antioxidant activity. This blend is specially selected for its components' ability to work synergistically, enhancing the overall antioxidant effect.

Proviox™ 50 neutralizes reactive oxidant species, improving oxidative status and supporting animal performance during stressful periods. By incorporating this blend into their feed formulations, animal farmers can effectively manage oxidative stress, supporting better health and performance for their animals.

Results from 100+ *in-vivo* trials across different species - swine, poultry, ruminant, and aqua - have demonstrated that Proviox™ 50 can help:

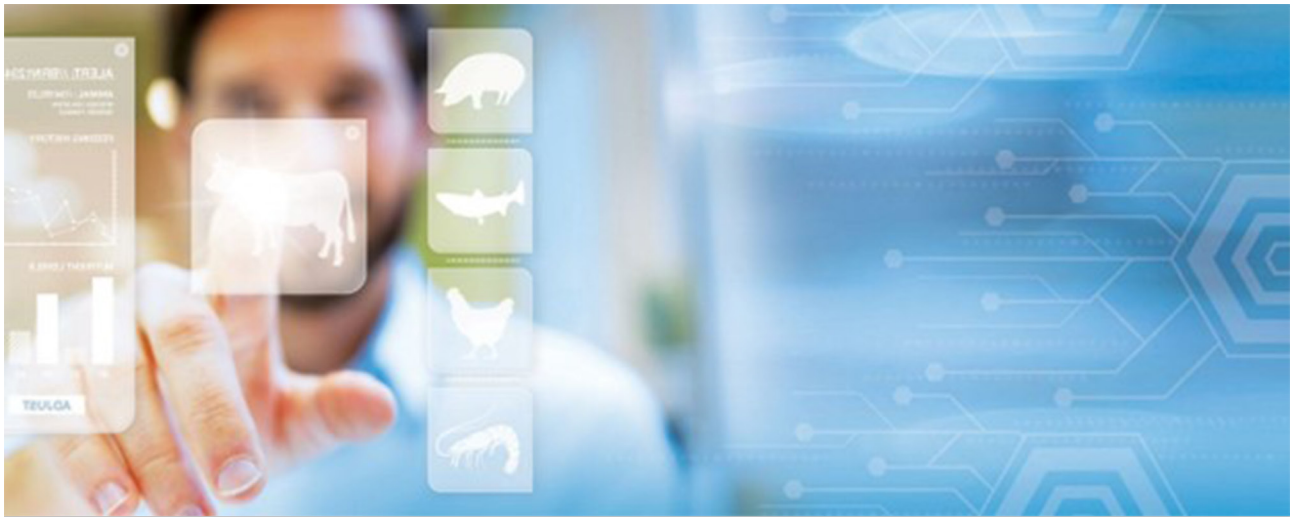
- Improve oxidative status and support performance during periods of stress.
- Reduce feed *cost* by reducing the level of vitamin E required in the diet.
- Support reproductive performance
- Support immunity

Proviox™ 50 supports animals throughout the whole lifecycle, especially during challenging production phases. It is safe, stable, and suitable for multiple species.

How does Proviox™ 50 help reduce feed costs by reducing the required levels of vitamin E in the diet?

Firstly, it is important to highlight the role of vitamin E in the feed formulation. Vitamin E acts as a free radical scavenger – in other words, it mitigates the negative impact of oxidation caused by stress. It is a vital part of many animal diets, and any supply disruptions can have a damaging effect on the industry.

In terms of feed costs, a vitamin E supply disruption can – like we have seen recently – lead to skyrocketing prices. Because vitamin E is so important to managing the balance of oxidants and antioxidants in the body, farmers must either accept the high vitamin E prices or look to innovation to mitigate the rising costs.



With Proviox™ 50, farmers and feed mills can replace up to 50% of the vitamin E in feed formulations. This is possible because scientifically proven blend of polyphenols in Proviox™ 50 supports the scavenging function and helps to regenerate vitamin E in the body, thus helping to protect the cells from free radical damage.

Using this broader blend of antioxidants means that we can reduce the vitamin E in the diet, which in turn reduces the formulation costs, **whilst maintaining performance**. These benefits are not only backed by science and proven by research, but we have had more than 10 years of success in the global market with Proviox™ 50.

The application of Proviox™ 50 is also precise. Our Proviox™ 50 calculator tool can determine the exact dosage rates for each species and takes account of multiple factors, such as vitamin E inclusion levels and feeding and growth phases.

How does this support reproduction across different species?

During reproductive stages, animals experience increased metabolic stress, which impacts their oxidative status. Proviox™ 50 helps support animals during gestation, promoting healthier, more resilient offspring and improved reproductive outcomes.

Is there anything you would like to add to readers out there who want to know more about how Cargill and Proviox™ 50 can help their operations?

Cargill's MHS can provide the right product at the right time, with the right amount. Our world-class, science-based portfolio, coupled with our nutritional and microbiome expertise, helps to optimize profitability and performance for our customers. This is supported by state-of-the-art R&D and manufacturing sites and the company's position as a global product leader with local customer intimacy.

Cargill's MHS, with its Proviox™ 50 solution, offers farmers and feed formulators a powerful tool to navigate the challenges of market volatility and increased oxidative stress. By supporting animal resilience capabilities and reducing feed costs, we help our customers thrive in a competitive and ever-changing market.

To the readers, please reach out to one of our experts if you want to learn more about how this can apply to your operations and benefit your animals. Our commercial and technical specialists are ready to provide detailed Proviox™ 50 trial data for each livestock species and comprehensive guidance on product usage across all systems.

About Wendeline Wouters

Wendeline Wouters, is Global Category Manager Antioxidants for Cargill Animal Nutrition division of Micronutrition and Health Solutions. She has a PhD from Wageningen University, in the Netherlands and extensive experience with science-based bioactive components at various globally operating companies for both human and animal nutrition. Areas of focus on bioactive components' in vitro and in vivo research, new product development and quality and technical and market applications.

THE RISE OF PHYTOGENIC FEED ADDITIVES IN ANIMAL NUTRITION

Christos Antipatis
Strategic Marketing & Technology Director for MHS
Cargill Animal Nutrition and Health

"Phytogenic and postbiotic feed additives have emerged as promising solutions, offering one effective way to support animal health and performance under good husbandry and farming conditions. Published research has shown that postbiotics, used as part of good on-farm conditions, may reduce the need for therapeutic interventions, as evidenced by studies in ruminants and poultry."

Growing consumer interest in functional foods, probiotics, and gut health has significantly influenced practices in the animal nutrition industry. In this dynamic landscape, Cargill has consistently paved the way with innovative solutions that support animal health and productivity. Consumers, farmers and pet-owners alike want to see a holistic approach to animal health and welfare, demanding high-quality, functional solutions.

Meeting this demand, Cargill recently launched its Micronutrition and Health Solutions (MHS) portfolio, applying a holistic approach to animal nutrition going beyond just feed additives and considering all microelements impacting animal diets. Through our broad portfolio and deep expertise, we offer many solutions, such as phytogenic and postbiotic feed additives, that respond both to farmers' expectations for animal performance and welfare as well as consumers' demands. MHS combines our nutritional science, research, and innovation capabilities to maximize productivity and support the digestive function and nutrient utilization of the animal.

THE IMPACT OF THE "FUNCTIONAL FOODS" TREND ON ANIMAL NUTRITION

This growing consumer interest in functional foods and gut health is influencing consumer purchasing decisions and production practices in the animal nutrition industry. For example, the growing humanization of our pets has big implications for pet food manufacturers, with pet parents actively seeking out the latest nutritional solutions for gut health to meet their pets' changing needs. Interest in animal well-being is driving an interest in immune-support products. Cargill's MHS portfolio of feed additive solutions, along with a long history of product application expertise, makes us well-positioned to provide unique solutions that bridge the functional foods trend between humans and animal.

Phytogenic and postbiotic feed additives respond both to farmers' expectations for animal performance and health, and to consumers' demands. For example, recent clinical research evidence from our Epicor ™ portfolio highlights the efficacy of postbiotics in supporting gut health function in both humans and companion animals.

In addition, phytogenics help animals eat more, which can support carcass weight and breast meat yield. Therefore, they have high growth potential as a component of healthy animal feed and constitute an extremely attractive area for investment.

Feed additives, such as postbiotics, can play a crucial role in supporting our animals' health.

Phytogenic additives offer a wide range of beneficial effects that enhance animal performance and welfare. Postbiotics support multiple species for gut integrity, volatile fatty acid profiles and immune function.

CONTRIBUTIONS TO ANTIBIOTIC USE REDUCTION

The European Union's ban on antibiotic growth promoters in 2006, followed by similar actions in other countries, has increased the focus on nutritional strategies and in particular on feed additives as a way of supporting health and performance and reducing reliance upon antibiotics. Phytogenic and postbiotic feed additives have emerged as promising solutions, offering one effective way to support animal health and performance under good husbandry and farming conditions. Published research has shown that postbiotics, used as part of good on-farm conditions, may reduce the need for therapeutic interventions, as evidenced by studies in ruminants and poultry. For example, postbiotic have demonstrated improvements in the average daily gain for steers and feed efficiency but without an increase in detectable antimicrobial resistance when compared with those fed the antibiotic.

Our focus on the Microverse has enabled us to accelerate our innovation pipeline with both new postbiotics and phytogenic solutions, leveraging interactions between very specific postbiotics and phytogenics to help address key customer unmet needs: zero nutrient waste, reducing livestock emissions, reducing antibiotic or ionophores usage, supporting immunity, and alternatives to zinc oxide, to name a few. Through in-house developments, partnerships like the one with BASF in enzymes, and mergers and acquisitions, we aim to strengthen our portfolio in existing product categories, as well as develop new and emerging offerings to meet evolving customer needs.

Phytogenic and other feed additives can help to significantly enhance animal performance. Studies have shown that phytogenic combinations improve feed digestibility, increase enzyme production, and provide antioxidant effects, leading to better

performance in poultry and other animals. In a large meta-analysis of published research, postbiotic inclusion in the diets of dairy cattle showed improvements in milk yield, milk fat and protein yields and dry matter intake.

In poultry, postbiotics have been shown to support gut morphology, intestinal barrier function, microbiome balance and immune status, reduced stress responses, and other functions translating into performance benefits including, but not limited to, higher egg production, improved hatchability, improved bodyweights, meat yields and egg quality. In multiple species, postbiotics have demonstrated the ability to support animals with stress responses to heat, exercise, transport and other stimuli, aiding in their ability to maintain performance in response to suboptimal conditions.

It's clear that additives can play a significant role in contributing to maintaining the health status of animals, making them more resilient and, as a result, helping to support a reduction in the use of antibiotics.

LOOKING TO THE FUTURE

Our customers face increased complexity as they balance animal health and welfare, performance, and business economics while meeting consumer preferences. Cargill's expertise in phytogenic, postbiotic and plant-based feed solutions applied through a holistic approach to animal nutrition means that we can consider all microelements impacting animal diets, providing tailored customer solutions.

By leveraging our capabilities in sourcing, formulating, application and innovation, we continue to lead the industry in providing effective solutions. As consumer trends and regulatory landscapes evolve, Cargill remains dedicated to promoting the health and well-being of animals and consumers alike.

About Christos Antipatis

Christos Antipatis is the Global SMT Director Micronutrition and Health Solutions (MHS) for Cargill Animal Nutrition and Health, responsible for managing the additives portfolio, leading innovation, and building strategic partnerships. He joined Cargill in 2016 and previously held global and regional roles in strategic and commercial marketing at DSM Nutritional Products for around 15 years.

Antipatis holds a degree in agricultural engineering from the Agricultural University of Athens, a master's in animal nutrition, and a PhD from the University of Aberdeen. He also conducted research at the Rowett Research Institute.

TAIL BITING IN PIGS: PREVENTION STRATEGIES

Dr. Ian Hands
Director Swine Key Accounts
Techna

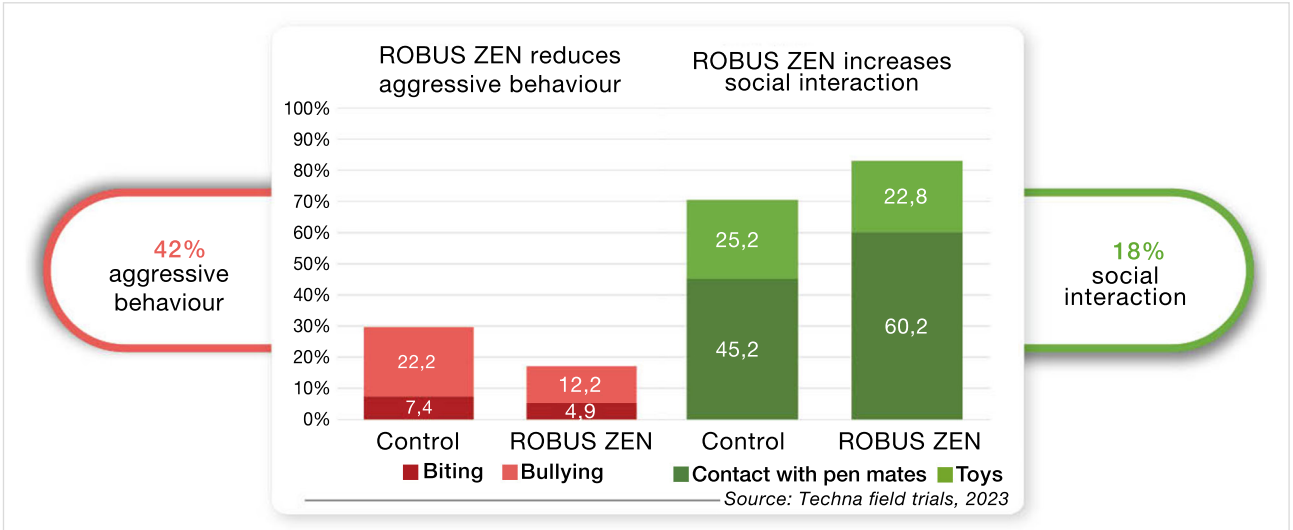
"Techna is pleased to announce the arrival of ROBUS ZEN, an in-feed botanical based additive, with carefully chosen ingredients known for their mode of action in inhibiting various stress activated pathways in the central nervous system and promoting the production of serotonin. In addition, ROBUS ZEN contains digestive enhancers to support performance."

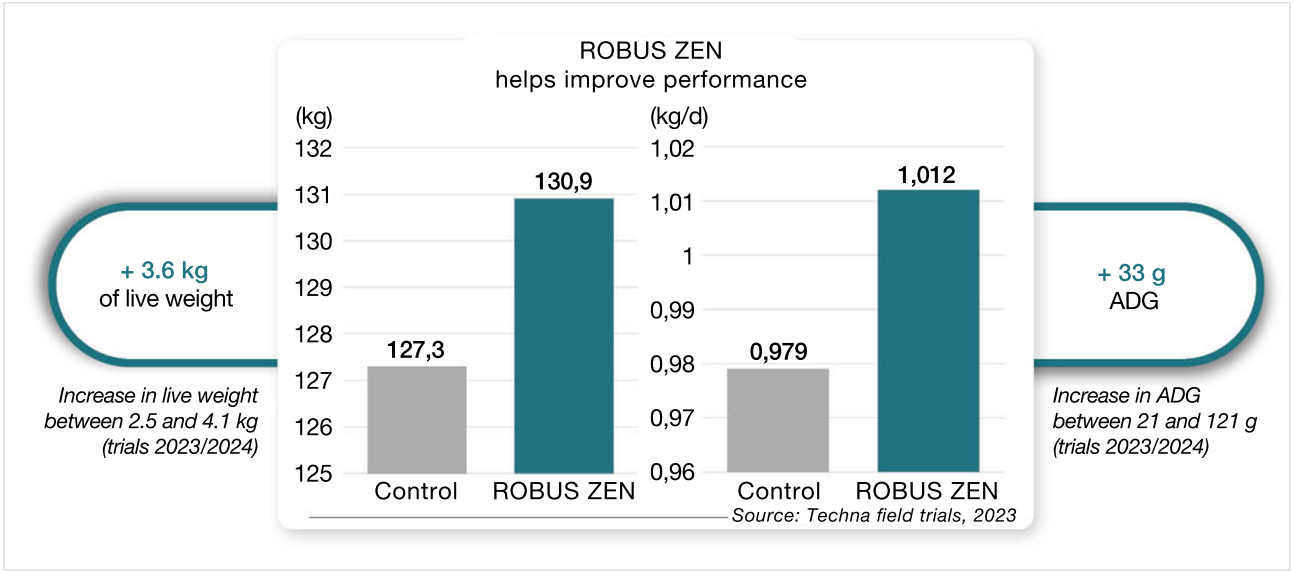
With a desire from many high welfare producers to be able to successfully produce pigs with long tails in a consistent and predictable production system, the control of tail biting is of importance. The cause of this vice can be multifactorial, including overcrowding, ventilation, poor health and nutrition, genetic factors, boredom, and social hierarchy, to name but a few. It is often difficult to pinpoint why an episode of tail biting occurs.

Control strategies vary, depending on the cause, such as providing enrichment and adequate space, altering the nutritional balance, early detection of the problem and the removal of the aggressor(s). Tail docking has also traditionally been commonplace, although there needs to be a good reason related to piglet welfare to employ it and this practice continues to come under scrutiny.

ROBUS ZEN: A NATURAL SOLUTION TO REDUCE AGGRESSION IN PIGS

Techna is pleased to announce the arrival of





ROBUS ZEN, an in-feed botanical based additive, with carefully chosen ingredients known for their mode of action in inhibiting various stress activated pathways in the central nervous system and promoting the production of serotonin. In addition, ROBUS ZEN contains digestive enhancers to support performance.

Results under real conditions: Going head-to-head with a competing additive, ROBUS ZEN was recently trialled against an alternative feed additive marketed for decreasing aggression (Product B) in an indoor slatted all-in-all-out finishing unit (40kg to 120kg) in Northern England. The pigs were from an extremely aggressive source known for tail biting.

The pigs were separated into two trial groups of 1,800 each, within identical conditions and fed the same diets. ROBUS ZEN was incorporated at a rate of 1kg/T, with Product B added at 4kg/T. In every parameter measured, ROBUS ZEN outperformed Product B. The majority of mortality was due to aggression or euthanasia, with Product B at 6.4% and ROBUS ZEN at 2.8%. ROBUS ZEN pigs were nine days faster to slaughter gaining an extra 1.5kg liveweight, with a feed saving of £3.33/pig compared to Product B. In addition, there was a saving of £1.20/pig in the ROBUS ZEN group due to less condemnation, grading and probe when compared to Product B.

In another recent trial carried out at an indoor slatted all-in-all-out finisher facility (35kg to 130kg) in Ireland, ROBUS ZEN was trialled against a control. The source of pigs was not known for aggression, so the objective was to assess performance under normal conditions. The trial consisted of 2 groups of pigs (32 pens x 27 pigs in each group), side by side, with the only difference being the addition of 1kg/T ROBUS ZEN to one of the groups. Whilst the control group performed very well with an ADG of 1124g/day, the ROBUS ZEN group gained an additional 21g/day but with an FCR saving of 0.14 compared to the control (2.25 control, 2.14 ROBUS ZEN).

USING ROBUS ZEN FOR ETHICAL AND HIGH-PERFORMANCE PIG PRODUCTION

Producers are using ROBUS ZEN in different ways, according to when the expected stress insult is. This can vary from including it in the grower and finisher diets, or around time of movement of pigs to different buildings or at mixing. Of course, it is far better to prevent an outbreak of aggression rather than having to react to it once it starts.

ROBUS ZEN is widely available across the UK and Ireland and is being used to control aggression in all categories of pigs, including sows, aggressive gilts, nursery and grow-finish pigs.

About Dr. Ian Hands

Dr. Ian Hands is a veterinarian who has spent his entire career in the global swine industry. His work at Techna focuses on bringing innovative solutions, such as feed additives, to enhance the nutrition, health, performance and welfare of the pig. Driven by a passion to support the industry, Dr. Hands combines scientific research with practical applications to ensure a return on investment for producers and stakeholders

Feedia
For Feed Industry since 1964

ROBUS ZEN

REDUCES NERVOUSNESS
AND IMPROVES PERFORMANCE

ROBUS ZEN, BENEFITS FOR THE ANIMAL AND THE BREEDER

- Calming animals during periods of stress.
- Reduced aggressive behaviour in favour of social interaction with their pen mates.
- Improved performance (ADG, FCR, live weight and carcass weight).
- Nutritional support for animal welfare (intact tail, entire male, etc.).

TECHNA
Smart Feed & Good Health

THE COMBINATION FOR A SUCCESSFUL TRANSITION

By Balchem Animal Nutriton & Health

With the recent withdrawal of Kexxtone from the European market, dairy farmers are seeking new solutions for managing the challenging transition period of dairy cows. ReaShure®-XC *Precision Release Choline* and NiaShure™ *Precision Release Niacin* offer an innovative and comprehensive approach to improving cow health, increasing milk production, and promoting calf health and productivity. Both products can help support transition cow health, resulting in a significant return on investment for dairy farmers.

BENEFITS OF REASHURE®-XC *PRECISION RELEASE CHOLINE*

• **Increased Milk Production:** Supplementing cows with ReaShure-XC during late gestation and early lactation has been shown to increase milk production throughout the entire lactation period.

• **Reduced Metabolic Disorders:** Supplemental ReaShure-XC has been shown to help reduce the incidence of metabolic disorders, enhancing overall cow health during the transition period.

• **Improved Liver Health:** ReaShure-XC helps to improve liver function, reducing the risk of fatty liver disease and promoting better fat mobilization.

• ***In Utero* Programming:** Supplemental ReaShure-XC helps promote *in utero* programming through DNA methylation, contributing to healthier and more productive calves.

• **Improved Colostrum Quantity:** Cows supplemented with ReaShure-XC produce more colostrum, essential for neonatal calf health.

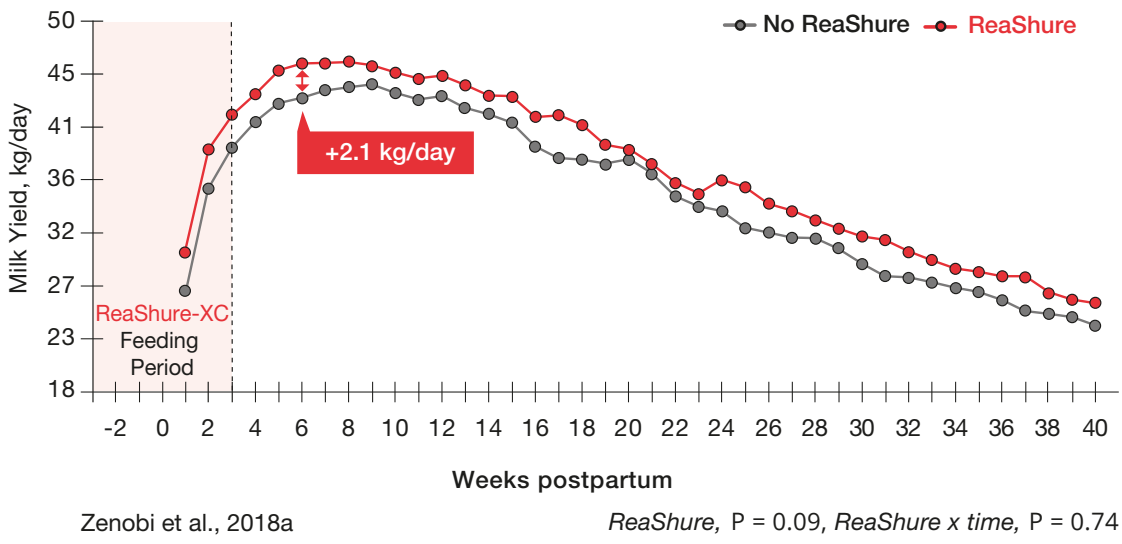


Figure 1. Effect of feeding ReaShure during the transition period on milk production over the full lactation

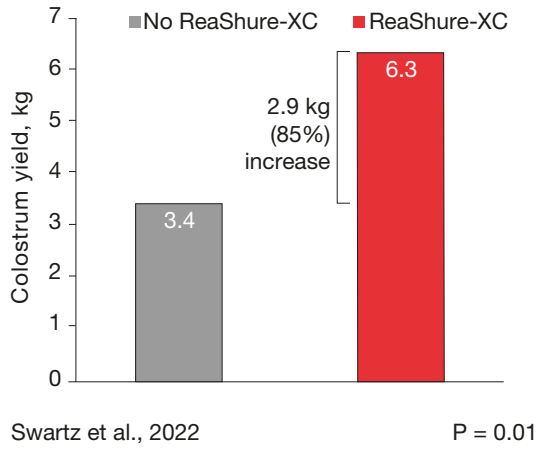


Figure 2. Effect of ReaShure-XC supplementation on colostrum yield

BENEFITS OF NIASHURE™ *PRECISION RELEASE NIACIN*

• **Control NEFA Mobilization:** Including NiaShure in the diet of over-conditioned cows helps control the mobilization of non-esterified fatty acids (NEFA), preventing harmful spikes.

• **Reduced Ketosis:** By lowering blood NEFA levels, NiaShure helps reduce the incidence of ketosis and other metabolic disorders associated with transitioning cows. Research at the University of Wisconsin (Yuan et al., 2021) demonstrated a significant reduction in blood NEFA when NiaShure was fed to lactating dairy cows. Lowering blood NEFA levels can reduce the incidence of ketosis and associated transition cow metabolic disorders.

• **Improved Metabolic Health:** NiaShure enhances overall metabolic efficiency, contributing to better cow health during the critical transition period.

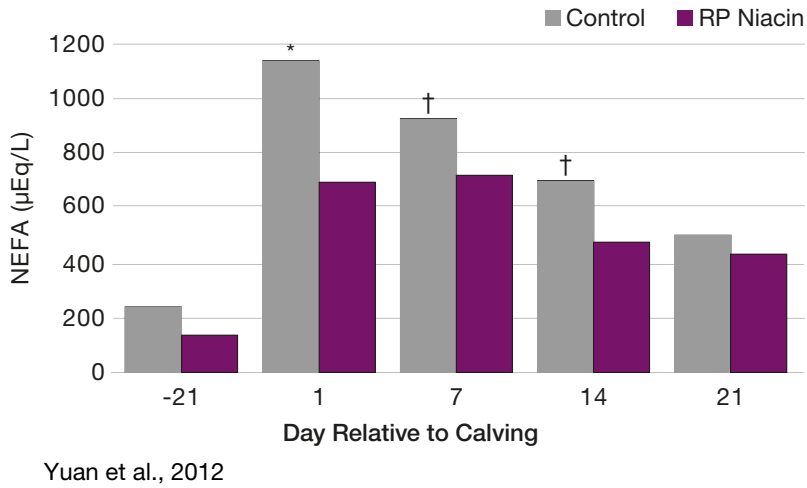


*Figure 3. Nefa plasma levels in cows supplemented with NiaShure. **Indicates difference (P< 0.01) between treatments; †indicates a tendency for a treatment effect (P< 0.10). Time (P< 0.01) and treatment × time interaction (P< 0.05); SEM= 113 µEq/L.*

Kexxtone Alternative*

ReaShure-XC and NiaShure represent an advanced and comprehensive non-antibiotic, nutritional alternative* to Kexxtone by helping lower blood NEFA levels associated with ketosis to support overall health, increased milk production, healthier and more productive calves, and improved colostrum yields.

WHY CHOOSE REASHURE-XC AND NIASHURE?

• **Proven Performance:** Balchem delivers proven performance backed by decades of success. With over 50 peer-reviewed papers, our products are some of the most extensively researched in the industry.

• **Balchem's X-Technology:** It provides the optimal combination of feed stability, rumen stability and intestinal release to deliver the most effective products on the market.

• **Real Results:** In the end, it all comes down to results. We deliver real results you can count on, results that exceed your expectations and deliver value to your bottom line. Set your cows up for a smooth transition and successful lactation with ReaShure-XC and NiaShure.

References

**ReaShure-XC and NiaShure are a nutritive alternative to antibiotics.*

SUSTAINABLE LIVESTOCK FARMING: PROGRESS SINCE 1950

Ilinca Anghelescu
Global Director, Marketing Communications
EW Nutrition

"The global population increased by approximately 220%, from 2.5 billion in 1950 to 8 billion in 2023. In the meantime, estimates suggest that, in the 1950s, agri-food systems were responsible for approximately 2-3 billion metric tons of CO_2-equivalent (CO_2e) emissions per year. This figure includes emissions from livestock, rice paddies, fertilizer use, and land-use change (e.g., deforestation for agriculture)."

As the global demand for animal products continues to rise, so do various claims about the impact of agriculture on greenhouse gas emissions. A study commissioned by the United Nations' Food and Agriculture Organization (FAO) concluded that, according to the most recent data, agri-food system emissions totaled 16.5 billion metric tons of CO_2 equivalent, representing 31% of global anthropogenic emissions.

Of these 31%, the most important trend highlighted by FAO was the "increasingly important role of food-related emissions generated outside of agricultural land, in pre- and post-production processes along food supply chains". The food supply chain (food processing, packaging, transport, household consumption and waste disposal) is thus set to become the top GHG emitter, above farming and land use.

HOW BAD IS 31%?

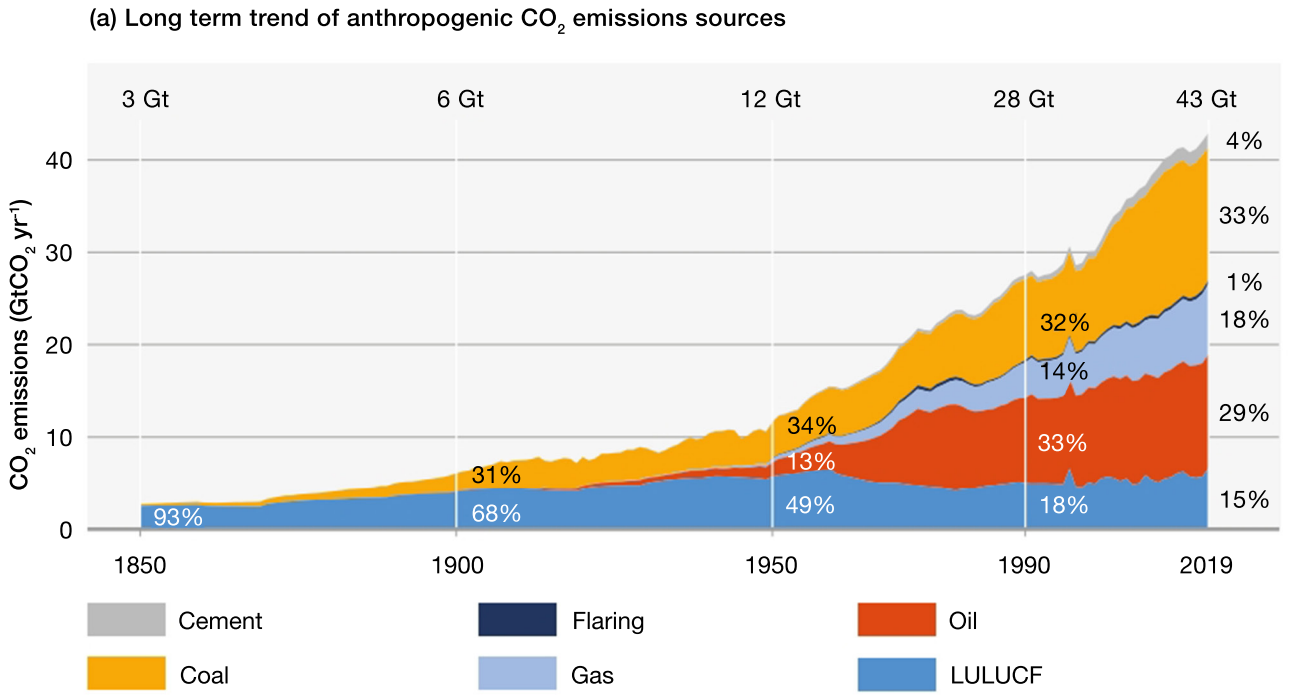
While 31% is a large figure, even this estimate represents a significant decrease from the 1950s, when agri-food emissions constituted approximately 58% of total anthropogenic emissions: "From 1850 until around 1950, anthropogenic CO_2 emissions were mainly (>50%) from land use, land-use change and forestry", states the latest IPCC report.

As the IPCC graph in Figure 1 indicates, the percentage decrease is mostly due to the rising prevalence of oil and coal in CO_2 emissions over the recent decades, as shown in Figure 2.

TOTAL POPULATION AND AGRI-FOOD EMISSION CHANGES, 1950 – TODAY

The global population increased by approximately 220%, from 2.5 billion in 1950 to 8 billion in 2023. In the meantime, estimates suggest that, in the 1950s, agri-food systems were responsible for approximately 2-3 billion metric tons of CO_2-equivalent (CO_2e) emissions per year. This figure includes emissions from livestock, rice paddies, fertilizer use, and land-use change (e.g., deforestation for agriculture).

Assessments generally agree that today's agri-food systems contribute approximately 9-10 billion metric tons of CO_2e annually, a threefold



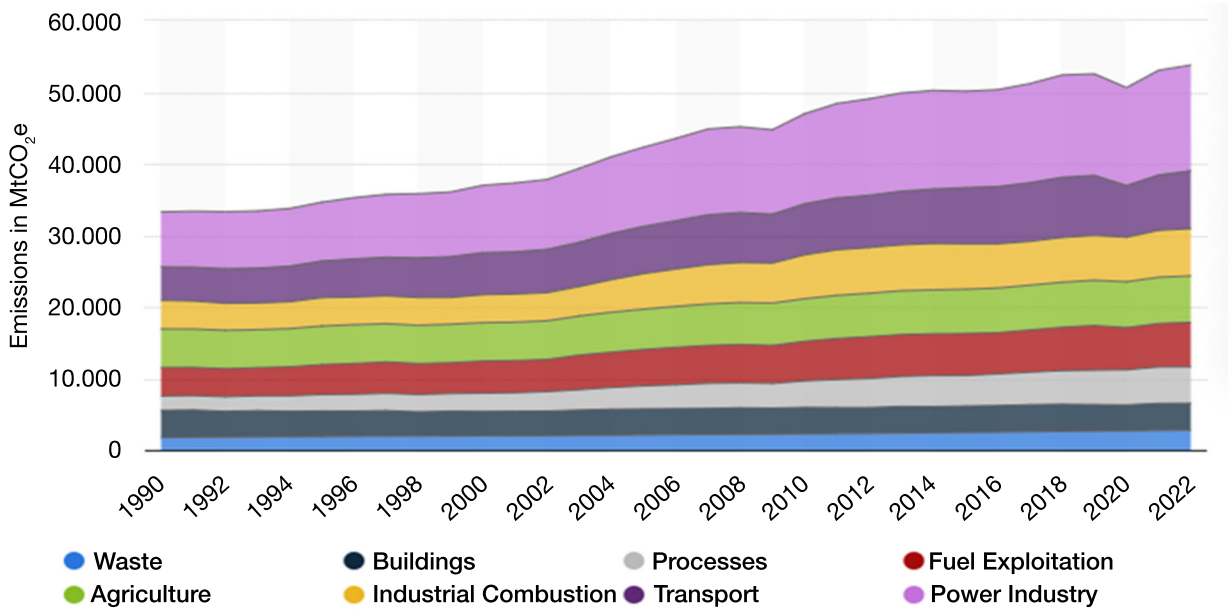
Source: IPCC AR6 Report, 2023. LULUCF = Land Use, Land-Use Change and Forestry

Figure 1.

increase from 1950. This includes emissions from agriculture (e.g., livestock, crop production), food processing, transportation, and land-use changes. This increase is consistent with FAO's new findings, of food chain climbing to the top of agri-food emitters.

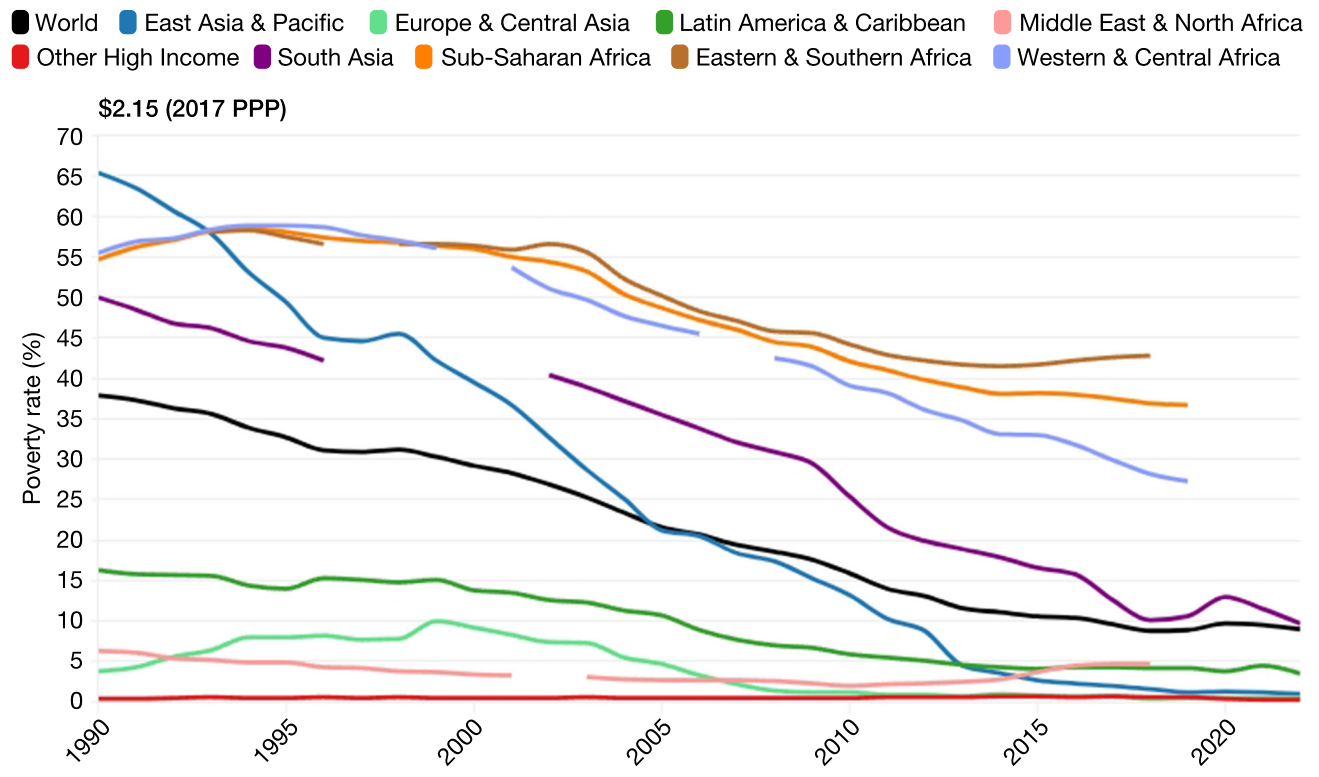
BUT WHERE DID THESE INCREASED EMISSIONS COME FROM?

A look at the graph below gives us an indication: world poverty rate decreased massively between 1950 and today. While COVID brought a setback, the historical data would clearly indicate a correla-



Annual greenhouse gas (GHG) emissions worldwide from 1990 to 2022, by sector (in million metric tons of carbon dioxide equivalent) - Source: Statista

Figure 2.



Source: Poverty and Inequality Platform
Note: Poverty estimates are reported only for years with sufficent survey data coverage.

WORLD BANK GROUP

Source: World Bank

Figure 3.

tion between the increased output in agri-food systems and the decreased rate of poverty.

How did poverty rates decline so steeply? The reasons lie, to a large extent, in technological innovation, especially in genetics and farm management, and in the increased apport of plentiful and affordable meat protein to the world. The numbers below build an image of an industry that produces better, more, and cheaper.

GLOBAL MEAT PRODUCTION: 1950 VS. PRESENT

Then…

In 1950, the estimated total meat production was of approximately **45 million metric tons.**

Key Producers: The United States, Europe, and the Soviet Union were the primary producers of meat.

Types of Meat: Production was largely dominated by beef and pork, with poultry being less significant.

…and now

Now, the total meat production lies somewhere around **357 million metric tons** (as of recent data from FAO)., representing a 53% increase from 2000 and a staggering 690% increase from 1950.

Key Producers: Major producers include China, the United States, Brazil, and the European Union.

Types of Meat: Significant increases in poultry production, with pork remaining a leading source of meat, especially in Asia. Beef production has also increased, but at a slower rate than poultry and pork.

FACTORS CONTRIBUTING TO INCREASED MEAT PRODUCTION

Population Growth: The world population has grown from approximately 2.5 billion in 1950 to over 8 billion today, driving increased demand for meat.

Economic Growth and Urbanization: Rising incomes and urbanization have led to shifts in economic power and dietary preferences, with more

people consuming higher quantities of meat, especially in developing countries.

Technological Advancements: Improvements in animal breeding, feed efficiency, and production systems have increased the efficiency and output of meat production.

Intensification of Livestock Production: The shift from extensive to intensive livestock production systems has allowed for higher meat yields per animal.

Global Trade: Expansion of global trade in meat and meat products has facilitated the growth of production in countries with comparative advantages in livestock farming.

LIVESTOCK YIELD INCREASE, 1950 TO THE PRESENT

The increase in livestock yield for cattle, pigs, and chickens between 1950 and the present has been significant due to advances in breeding, nutrition, management practices, and technology.

BEEF

1950s

- **Average Carcass Weight:** In the 1950s, the average carcass weight of beef cattle was about 200 to 250 kilograms (440 to 550 pounds).
- **Dressing Percentage:** The dressing percentage (the proportion of live weight that becomes carcass) was typically around 50-55%.

Present Day

- **Average Carcass Weight:** Today, the average carcass weight of beef cattle is approximately 300 to 400 kilograms (660 to 880 pounds).
- **Dressing Percentage:** The dressing percentage has improved to about 60-65%.

Increase in Beef Cattle Yield

- **Increase in Carcass Weight:** The average carcass weight has increased by about 100 to 150 kilograms (220 to 330 pounds) per animal.
- **Improved Dressing Percentage:** The dressing percentage has increased by about 5-10 percentage points, meaning a greater proportion of the live weight is converted into meat.

DAIRY

1950s

- **Average Milk Yield per Cow:** Approximately 2,000 to 3,000 liters per year, depending on the region.

Present Day

- **Average Milk Yield per Cow:** Approximately 8,000 to 10,000 liters per year globally, with some countries like the United States achieving even higher averages of 10,000 to 12,000 liters per year.

Increase in Milk Yield: Milk yield per cow has increased about 4-5 times due to genetic selection, improved nutrition, technological advancements, and better herd management.

CHICKENS (LAYERS)

1950s

- **Average Egg Production per Hen:** In the 1950s, a typical laying hen produced about 150 to 200 eggs per year.

Present Day

- **Average Egg Production per Hen:** Today, a typical laying hen produces approximately 280 to 320 eggs per year, with some high-performing breeds producing even more.

Increase in Egg Yield: The average egg production per hen has increased by approximately 130 to 170 eggs per year.

CHICKENS (BROILERS)

1950s

• **Average Yield per Bird:** In the 1950s, broiler chickens typically reached a market weight of about 1.5 to 2 kilograms (3.3 to 4.4 pounds) over a growth period of 10 to 12 weeks.

Present Day

• **Average Yield per Bird:** Today, broiler chickens reach a market weight of about 2.5 to 3 kilograms (5.5 to 6.6 pounds) in just 5 to 7 weeks.

Increase in Yield: The average weight of a broiler chicken has increased by approximately 1 to 1.5 kilograms (2.2 to 3.3 pounds) per bird. Additionally, the time to reach market weight has been nearly halved.

FACTORS CONTRIBUTING TO YIELD INCREASES

Genetic Improvement:

• **Selective Breeding:** Focused breeding programs have developed chicken strains with rapid growth rates and high feed efficiency, significantly increasing meat yield.

Nutrition:

• **Optimized Feed:** Advances in poultry nutrition have led to feed formulations that promote faster growth and better health, using balanced diets rich in energy, protein, and essential nutrients.

Management Practices:

• **Housing and Environment:** Improved housing conditions, including temperature and humidity control, have reduced stress and disease, enhancing growth rates.

Technological Advancements:

• **Automation:** Automation in feeding, watering, and waste management has improved efficiency and bird health.

• **Health Monitoring:** Advances in health monitoring and veterinary care have reduced mortality rates and supported faster growth.

Feed Conversion Efficiency:

• **Improved Feed Conversion Ratios (FCR):** The amount of feed required to produce a unit of meat has decreased significantly, making production more efficient.

WHY FEED CONVERSION RATIO IS A SUSTAINABILITY METRIC

Feed Conversion Ratio (FCR) is a critical metric in livestock production that measures the efficiency with which animals convert feed into body mass. It is expressed as the amount of feed required to produce a unit of meat, milk, or eggs. Advances in nutrition and precision feeding allow producers to tailor diets that optimize FCR, reducing waste and improving nutrient uptake. Also, breeding programs focused on improving FCR can lead to livestock that naturally convert feed more efficiently, supporting long-term sustainability.

Poultry (Broilers): From the 1950s, improved from approximately 4.75 kg/kg to 1.7 kg/kg.

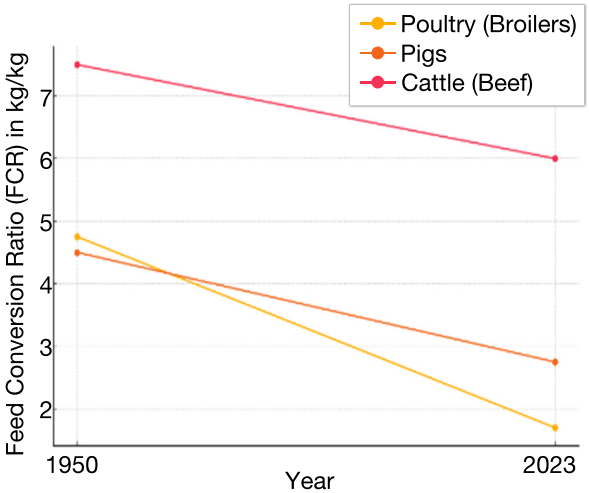
Pigs: From the 1950s, improved from about **4.5 kg/kg** to 2.75 kg/kg.

Cattle (Beef): From the 1950s, improved from around 7.5 kg/kg to 6.0 kg/kg.

FCR is crucial for livestock sustainability for several reasons, as shown below.

1. Resource efficiency

• **Feed Costs:** Feed is one of the largest operational



Evolution of FCR from 1950

Figure 4.

costs in livestock production. A lower FCR means less feed is needed to produce the same amount of animal product, reducing costs and improving profitability.

• **Land Use:** Efficient feed conversion reduces the demand for land needed to grow feed crops, helping to preserve natural ecosystems and decrease deforestation pressures.

• **Water Use:** Producing less feed per unit of animal product reduces the water needed for crop irrigation, which is crucial in regions facing water scarcity.

2. Environmental impact

• **Greenhouse Gas Emissions:** Livestock production is a significant source of greenhouse gases (GHGs), particularly methane from ruminants and nitrous oxide from manure management. Improved FCR means fewer animals are needed to meet production goals, reducing total emissions.

• **Nutrient Runoff:** Efficient feed use minimizes excess nutrients that can lead to water pollution through runoff and eutrophication of aquatic ecosystems.

3. Animal welfare

• **Health and Growth:** Optimizing FCR often involves improving animal health and growth rates, which can lead to better welfare outcomes. Healthy animals grow more efficiently and are less susceptible to disease.

4. Economic viability

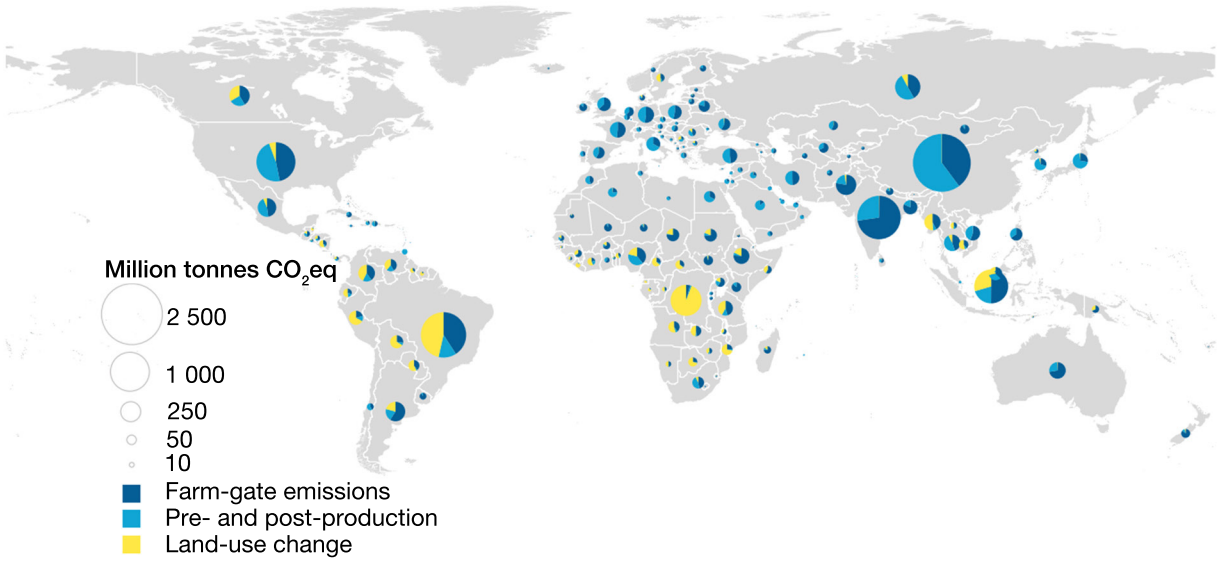
• **Competitiveness:** Lowering FCR improves the economic viability of livestock operations by reducing input costs and increasing competitiveness in the global market.

• **Food Security:** Efficient livestock systems contribute to food security by maximizing the output of animal protein relative to the input of resources.

Improving FCR is essential for achieving sustainability in livestock production. It leads to more efficient resource use, reduced environmental impact, enhanced economic viability, and supports the well-being of animals. As global demand for animal products continues to rise, optimizing FCR will be crucial in balancing production with the need to protect and preserve natural resources.

LIVESTOCK EMISSIONS

Livestock emissions can be direct (farm-gate) or indirect (land use). Pre- and post-production emissions are considered separately, since they refer to emissions from manufacturing, processing, packaging, transport, retail, household consumption, and waste disposal.

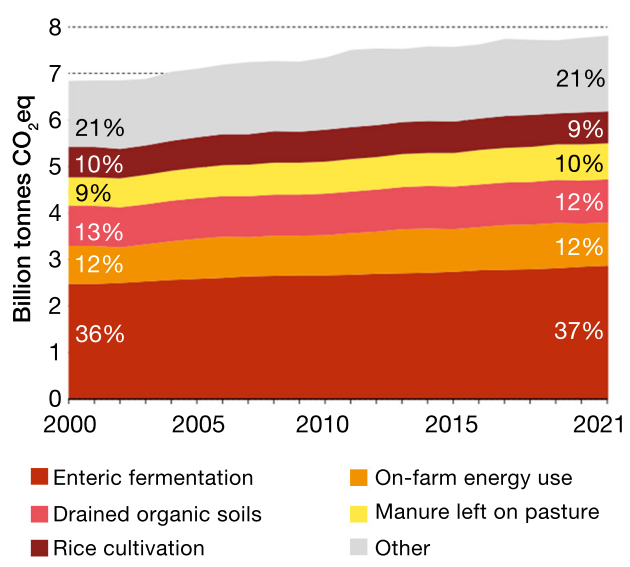


Source: FAO

Figure 5.

FARM-GATE EMISSIONS

Global farm-gate emissions (related to the production of crops and livestock) grew by 14% between 2000 and 2021, to 7.8 Gt CO_2 eq, see below. 53% come from livestock-related activities, and the emissions from enteric fermentation generated in the digestive system of ruminant livestock were alone responsible for 37 percent of agricultural emissions (FAOSTAT 2023).



Note: Percentages on the figure indicare the shares in the total; they may noy tally due to rounding.
Source: FAO 2023. Emissions totals. In: *FAOSTAT*. Rome. [Cited October 2023.]

Source: FAO

Figure 6.

LAND USE FOR LIVESTOCK

Land use emissions contribute a large share to agricultural emissions overall, especially through deforestation (~74% of land-use GHG emissions). The numbers have declined in recent years, to a total of 21% reduction between 2000 and 2018. The other side of the coin is represented by the increased land usage for livestock, either directly for grazing or indirectly for feed crops.

1. Pasture and grazing land

1950: Approximately 3.2 billion hectares (7.9 billion acres) were used as permanent pastures.

Present: The area has increased to around 3.5 billion hectares (8.6 billion acres).

Change: An increase of about 0.3 billion hectares (0.7 billion acres).

2. Land for feed crops

1950: The land area dedicated to growing feed crops (such as corn and soy) was significantly less than today due to lower livestock production intensities and smaller scale operations. Feed crops likely accounted for about 200-250 million hectares of the cropland, although figures are evidently difficult to estimate.

Present: Of the approx. 5 billion hectares of land globally used for agriculture, about 1.5 billion hectares are dedicated to cropland.

The increase in cropland hectares is a direct consequence of the intensification of demand for livestock production. To keep these numbers in check, it is essential that producers strive to use as little feed as possible for as much meat yield as possible – and this directly relates to a key metric of the feed additive industry: Feed Conversion Ratio, mentioned above.

THE ROLE OF FOOD LOSS IN LIVESTOCK SUSTAINABILITY

The Food and Agriculture Organization (FAO) of the United Nations defines **food loss** as the decrease in quantity or quality of food resulting from decisions and actions by food suppliers in the chain, excluding retail, food service providers, and consumers. Food loss specifically refers to food that gets spilled, spoiled, or lost before it reaches the consumer stage, primarily taking place during production, post-harvest, processing, and distribution stages.

Food loss is currently estimated to be relatively stable over the last decades, at around 13%.

Key aspects of food loss

1. Stages of Food Loss:

- **Production:** Losses that occur during agricultural production, including damage by pests or diseases and inefficiencies in harvesting techniques.
- **Post-Harvest Handling and Storage:** Losses that happen due to inadequate storage facilities, poor handling practices, and lack of proper cooling or processing facilities.

• **Processing:** Losses during the processing stage, which may include inefficient processing techniques, contamination, or mechanical damage.
• **Distribution:** Losses that occur during transportation and distribution due to poor infrastructure, inadequate packaging, and logistical inefficiencies.

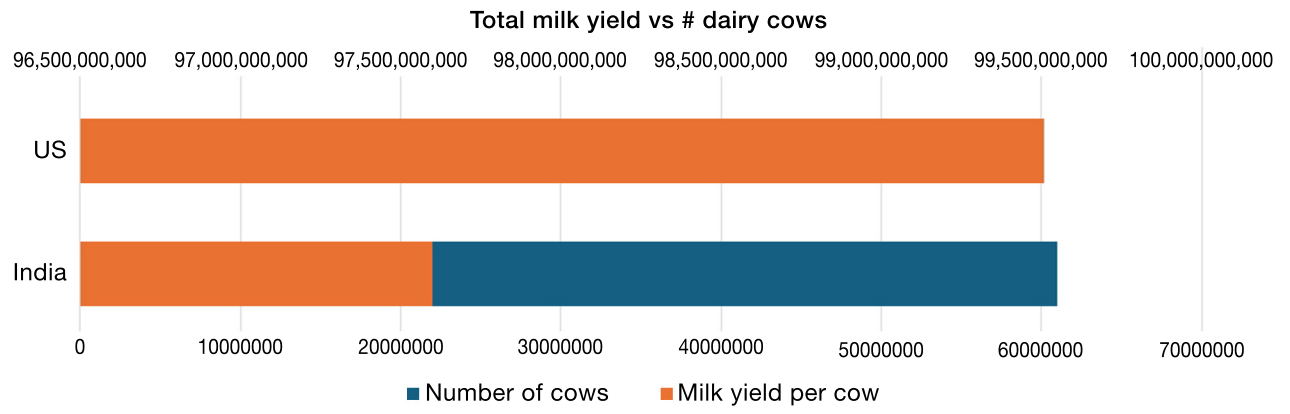
2. Quality and Quantity:
• **Quality Loss:** Refers to the reduction in the quality of food, affecting its nutritional value, taste, or safety, which may not necessarily reduce its quantity.
• **Quantity Loss:** Refers to the actual reduction in the amount of food available for consumption due to physical losses.

3. Exclusions:
• **Retail and Consumer Level:** Food loss does not include food waste at the retail or consumer levels, which is categorized as food waste. Food waste refers to the discarding of food that is still fit for consumption by retailers or consumers.

IMPORTANCE OF REDUCING FOOD LOSS

Every step along the production chain, each action taken to preserve feed, increase yield, ensure stable and high meat quality, can contribute to reducing food loss and ensuring that animal protein production stays sustainable and feeds the world more efficiently.
• **Food Security:** Reducing food loss can help improve food availability and access, particularly in regions where food scarcity is a concern. Where we thought we were on our way to eradicate world hunger, recent upticks in several regions show us that progress is not a given.
• **Economic Efficiency:** Minimizing food loss can improve the efficiency and profitability of food supply chains by maximizing the utilization of resources.
• **Environmental Impact:** Reducing food loss helps to decrease the environmental footprint of food production by lowering greenhouse gas emissions and minimizing land and water use. This is all the more important in regions where world hunger shows signs of going up. Perhaps not by coincidence are these regions some of the most affected by climate change.

By understanding and addressing the causes of food loss, stakeholders across the food supply chain can work towards more sustainable and efficient food systems.



Based on Our World in Data

Figure 7.

WHAT'S NEXT?

Improving production practices and technology

Investment in research and development of new technologies that enhance livestock production efficiency and reduce environmental impact is vital for the future sustainability of the sector.

India is a good illustration of room to grow. If we look at cow milk alone, India, with a headcount of approximately 61 million animals, has a total milk production that is neck-and-neck with the United States, whose dairy cow headcount is in the neighborhood of 9.3 million. India's milk yield sits around 1,600 liters/animal/year, compared to the US's average of 10,700 liters.

Optimizing Feed Efficiency

Continued focus on improving FCR through genetic selection, optimized nutrition, and advanced management practices will be crucial for reducing the environmental footprint of livestock production.

Promoting Sustainable Land Use

Strategies to balance the need for increased livestock production with sustainable land use practices are essential. This includes adopting agroecological approaches and improving the efficiency of feed crop production.

Reducing Food Loss

Stakeholders across the food supply chain must prioritize reducing food loss through improved storage, transportation, and processing technologies. This will help ensure that livestock production contributes effectively to global food security.

Enhancing Emission Tracking and Reporting

There is a need for standardized methods for collecting and reporting data on GHG emissions in agriculture. This will enable more accurate assessments and the development of targeted strategies for emission reductions.

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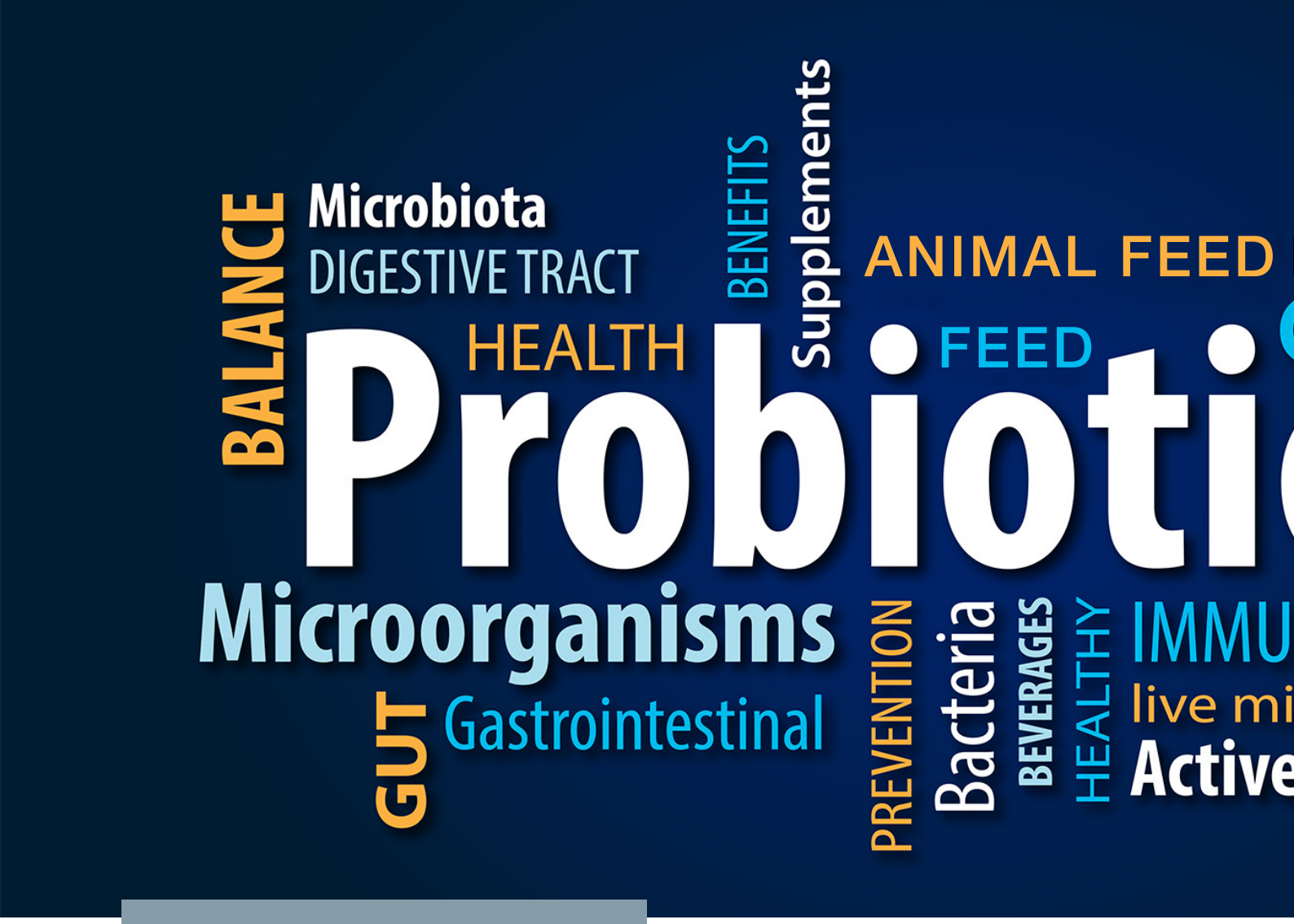


Feed Probiotics and Global Market Status

Feed probiotics are a valuable addition to animal nutrition and offer many benefits that improve animal health, growth and overall productivity, while also helping to combat antibiotic resistance and contribute to methane reduction, leading to more sustainable livestock farming practices. A better understanding of such benefits of probiotics is driving the growth of the feed probiotics market. According to research companies whose data support this, by 2024, the feed probiotics market will reach a size of approximately USD 3.81 billion and will continue to grow at a CAGR of 6.9% until 2030.

By Derya Yildiz

Feed probiotics are live microorganisms added to animal feed to improve gut health and general welfare. These microorganisms include species such as *Lactobacillus, Bacillus, Streptococcus, Pediococcus, Enterococcus, Bifidobacterium and Propionibacterium*. These beneficial bacteria help maintain a healthy balance of microorganisms in the digestive tract, known as the gut microbiome. There are many reasons for the use of probiotics in animal feed. The most important of these is to improve gut health, which significantly affects the overall health and performance of animals. Probiotics are known to help the beneficial bacteria colonize the gut and prevent the overgrowth of harmful pathogens. A healthy gut microbiome, in turn, improves feed efficiency by helping nutrients to be efficiently absorbed from feed. This translates into better growth rates, higher performance and lower feed

costs. Field probiotics also help prevent and treat diarrhea, a common health problem in livestock, and stimulate the immune response, making animals more resilient to disease. With all these qualities, probiotics can be used as an alternative to antibiotics and reduce the risk of antibiotic resistance.

In conclusion, feed probiotics are a valuable addition to animal nutrition and offer many benefits that improve animal health, growth and overall productivity, while contributing to more sustainable animal farming practices.

FEED PROBIOTICS MARKET AND FORECASTS

The global feed probiotics market has witnessed significant growth in recent years, driven by increasing awareness about the benefits of probiotics for animal health and productivity. Market research firm **Mordor Intelligence** estimates that the market size will be USD 3.01 billion in 2024. Forecasting a Compound Annual Growth Rate (CAGR) of 5.09% for the forecast period 2024-2029, the company expects the total market size to reach USD 3.85 billion in 2029. The report published by **Research and Markets**, which is based on the 2024-2029 period (with the exception of the 5.05% CAGR forecast), also supports Mordor Intelligence's data.

On the other hand, **Cognitive Market Research** points to higher data on the current market size and growth prospects in its recently updated report. According to the company's report, the market size will reach USD 4.98 billion by the end of 2024 and will continue to grow at a CAGR of 9.7% until 2031. This implies a market size of more than USD 9 billion.

Maximize Market Research, which estimates a market size of approximately USD 4.21 billion for 2023, also supports this strong growth outlook, forecasting that the market will grow at a CAGR of 8.5% until 2030, reaching USD 7.45 billion.

The report prepared by **Fact.MR** indicates that the global feed probiotics market will have a size of USD 3.51 billion by the end of 2024, growing at a CAGR of 6.6% between 2024 and 2034 and reaching USD 6.65 billion by the end of 2034.

As the reports suggest, the global feed probiotics market is poised for significant growth. Based on the data from research companies, it is possible to estimate that the average market size will be USD 3.81 billion in 2024, the market will grow at a CAGR of approximately 6.9% during the period 2024-2030, and the total market size will exceed USD 5.7 billion in 2030.

FACTORS SUPPORTING MARKET GROWTH

The global feed probiotics market is experiencing strong growth due to a combination of many factors. The major factors supporting the growth of the market include:

- Increasing Demand for Animal Protein

World population increases and rising incomes

are leading to a growing demand for animal proteins such as meat, milk and eggs. This has led to a larger livestock industry and requires effective and sustainable solutions to maintain animal health and productivity. The ability of probiotics to improve the balance of the gut microbiota, thereby increasing feed efficiency and production performance, makes it a natural and beneficial supplement to meet the growing need for protein.

- Rising Consumer Awareness of Food Safety

Consumers are becoming increasingly aware of food safety concerns associated with the overuse of antibiotics in livestock production, including potential risks such as antibiotic resistance. Probiotic additives can provide a viable alternative to antibiotics, helping to both protect animal health, reduce the incidence of foodborne diseases and improve the overall safety of animal-sourced products.

- Increasing Focus on Animal Welfare

Animal welfare is becoming increasingly important as consumers and regulators demand the ethical and humane treatment of livestock.

Probiotic additives can contribute to improved animal welfare by supporting gut health, reducing stress and improving overall welfare.

- Advancements in Probiotic Technology

Ongoing research and development in probiotic technology is leading to the development of more effective and efficient probiotic strains and formulations. These developments are expanding the application of probiotics in animal feed, driving market growth.

- Favorable Regulatory Environment

Many governments are introducing regulations that support the use of probiotics in animal feed as a sustainable and environmentally friendly alternative to antibiotics. These favorable regulatory legislations are creating a favorable environment for the growth of the feed probiotic additives market.

- Growing Interest in Natural and Organic Products

Consumers increasingly prefer natural and organic products, including animal-based foods. Probiotic additives as natural ingredients are in line with this trend and are gaining popularity among consumers. They are also perceived as safer and more environmentally friendly, leading to easier adoption of their usage in animal feed.

- Increasing Adoption of Precision Livestock Practices

Precision livestock farming applications involving the use of technology to monitor and manage livestock are becoming increasingly common. Probiotic additives can be integrated into these systems to provide targeted and personalized nutritional solutions for animals.

As a result, the global feed probiotic additives market is poised for significant growth owing to increasing demand for animal protein, shift towards natural feed additives, concerns over antibiotic resistance, and numerous health benefits of probiotics. Technological advancements and regulatory legislations are further supporting this growth, making probiotics a crucial component in modern animal nutrition.

FACTORS LIMITING MARKET GROWTH

While the global feed probiotics market is experiencing significant growth, analysts think that certain factors could restrain this expansion. Here are the major challenges and limitations that may be faced:

- High Costs

One of the main constraints is the high cost associated with probiotic products. The production of high-quality probiotics involves advanced technologies and strict quality control measures that can increase costs. This makes probiotics more expensive compared to traditional feed additives, potentially limiting their adoption, especially in cost-sensitive markets.

- Lack of Standardization

The lack of standardized regulations and guidelines for the production and use of feed probiotics

SOME SUPPLIERS IN THE GLOBAL FEED PROBIOTICS MARKET:

- Abbott Laboratories
- Adisseo
- ADM
- Alltech
- Amspro Biotech
- Baolingbao
- BASF SE
- Beghin Meiji (Tereos S.A.)
- Behn Meyer
- BENEO GmbH
- Biochem
- BioResource International
- Bio-Vet Inc.
- Calpis Co.
- Cargill
- Danisco (IFF)
- Dsm-firmenich
- Evonik Industries
- EW Nutrition
- H. Wilhelm Schaumann
- Impextraco
- Jarrow Formulas
- Kemin Industries
- Kerry Group
- Lallemand
- Land O'Lakes
- Life Products
- Longlive
- MIAVIT Stefan Niemeyer
- Mitsui & Co.
- Nestle
- Novonesis
- Novus International.
- Nutreco (Selko)
- Ohly
- Orffa International
- Phileo by Lesaffre
- Provita Animal Health
- Pure Cultures
- Saideep Exports
- Unique Biotech

can create challenges in terms of quality control, efficacy and consumer confidence.

- Shelf-Life Limitations

Probiotics are living microorganisms and their viability can be affected by factors such as temperature, humidity and storage conditions. Factors such as excessive heat, humidity and improper storage can affect the viability of probiotics and reduce their effectiveness. Therefore, ensuring the stability and shelf life of probiotic products throughout the supply chain is a significant challenge that also increases costs.

- Limited Awareness

While consumer awareness of the benefits of probiotics for human health is increasing, there is still limited awareness and understanding of the benefits and proper use of probiotics among animal farmers. This lack of knowledge may lead to under- or misuse of probiotic products, hindering market growth.

- Regulatory Hurdles

In some countries, obtaining regulatory approval for the use of new probiotic strains or formulations can be a time-consuming and expensive process. This can hinder different market entries and limit the availability of innovative products.

- Competition from Alternative Products

While probiotics offer a promising alternative to antibiotics, they may face competition from other antibiotic substitutes such as organic acids and essential oils. Similarly, there is competition from other feed additives such as prebiotics and enzymes that offer benefits for animal health and performance. Such alternatives may be lower in cost or perceived as more familiar by producers, which may limit the market share of probiotics.

- Concerns about Efficacy

The efficacy of probiotics can vary depending on factors such as the strain used, dosage and the specific conditions of the livestock environment. This variability may lead to inconsistent results and some animal breeders may be hesitant to adopt probiotics as a reliable feed additive.

According to analysts, addressing all these challenges will be crucial for the continued growth and sustainability of the global feed probiotics market. Industry stakeholders can help overcome these barriers and unlock the full potential of probiotics in animal nutrition by investing in research and development, promoting standardization and increasing consumer awareness.

MARKET SITUATION BY ANIMAL SPECIES

In the global feed probiotics market, which is witnessing significant growth, specific applications of feed probiotics and market dynamics vary across different animal species. For instance, **poultry** is one of the largest consumers of feed probiotics. The use of probiotics in poultry feed is primarily due to their ability to improve gut health, increase feed efficiency, and reduce the incidence of diseases such as necrotic enteritis and coccidiosis. The growing demand for poultry meat and eggs and the need to

reduce the use of antibiotics is driving the adoption of probiotics in this segment.

Ruminants, including cattle, sheep and goats, benefit significantly from the addition of probiotics into their diets. Probiotics can help improve rumen function, increase nutrient digestion and absorption and reduce methane emissions in ruminants. This can lead to better feed efficiency, increased milk production and improved meat quality. The growing demand for dairy products and beef is a major driving force for the use of probiotics in the ruminant sector.

Probiotics are widely used in **pig** diets to improve gut health, increase nutrient absorption and reduce the incidence of diarrhea. Probiotics can also help improve growth rates and feed efficiency in pigs. The shift to antibiotic-free pork production is another factor encouraging the use of probiotics in this segment.

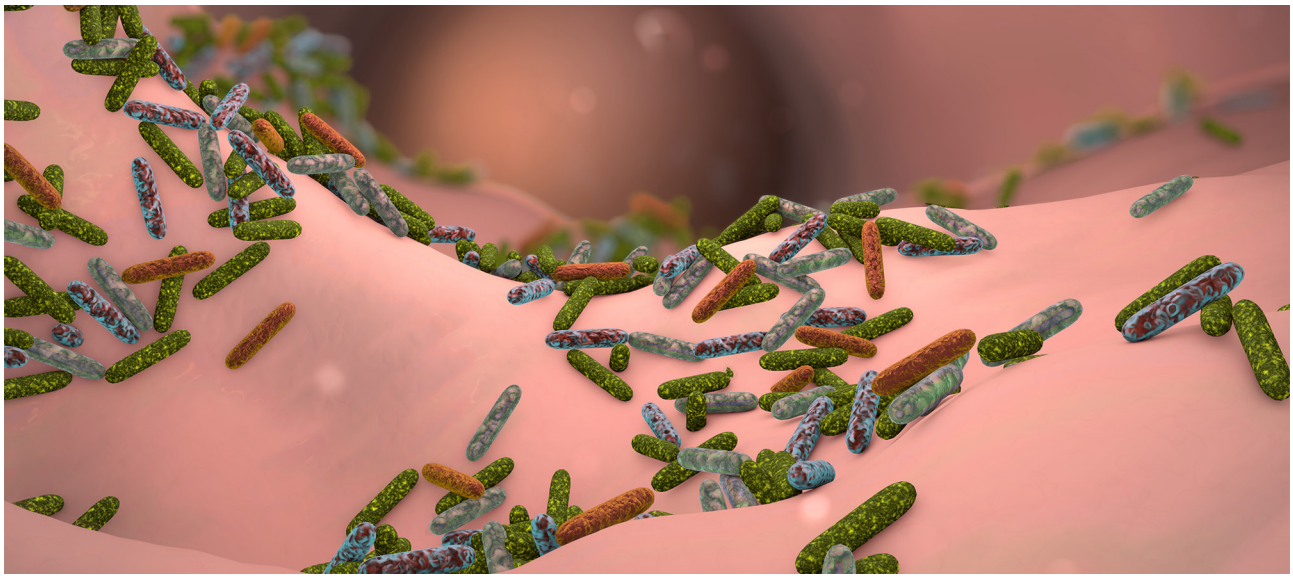
The use of probiotics in **aquafeeds** is becoming increasingly widespread, especially in aquaculture systems where disease pressure is increasing due to high stocking density. Probiotics help improve water quality, increase feed efficiency and strengthen the immune system of aquatic species. They are used in the farming of fish, shrimp and other aquatic organisms to reduce the incidence of disease and increase overall productivity. The growing demand for seafood and the need for sustainable aquaculture practices are driving the adoption of probiotics in this segment.

To summarize, the use of probiotics varies across different animal species due to factors such as physiological differences, nutritional requirements and disease challenges. While the poultry and swine sectors are relatively mature markets for feed probiotics, the demand for probiotics in ruminant and aquafeeds is also growing rapidly.

MARKET GROWTH ON REGIONAL BASIS

Global feed probiotics market dynamics and growth rates vary across different regions. **The Americas**, especially North America, has been the largest contributor to the global feed probiotics market. The U.S. and Canada are the leading countries contributing to the market owing to their advanced livestock production systems and high awareness of the benefits of probiotics. Moreover, the region is also witnessing significant investments in research and development leading to the launch of innovative probiotic products.

The **Asia-Pacific** region is experiencing rapid growth in the feed probiotics market, driven by factors such as increasing population, rising incomes, and growing livestock industries. China, India and Southeast Asian countries are emerging as key markets for feed probiotics. The region's large livestock population and increasing consumer awareness on food safety are driving the demand for natural and sustainable feed additives.



Europe has a developed feed probiotics market with established players and a strong regulatory system. The region's focus on sustainable and ethical livestock production has contributed to the growth of the feed probiotics market. Notably, the European Union's ban on antibiotic growth promoters has led to increased adoption of probiotics as an alternative in the region. Countries such as Germany, France, and the United Kingdom are among the major users of feed probiotics.

The Middle East and Africa regions are relatively smaller markets for feed probiotics compared to the Americas, Asia-Pacific and Europe. These regions face challenges such as limited awareness and high probiotic costs, but have promising potential for growth thanks to expanding livestock sectors. Countries such as Saudi Arabia, Egypt and South Africa are experiencing growth in the feed probiotics market.

COMPETITION IN THE FEED PROBIOTICS MARKET

Growth in the global feed probiotics market has created opportunities for feed probiotics suppliers, but has also intensified competition in the industry. Today, the feed probiotics market is characterized by a mix of large multinational companies and smaller, regional players. The major players in the market have a strong global presence, extensive research and development capabilities and a wide range of probiotic products. They typically compete on factors such as product quality, innovation, pricing and distribution networks. While smaller regional players face challenges from larger competitors, they are able to differentiate themselves by focusing on niche markets, offering customized solutions and building strong relationships with local customers.

Analysts point out that to succeed in the competitive feed probiotics market, suppliers need to adopt effective strategies such as:

-**Research and development:** Invest in research and development to develop new and innovative probiotic products,

- **Product differentiation:** Focus on developing unique probiotic strains or formulations that meet

specific animal health needs,

- **Strong distribution networks:** Building strong partnerships with distributors and retailers to ensure broad market access,

- **Marketing and education:** Investing in marketing and education to raise awareness of the benefits of feed probiotics,

- **Strategic partnerships:** Collaborating with other industry players such as feed producers and livestock farmers to expand market access and share resources.

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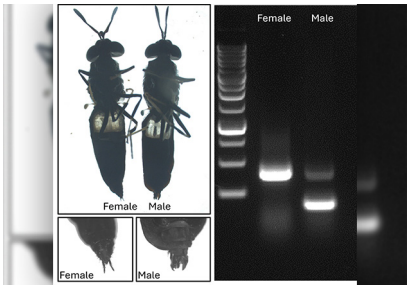
FreezeM unveils new method in sex identification of BSF larvae

One of the leaders in black soldier fly (BSF) breeding, FreezeM's R&D team developed a groundbreaking method for identifying male and female BSF larvae using Polymerase Chain Reaction (PCR), revolutionizing breeding and rearing practices. Previously, sex differentiation was only possible in adults through a manual, one-by-one process under a microscope, according to the company. Early identification during the larval stage, especially in a high-throughput manner, presents significant opportunities to optimize breeding, rearing, and production efficiency by enabling targeted management of each sex.

The company explains the key findings as:

- Innovative Sex Differentiation: Our R&D team discovered a unique genetic sequence distinguishing male and female BSF. By amplifying this sequence with PCR, we can now accurately determine the sex of larvae.
- Non-Invasive and Sustainable: This non-destructive method allows larvae to be tested through a harmless biopsy. The larvae continue developing into adults capable of reproduction, making it practical and sustainable for ongoing breeding programs.
- Impact on Breeding and Rearing: Early sex differentiation enables more precise breeding and rearing strategies. Producers can optimize male/female population balances for specific objectives,



improving resource management, product consistency, and economic outcomes.

- High-Throughput Application: This PCR-based approach supports large-scale operations by enabling high-throughput screening. Early sex identification streamlines selective breeding programs and promotes the development of genetically superior lines for targeted traits.

Read more>>

FAO publishes continental atlas of tsetse flies in Africa

The Food and Agriculture Organization of the United Nations (FAO) released the continental atlas of the distribution of tsetse flies in Africa, a vital tool in combatting an often-lethal parasitic disease among livestock that causes billions of dollars in economic losses for farmers in sub-Saharan Africa.

Tsetse flies (genus Glossina) are blood-sucking insects that act as incubators and carriers for trypanosomes, single-celled parasites responsible for causing debilitating and often fatal diseases. In humans, this disease is also known as "sleeping sickness," resulting in an illness that affects the nervous system and manifests symptoms such as fatigue, severe headaches, and coma. If not diagnosed and appropriately treated, the disease almost invariably leads to death.

While sleeping sickness is no longer considered a public health problem, with fewer than 2,000 cases

reported each year in humans, the disease still severely affects livestock in Africa. Animal trypanosomosis, known as "nagana" in cattle, hinders milk and meat production, as well as the animals' ability to work. This leads to food insecurity and decreased income for millions of African farmers who depend on livestock.

Read more>>

Nor-Feed obtains B-Corp label

A company that specializes in natural solutions for animal nutrition, Nor-Feed announced its B-Corp label obtained on September 17, 2024. This recognition reportedly marks a key milestone for the company, underlining its commitment to environmental responsibility, social impact and transparency. By joining the global community of B-Corp companies, Nor-Feed affirms its commitment to reconciling economic performance with positive impact, thereby contributing to lasting change in the animal nutrition sector.

Since its creation in 2003, over 80% of the plant extracts selected by Nor-Feed have been derived from food industry co-products, in order to minimize the use of natural resources. The company points out that its natural solutions help to reduce the use of synthetic molecules such as antibiotics and insecticides in animal feed, and to reduce the environmental impact of animal production. Recent initiatives, such as

the publication of life cycle analyses of its products in a peer-reviewed scientific journal, illustrate Nor-Feed's commitment to minimizing its environmental footprint and contributing to responsible agriculture.

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Dairy professionals focus on 3 key mega challenges to solve

Methane reducing interventions, more focus on welfare and disease prevention, and application of data and technology. These are some of the key mega challenges to solve to safeguard a healthy, viable and sustainable dairy sector in 2050 and beyond. This was one of the conclusions drawn from the short course 'Jump to the future: Dairy farming 2050'.

The half day event, which took place on August 12 in Ghent, Belgium, prior to the National Mastitis Council (NMC) regional meeting, attracted 140 dairy professionals from around the world. The organisers, Royal GD and Beluga Animal Health, invited 5 expert speakers to talk about the different (mega) challenges in dairy farming today, and in the future.

Reducing methane production by cattle is a key challenge facing the dairy industry. Failing to do so will compromise the sector's license in the coming decades. Rinse Jan Boersma, founder of Beluga Animal Health, explained in his presentation that the latest insights around the impact of methane are increasingly backed up with new science. He said: "Greenhouse gasses (GHG) differ in warming potential and persistence. Methane is a short-lived GHG, which means it is broken down in the atmosphere much faster than carbon dioxide and nitrous oxide. In addition, most of the methane from dairy farming does not arise from fossil fuels, and therefore doesn't bring new carbon in the atmosphere." Boersma's presentation therefore touched on the concept of Global Warming Potential (GWP), and its affiliated model (GWP100) that allows comparisons of the global warming impacts of different gases.

Read more>>

Alltech makes strategic licensing agreement for equine products

An American company specializing in the marketing of natural nutritional supplements for horses, EnviroEquine, and Alltech announced a strategic licensing agreement that will feature Alltech technologies in many of EnviroEquine's supplemental nutritional equine products.

EnviroEquine created an operation that delivers true "farm-to-stable" quality, a commitment that ensures a rare level of control over every stage of production. For EnviroEquine, product integrity starts at the source. The company explains it is focused on sustainable practices for animals, people and the planet. To that end, it works solely with suppliers committed to sustainability and excellence in quality.

"We are excited to partner with Alltech as they are a global leader in animal nutrition," says Angela J. Brackett, Director of Development, Marketing and Sales at EnviroEquine. "This partnership confirms the effectiveness of EnviroEquine's products and enhances

them with science-based technology from Alltech, and we anticipate a boost in brand presence both in North America and Europe over the coming months."

Read more>>

AFIA inks MoU to strengthen Vietnam's animal and feed industries

The American Feed Industry Association (AFIA) signed a Memorandum of Understanding (MoU) with the Vietnam Feed Association (VFA) and Animal Husbandry Association of Vietnam (AHAV) to strengthen Vietnam's feed and animal production industries. The signing ceremony, held in Hanoi, Vietnam, on September 12, highlighted the trilateral commitment to foster growth, innovation and sustainability in these sectors within the country.

The MoU, which began in June, formally establishes a strategic partnership and framework for cooperation between the organizations through leveraging shared knowledge and expertise to support Vietnam's goals for sustainable development in the feed and animal production industries.

"After years of working to bring awareness to the Vietnamese animal production and feed industries, veterinarians and regulators of the variety of products U.S. feed ingredient manufacturers can offer to maximize feed efficiency and improve animal health and production, this MOU represents our future commitment to fostering growth, innovation

and sustainability in the country," said Gina Tumbarello, AFIA's Senior Director of Global Strategies, Policy and Trade. "Together, we can build a more resilient and sustainable feed and animal production industry that meets today's consumer needs and paves the way for future growth."

AFIA's work in Vietnam has been supported by the USDA's Foreign Agricultural Service Market Access Program funds, which have been instrumental in facilitating efforts to educate the Vietnamese feed and animal production industries on the value of U.S. feed ingredients and best practices for sustainable growth.

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Aerbio unveils fully operational alternative protein facility

One of the pioneers in sustainable biotechnology, Aerbio announced its plans to raise up to €50 million in a Series A funding round, with the target close set for Q4 2024. This bold step forward will reportedly fund the construction of Aerbio's cutting-edge demonstration-scale facility and expand the company's revolutionary (R)evolve™ platform, setting the stage for full-scale commercial operations.

Aerbio is at the forefront of biotechnology innovation, transforming simple molecules into valuable products without the need for arable land or fossil fuels. With its groundbreaking (R)evolve™ platform, the company points out it has unlocked the potential of microbiology to convert carbon dioxide and hydrogen into valuable products. Aerbio's launching product is Proton™, a protein-rich ingredient poised to revolutionise food and animal nutrition industries.

"Our ambition knows no bounds," says Kaspar Kristiansen, CEO of Aerbio. "Our Series A round is a bold statement in our conviction in our plan and our relentless pursuit of breaking new ground in biotechnology. We're not just building a company—we're turning biotechnology on its head, paving the way for a sustainable future where sugar-free fermentation is a reality."

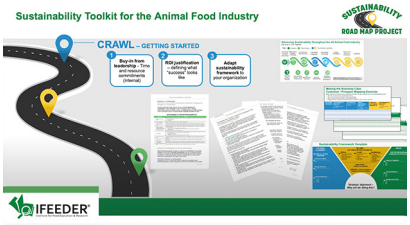
Read more>>

IFEEDER releases resources from phase two of sustainability project

The Institute for Feed Education and Research (IFEEDER) released new materials from the second phase of its sustainability project, taking another step toward advancing sustainability within the animal food industry. Representing both U.S. and Canadian industry members and stakeholders, these resources, developed in collaboration with the Context Network and the Animal Nutrition Association of Canada (ANAC), include findings from a comprehensive landscape assessment of industry sustainability practices and a literature database of how animal performance is impacted by novel feed ingredients.

"These resources are designed to address the need for efficient, and effective tools for measuring, reporting and verifying sustainability efforts," says Lara Moody, IFEEDER executive director. "By engaging our animal food customers and considering how we can help them achieve their environmental footprint goals, we will be better equipped to make informed decisions and meet their sustainability objectives."

During the second phase of the Sustainability Road Map project, IFEEDER, ANAC and the Context Network collaborated with partners across the animal food industry to achieve several objectives. An objective included aligning and ensuring industrywide consistency in how data is measured, reported and verified across indicators and metrics important to the industry and its customers. IFEEDER explained that the project also sought



to improve the efficiency and effectiveness of life cycle assessments (LCAs), thereby supporting the industry and its customers in their sustainability efforts. In addition, the project focused on assessing and considering the environmental benefits of innovations in areas such as animal food ration development, ingredients and additives, which are essential for stakeholders aiming to meet corporate sustainability commitments.

Read more>>

dsm-firmenich secures EU approval for HiPhorius

One of the leading innovators in nutrition, health and beauty, dsm-firmenich announced the authorization of HiPhorius™ for all poultry species for fattening or reared for laying or reared for breeding, sows of all Suidae species and all fin fish in the European Union.

According to the company, HiPhorius™ is a new generation phytase which can help farmers achieve more sustainable and profitable animal protein production through more efficient phosphorous utilization and faster more efficient removal of the potent antinutrient phytate.

Sergio Schuler, Vice President Europe, Middle East and Africa for Animal Nutrition & Health at dsm-firmenich says: "Securing EU authorization for HiPhorius™ marks a significant milestone for the feed industry and brings major benefits for producers across Europe. This approval will not only ensure we continue to serve our customers with the very latest feed enzyme technology but also underscores the dsm-firmenich | Novonesis Alliance's commitment to providing value-adding, sustainable solutions for the global feed and animal protein industry."

With this latest EU authorization, HiPhorius™ is expected to offer significant benefits for poultry, swine, and aquaculture by improving animal performance, reducing cost of feed, and minimizing environmental impact.

Read more>>

Three Dog Brands expands portfolio into dehydrated pet treats industry

A Topspin Consumer Partners portfolio company, Three Dog Brands, LLC (TDB) acquired Kennelmaster Foods Inc., one of the leading providers of natural, human grade, dehydrated pet treats made in the US. Kennelmaster sells its products under the Chip's Naturals brand and utilizes dehydration technology to create differentiated, nutritious and high-protein products.

"We're excited to welcome Chip's Naturals to Three Dog Brands," says Kristi Ross, CEO of TDB. "Chip's Naturals' product offering allows TDB to expand beyond its portfolio of confectionery treats into the growing dehydrated treats segment and strengthens our position as the leader in humanized dog treats."

Kennelmaster was founded in 2008 and is currently operated by sisters Vicki Wagner and Joann Bennett. Wagner and Bennett have successfully grown the Chip's Naturals brand with innovative, single-ingredient products that have a humanized element. Chip's Naturals' most popular product is "Doggie Chicken Chips", whose thinness and crunchiness resemble human potato chips, according to the announcement. The company has in-house manufacturing capabilities and produces its "Doggie Chicken Chips" at its facility in New Smyrna Beach, Florida, USA.

Read more>>

Angel Yeast realizes plateau probiotic project

One of the global leaders in yeast manufacturing, Angel Yeast officially put its plateau probiotics project into production in Xizang, China, a milestone of the company's biotech transformation strategy and a key step to achieve local, industrialized production of probiotics.

The probiotics product can be applied in the food, healthcare, agriculture industries and more, boasting huge economic value and market potential, according to the company's statement. Angel Yeast's probiotics production now focuses on three main industrialized strains – the Lactobacillus plantarum S2 has strong acid-producing capacity and excellent fermentation results, which can be utilized in food and agriculture productions; the DB-8 that's mainly applied in dairy products and can make the yogurt to have a natural tomato flavor without additives, which is of high commercial value; and Streptococcus thermophilus, which can prevent the yogurt from further acidification over time to maintain the good taste.

He Xinzhang, General Manager of Angel Yeast's subsidiary in Xizang, noted that for three years, the R&D team overcame altitude sickness and visited the herdsmen's families, collected dairy products, and traveled to the high-altitude areas to chase yaks and pick up cow dung, completing a series of microbial resources census collection and evaluation works with fruitful results.

Read more>>

Novus opens new Asia-Pacific regional office in Thailand

Novus International, which describes itself as an intelligent nutrition company, announced the opening of its new Asia-Pacific regional head office in Bangkok, Thailand. This office will serve as the central hub for the company's operations across the region and reflects Novus' commitment to help protein producers in Asia-Pacific grow their business.

Novus points out the move as a significant milestone in its growth strategy for Asia. "The new office will provide a more collaborative and efficient environment tailored to the needs of our team to support the growing operations in Asia," said Jackie Xie, Human Resources Manager for Asia who has been with Novus for close to 15 years.

The company's Shared Services Center, which consolidates functions such as finance, human resources, logistics, and customer service will operate out of the Thailand office. Wichai Chiewchanwilas, a longstanding senior member of the Supply Chain team in the region shared that "This centralization enables Novus to leverage regional expertise, improve collaboration, and deliver consistent, high-quality services to customers and partners throughout Asia-Pacific, affirming our goal to deliver solutions closer to the customer."

The new Novus office is located at The Parq, a mixed-used workplace building, on Ratchadaphisek Road, an area set to emerge as a dynamic commercial district in Bangkok. The opening ceremony was a blend of tradition and innovation, reportedly reflecting the company's deep respect for local culture and its forward-looking vision.

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Boehringer Ingelheim acquires pet therapeutics company

Boehringer Ingelheim publicized the acquisition of Saiba Animal Health AG, a company focused on the development of novel therapeutic medicines to address chronic diseases in pets. With the acquisition, Boehringer Ingelheim aims to strengthen its animal health research and development (R&D) pipeline, specifically in the fast-growing pet therapeutics category. As life expectancy for pets increases, so does the need for effective treatment of debilitating diseases, according to the company.

Saiba Animal Health's innovative technology platform uses a therapeutic vaccine approach, which is designed to create an immune response, targeting chronic diseases such as allergy, inflammation and pain. The therapeutic vaccines incorporate virus-like particles to induce the animal's immune system. They produce neutralizing antibodies against the animal's own disease-causing proteins. This approach may result in a longer duration of action, better treatment outcomes, and increased pet owner convenience and compliance.

"Our pets live longer which creates different needs for their medical care, and often without good existing treatment options," says Eric Haaksma, Head of Global Innovation, Animal Health at Boehringer Ingelheim. "As a research-driven company, we are very excited about the potential of Saiba Animal Health's groundbreaking technology platform, which could result in a more specific and longer-lasting therapeutic response to chronic diseases in companion animals than current approaches."

Read more>>

Growing start-ups to meet at Animal AgTech Innovation Summit

The Animal AgTech Innovation Summit in Amsterdam on October 9-10 will bring together 350+ global leading food producers, animal health providers, feed and nutrition companies, technology developers, start-ups, and investors for two high energy days of 1-1 meetings, panel sessions, roundtable discussions and a networking drinks reception.

Rethink Events, the organizer of the Animal AgTech Innovation Summit, unveiled that the event will highlight novel solutions this year and present the 19 growing companies selected to present, pitch and exhibit in Amsterdam on October 9-10, 2024. The summit provides a platform for start-ups to meet potential investors and partners, raise their profile, and position their technology alongside the industry heavyweights who attend from around the world each year.

"Despite the trend towards more plant proteins,

animals remain key for a healthy and diversified diet. Start-ups are without a doubt a driving force behind the progress we see in animal agtech. They bring new ideas and technologies that can improve animal welfare, sustainability and food security. It is crucial to support these entrepreneurs who are shaping the future of agriculture," says Patrik Haesen, CEO of Agri Investment Fund.

Read more>>

Biotech startup secures £14m funding to produce microalgae-based Omega-3

University of Edinburgh student startup MiAlgae, which uses co-products from the whisky industry to sustainably produce Omega-3 for fish feed, has secured £14 million in funding to build an industrial scale production facility in Scotland.

Founded by Douglas Martin while he was studying for an MSc in Synthetic Biology and Biotechnology in 2016, MiAlgae has now reached commercial-scale of its sustainable marine Omega-3 product, NaturAlgae, at its demonstrator site in Balfron, Stirlingshire, Scotland.

New venture capital investors SWEN, Blue Ocean, Clay Capital and Rabo Ventures joined existing backers Equity Gap, Old College Capital (OCC) – the University of Edinburgh's in-house venture investment fund, Social Investment Scotland (SIS) Ventures, Ananke Ventures, Ascension Ventures, and Scottish Enterprise in the oversubscribed funding round.

The global aquaculture industry has expanded more than fivefold in the last 30 years to help feed the growing world population. However, the supply of fish oil, which is the primary source of Omega-3s for farmed fish, has remained stagnant at around one million tons per year. This fish oil is derived by harvesting 20 million tons of wild-caught fish annually, a practice that is

both unsustainable and harmful to marine ecosystems.

The 2023 launch of MiAlgae's demonstrator site has reportedly proven the viability of its cutting-edge approach. By repurposing nutrient-rich by-products from whisky distillation, the company grows microalgae, providing an eco-friendly source of Omega-3s.

Building on this success, MiAlgae is now gearing up to take the next step with the development of an industrial scale production facility in Scotland. The company claims that the new site will enable full commercialization of NaturAlgae, meeting rising demand across the aquaculture, pet food, and human health sectors for sustainable Omega-3s. This expansion will boost MiAlgae's production capacity, fuel its global growth, and create new 'green' jobs.

Read more>>

Cooke joins GSSI as Funding Partner

One of the largest precompetitive collaborations in the world, The Global Sustainable Seafood Initiative (GSSI) announced that Cooke Inc. joined GSSI as a funding partner. Cooke's core purpose is to cultivate the ocean with care, nourish the world, provide for families, and build stronger communities – this aligns closely with the vision of GSSI, according to the announcement. Sustainable development has been a driving force for Cooke, with investment in science-based marine practices and innovation, allowing them to bring a healthy and sustainable protein source to tables around the world.

As a GSSI Partner, Cooke aims to play a larger role in empower-

ing GSSI's sustainability leaders to collaborate and share knowledge to ensure confidence in the supply of certified seafood.

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Novus to focus on improving meat quality at PSA LATAM Conference

High-quality meat means high profits for broiler producers. Aiming to support producers in their effort to grow top-quality birds, Novus unveiled it is hosting a special symposium during the Poultry Science Association's 2024 Latin American Scientific Conference. The event titled "A Holistic View on the Factors that Affect Saleable Meat: Challenges from Field to Processing" will take place during the industry event on October 9 in Iguazú Falls, Paraná, Brazil.

"Meat and carcass quality remains a key concern for poultry producers globally but especially in Latin America where the industry is growing more each year," says Kelen Zavarize, Novus Technical Services Manager. "Ensuring good quality meat is necessary for the security of domestic and export markets. For this symposium, we're bringing together industry experts to share their insights on the challenges and opportunities to improve meat quality."

The symposium agenda includes presentations on skin quality and structural health, broiler house management, broiler market expectations, and battling Salmonella.

Rodrigo Bernardi, Novus' Regional Business Manager for Brazil, says the symposium is a chance for producers and nutritionists to confirm what they are already doing correctly and identify areas where improvements can be made. "The symposium affirms that there is no one particular thing that can positively affect meat quality; it takes many parts working together. These presentations ultimately provide considerations for the producer who is asking themselves, 'How do I improve the profitability of my operation?'" expresses Bernardi.

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IFFO points out increased fishmeal production

IFFO - The Marine Ingredients Organisation, an international trade organisation that represents the marine ingredients industry, explained an increase in fishmeal and fish oil production. Based on statistics shared by the organisation's membership, which accounts for 55% of global marine ingredients production, the overall production of fishmeal between January and June 2024 was up by 40%, while that of fish oil was up by 10%, compared with the same period of last year. This was thanks to the increased catches in the North-Centre of Peru, where operations are currently under a fishing ban, according to IFFO. Only Peru's southern fishing grounds are currently open to operations, with 15% of the quota landed so far.

The data from IFFO's reports show that:

• In Chile, landings in the first 6 months of 2024 have decreased, year on year, in the South, while they are up in the North of the country.

• In Northern Europe, the volume of available raw materials is down, year on year, as expected due to the lower quotas granted in 2024 vs 2023.

• As for the USA, menhaden catches continue to progress, although they remain below the levels reported in 2023.

According to the statement of IFFO, while China's fishing ban was lifted mid-August, local producers of fishmeal and fish oil remain cautious about domestic potential production levels for 2024

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Scoular completes $20 million expansion of feed blending facility

Global agribusiness Scoular completed a $20 million expansion of its state-of-the-art feed blending facility, providing another local option for dairy and beef producers seeking high-quality steam flaked and calf grains. Scoular celebrated the project completion with a ribbon-cutting in Jerome, Idaho, USA. The expansion adds a 120-feet high concrete feed mill, boosting the facility's production capacity by 35 percent. The expansion also delivers a 40 percent increase in storage capacity.

"Scoular's mission is to deliver safe, reliable and innovative solutions to our feed and food customers around the world," said Paul Maass, CEO of Scoular. "This new investment is a perfect example of meeting our customers' demands and bringing forward the ideal solutions. We are thrilled to continue to make growth investments in this important region and industry."

Scoular's existing facility in Jerome provides custom feed blends for dairy and beef customers. The expansion adds two key capabilities:

• A steam flaking process that processes corn and barley into flakes and makes the feed more digestible for cattle. The corn is steamed, heated, then pressed into a flake.

• A pellet mill to make feed pellets. Pellets are easy to transfer, handle and proportion for optimal nutrition. Feed pellets typically are used for feeding calves and beef cattle.

Scoular points out that its Jerome team thrives on serving customers, and the additional capabilities provide new ways to meet their needs.

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New study explores benefits and realistic growth potential of LC-PUFAs

A review led by Dr. Brett Glencross, Technical Director at IFFO – The Marine Ingredients Organisation, along with a team of renowned fish and human nutrition experts, assessed the current landscape of Long-Chain Omega-3 Polyunsaturated Fatty Acids (LC-PUFAs) as well as their benefits and explored their realistic growth potential. The report, published in Reviews of Fisheries Science and Aquaculture, relies on insights gleaned from a technical workshop held in Stirling, Scotland, in May 2023.

According to the information shared by IFFO, LC-PUFAs like eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) have a wide range of effects both on fish and human physiology: cell membrane structure, regulation of inflammation and disease resistance. Current estimates of EPA and DHA production are around 160 ktonnes/year, with more than 90% of this coming from fishery and aquaculture resources:

- Estimates of global fish oil production are around 1,200 ktonnes/year with an increasing contribution of by-products from various fisheries and aquaculture (53%).

Among these oils, EPA and DHA can make up from <2% to almost 60% of the total fatty acids.

- Aquaculture is a net producer of EPA + DHA relative to its inputs and a greater contributor to human EPA + DHA supplies than the direct consumption of wild fish.

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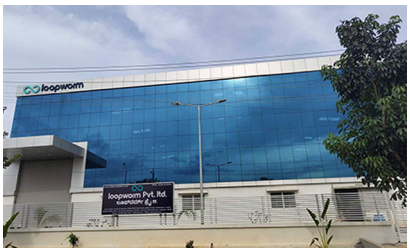
Indian insect company certifies safety, quality and industry compliance

A bioscience and biomanufacturing company that transforms farmed insects into sustainable value-added products, Loopworm announced that it secured ISO 22000, GMP+, and HACCP certifications for Loop-Factory, a 6k tonnes/annum insect protein production unit in Bangalore, India. According to Loopworm, these prestigious certifications underscore the company's dedication towards ensuring safety, quality, and industry compliance in providing insect-derived protein for pet foods as well as animal feed.

Obtaining the ISO 22000 certificate demonstrates that all products manufactured by Loopworm adhere to rigorous food safety standards. It ensures that Loopworm's insect-derived products are produced in a controlled and hygienic environment to eliminate any possibility of contamination. It also guarantees that Loopworm products are safe for animal consumption and won't introduce harmful pathogens into the supply chain avoiding disease outbreaks.

The GMP+ (Good Manufacturing Practices for Feed) certification proves the consistent production and quality control of Loopworm's feed products. This ensures that its insect protein and fat ingredients meet high standards across every batch. GMP+ certification is also important to demonstrate compliance with international quality and safety requirements for feed. Since obtaining GMP+ is a necessity for



several international locations, especially in Europe, it reportedly allows Loopworm to penetrate those markets. HACCP (Hazard Analysis and Critical Control Points) certification also highlights Loopworm's preemptive measures for risk management. By observing and controlling hazards in the production process, HACCP guarantees that Loopworm's products do not contain biological, chemical, or physical contamination.

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AFIA calls for new research, industry leaders for 2025 Pet Food Conference

The American Feed Industry Association (AFIA) is now accepting nominations for the prestigious Friend of Pet Food Award and applications for student research to be presented at the upcoming AFIA Pet Food Conference (PFC). The PFC will take place on January 28, 2025, in Atlanta, Georgia, US, in conjunction with the International Production & Processing Expo (IPPE).

Launched in 2019, the Friend of Pet Food award recognizes individuals who have made significant contributions to support the growth of the pet food industry. An ideal nominee will be currently employed and active in the pet food industry or an associated area, such as new product development, transportation, regulatory, academia, media or promotion.

"The Friend of Pet Food Award is a special recognition for someone who has played an instrumental

role in moving the industry forward," said Louise Calderwood, AFIA's Director of Regulatory Affairs. "We encourage our members and industry colleagues to nominate those who have made a lasting impact on improving pet nutrition."

The awardee will be invited to attend and be publicly recognized at PFC.

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FEDIAF unveils updated 2024 Nutritional Guidelines for pet food

The voice of the European Pet Food Industry, FEDIAF EuropeanPetFood unveiled the updated 2024 Nutritional Guidelines for Pet Food for Cats and Dogs. This comprehensive document details essential information on the recommended nutrient levels for cat and dog food, according to their life stage, health status, and activity levels.

Meticulously peer-reviewed by FEDIAF's Nutrition Working Group and Scientific Advisory Board (SAB), which consists of independent nutrition scientists in academia and private consulting from European countries, these guidelines are the primary reference for pet nutrition in Europe, trusted by EU authorities, consumer organizations, professionals, and pet owners alike, according to the press release.

Alice Tempel Costa, FEDIAF Deputy Secretary-General, highlights their importance: "These guidelines are the go-to, essential resource for manufacturers committed to producing safe, nutritious, and palatable food for pets. They incorporate the National Research Council (NRC) data and latest scientific research, serving as a practical guide for developing both complete and complementary pet food recipes. The document also includes a useful glossary, ingredient explanations, detail on energy requirements and annexes on body condition scores, in addition to a summary of the risks of certain human foods for pets."

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Cargill Philippines discusses future of poultry industry at PBC

Cargill Philippines hosted its 2024 Poultry Business Conference (PBC) at the Hilton Clark Sun Valley Resort in Clark, Pampanga on September 10. With the theme "Leading Business Through Synergistic Collaboration", the event stressed the vital role of strategic partnerships in addressing the evolving needs of the poultry industry and securing our food future.

As the Philippines' population grows, so does the demand for poultry as chicken and eggs are staples in every household. With per capita consumption reportedly expected to rise by 3 to 5% and production growing steadily at 7%, the future of the poultry industry is promising. However, the bright outlook comes with its share of challenges including disease, climate conditions, market fluctuations, and importation issues – all of which require collective action.

Cargill's Poultry Business Conference brought together industry leaders, poultry owners, and stakeholders to discuss emerging trends and strategies that are essential for the sector's future. Cargill explained the several key themes emerged at the conference as:

Southeast Asia, with its growing preference for poultry, is set to become a significant player in the global market. Nonetheless, local productions are impacted by consumer spending that has yet to recover to pre-pandemic levels – thanks to the sticky inflation. The Department of Agriculture's (DA) call for increased egg consumption to address oversupply issues and lower farm-gate prices highlights the need for adaptive strategies in this ever-changing market.

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