Mycotoxins in poultry – External signs can give a hint

Part 3: Bone disorders and foot pad lesions

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Bone health is essential for animals and humans. Besides giving structural support, allowing movement, and protecting vital organs, the bones release hormones that are crucial for mineral homeostasis and acid balance and serve as reservoirs of energy and minerals (Guntur & Rosen, 2012; Rath, N.C. & Durairaj, 2022; Suchacki et al., 2017).

Bone disorders and foot pad lesions are considerable challenges in poultry production, especially for fast-growing birds with high final weights. Due to pain, the animals do not move, and dominant, healthy birds may restrict lame birds' access to feed and water. In consequence, these birds are often culled. Moreover, processing these birds is problematic, and often, they must be discarded or downgraded.

Foot pad lesions, another common issue in poultry production, can also have significant economic implications. On the one hand, pain restricts birds from eating and drinking and reduces weight gain. On the other hand, for many producers, chicken feet constitute a substantial part of the economic value of the bird; therefore, discarding them represents a significant financial loss. Additionally, to push poultry production in the right direction concerning animal health and welfare, a foot pad scoring system at the processing plant is in place in European countries.

Mycotoxins affect bones in different ways

Mycotoxins, depending on their target organs, can have diverse effects on the skeleton of birds. For example, mycotoxins that target the liver can disrupt calcium metabolism, which in turn affects the mineralization of the bones (rickets) and the impairment of chondrocytes can slow down bone growth (e.g., tibial dyschondroplasia). When the kidneys are impacted, urate clearance decreases, plasma uric acid consequently increases, and urate crystals form in the synovial fluid and tendon sheaths of various joints, particularly the hock joints. These examples highlight the complex and varied ways mycotoxins can impact poultry bone health.

Inadequate bone mineralization and strength – Rickets and layer cage fatigue

Sufficient bone mineralization is essential for the stability of the skeleton. Calcium (Ca), Vitamin D, and Phosphorous (P) deficiency leads to inadequate mineralization, weakens the bone, and can cause soft and bent bones or, in the case of layers, cage fatigue – a collapse of the spinal bone- and paralysis. Inadequate bone mineralization can be caused in different ways, among them:

1. Decrease in the availability of the nutrients necessary for mineralization. This can occur if the digestibility of these nutrients deteriorates
2. Impact on the Ca/P ratio—A ratio of 1 – 2:1 is vital for adequate bone development (Loughrill et al., 2016). Mycotoxins can alter absorption and transporters for one or both elements, altering their ratio.
3. Impact on the Vitamin D receptor, affecting its expression or the transporters for Ca and P.

Aflatoxins can impair bone mineralization by different modes of action. An important one is the impairment of the digestibility of Ca and P: Kermanshahi et al. (2007) fed broilers diets with high levels of aflatoxins (0.8 to 1.2 mg AFB1/kg feed) for three weeks, which resulted in a significant reduction of Ca and P digestibility. Other researchers, however, did not find an effect on Ca and P digestibility with lower aflatoxin levels: Bai et al. (2014) feeding diets contaminated with 96 (starter) and 157 µg Aflatoxins (grower) per kg of feed to broilers and Han et al. (2008) saw no impact on cherry valley ducks with levels of 20 and 40 µg AFB1/kg diet.

Indirectly, a decrease in the availability of Ca and P due to aflatoxin-contaminated feed can be shown by blood or tibia levels of these minerals, as demonstrated by Zhao et al. (2010): They conducted a trial with broilers, resulting in blood serum levels of Ca and P levels significantly ($P<0.05$) dropped with feed contaminated with 2 mg/kg of AFB1. Another trial conducted by Bai et al. (2014) showed decreased Ca in the tibia and reduced tibial break strength.

To get more information about the effect of mycotoxins on bone mineralization and the utilization of Ca, P, and Vit. D in animal organisms, Costanzo et al. (2015) challenged osteosarcoma cells with 5 and 50 ppb of aflatoxin B1. They asserted a significant down-modulation of the expression of the Vitamin D receptor. Furthermore, they assumed an interference of AFB1 with the actions of vitamin D on calcium-binding gene expression in the kidney and intestine. Paneru et al. (2024) could confirm this downregulation of the Vit D receptor and additionally of the Ca and P transporters in broilers with levels of ≥75 ppb AFB1. They also saw a significant reduction in tibial bone ash content at AFB1 levels >230 ppb, a decreased trabecular bone mineral content and density at AFB1 520 ppb, and a reduced bone volume and tissue volume of the cortical bone of the femur at the level of 230 ppb (see Figure 1). They concluded that AFB1 levels of already 230 ppb contribute to bone health issues in broilers.

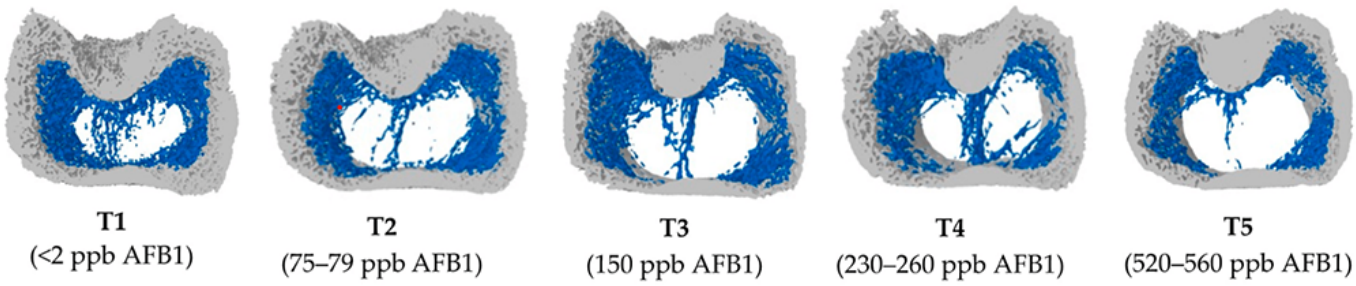

Figure 1: Increasing doses of AFB1 (<2 ppb – 560 ppb) deteriorate bone quality (Paneru, 2024): Cross-sectional images of femoral metaphysis with increasing AFB1 levels (left to right). The outer cortical bone is shown in light grey, and the inner trabecular bone in blue. Higher levels of AFB1 (T4 and T5) show a disruption of the trabecular bone pattern (less dense blue pattern with thinner and more fragmented bone strands and with wide spaces between the trabecular bone) (shown in white).

All experiments strongly suggest that aflatoxins harm bone homeostasis. Additional liver damage, oxidative stress, and impaired cellular processes can exacerbate bone health issues**.**

Trichothecenes also negatively impact bone mineralization. Depending on the mycotoxin, they may affect the gut, decreasing the absorption of Ca and P and probably provoking an imbalance in the Ca/P ratio.

For instance, when **T-2 toxin** was fed to Yangzhou goslings at 0.4, 0.6, and 0.8 mg/kg of diet, it decreased the Ca levels (halved at 0.8 mg/kg) and increased the P levels in the blood serum, so the Ca/P ratio decreased from the adequate ratio of 1 – 2 to 0.85, 0.66, and 0.59 ($P<0.05$) (Gu et al., 2023). The alterations of the Ca and P levels, the resulting decreasing Ca/P ratio, and an additional increase in alkaline phosphatase (ALP) suggest that T-2 toxin negatively impacts Ca absorption, increases ALP, and, therefore, disturbs calcification and bone development.

Other studies show that serum P levels decreased in broilers fed DON-contaminated feed with levels of only 2.5 mg/kg (Keçi et al., 2019). One reason for the lower P level is probably the lower dry matter intake, affecting Ca and P intake. Ca serum level is not typically reduced, which can be explained by the fact that Ca plays many critical physiological roles (e.g., nerve communication, blood coagulation, hormonal regulation), so the body keeps the blood levels by reducing bone mineralization. Another explanation is delivered by Li et al. (2020): After their trial with broilers, they stated that dietary P deficiency is more critical for bone development than Ca deficiency or Ca & P deficiency. The results of the trial conducted by Keçi et al. with DON (see above) were reduced bone mineralization, affected bone density, ash content, and ash density in the femur and tibiotarsus with a stronger impact on the tibiotarsus than on the femur.

In line with trichothecenes effects in Ca and P absorption, Ledoux et al. (1992) suppose that diarrhea caused by intake of fumonisins leads to malabsorption or maldigestion of vitamin D, calcium and phosphorus, having birds with rickets as a secondary effect.

Ochratoxin A (OTA) impairs kidney function, negatively affects vitamin D metabolism, reduces Ca absorption, and contributes to deteriorated bone strength (Devegowda and Ravikiran, 2009). Indications from Huff et al. (1980) show decreased tibia strength after feeding chickens OTA levels of 2, 4, and 8 µ/g, and Duff et al. (1987) report similar results also in turkey poults.

A further mycotoxin possibly contributing to leg weakness is cyclopiazonic acid produced by Aspergillus and Penicillium. This mycotoxin is known for leading to eggs with thin or visibly racked shells, indicating an impairment of calcium metabolism (Devegowda and Ravikiran, 2009). Tran et al. (2023) also showed this fact with multiple mycotoxins.

The co-occurrence of different mycotoxins in the feed – the standard in praxis – increases the risk of leg issues. A trial with broiler chickens conducted by Raju and Devegowda (2000) showed a bone ash-decreasing effect of AFB1 (300 µg/kg), OTA (2 mg/kg), and T-2 toxin (3 mg/kg), fed individually but an incomparable higher effect when fed in combination.

Impairment of bone growth – tibial

dyschondroplasia (TD)

In TD, the development of long bones is impaired, and abnormal cartilage development occurs. It is frequent in broilers, with a higher incidence in males than females. It happens when the bone grows, as the soft cartilage tissue is not adequately replaced by hard bone tissue. Some mycotoxins have been related to this condition: According to Sokolović et al. (2008), actively dividing cells such as bone marrow are susceptible to T-2 toxin, including the tibial growth plates, which regulate chondrocyte formation, maturation, and turnover.

T-2 toxin: In a study with primary cultures of chicken tibial growth plate chondrocytes (GPCs) and three different concentrations of T-2 toxin (5, 50, and 500 nM), He et al. (2011) found that T-2 toxin decreased cell viability, alkaline phosphatase activity, and glutathione content ($P < 0.05$). Additionally, it increased the level of reactive oxygen species and malondialdehyde in a dose-dependent way, which could be partly recompensated by adding an antioxidant (N-acetyl-cysteine). They concluded that T-2 toxin inhibits the proliferation and differentiation of GPCs and contributes, therefore, to the development of TD, altering cellular homeostasis. Antioxidants may help to reduce these effects.

Gu et al. (2023) investigated the closely bodyweight-related shank length and the tibia development in Yangzhou goslings fed feed with six different levels (0 to 2.0 mg/kg) of T-2 toxin for 21 days. They determined a clear dose-dependent slowed tibial length and weight growth ($p<0.05$), as well as abnormal morphological structures in the tibial growth plate. As tibial growth and shank length are closely related to weight gain (Gu et al., 2023; Gao et al., 2010; Ukwu et al., 2014; Yu et al., 2022), their slowdown indicates lower growth performance.

Fumonisin B1 is also a potential cause of this kind of leg issue. Feeding 100 and 200 mg/kg to day-old turkey poults for 21 days led to the development of TD (Weibking et al., 1993). Possible explanations are the reduced viability of chondrocytes, as found by Chu et al. (1995) after 48 h of exposure, or the toxicity of FB1 to splenocytes and chondrocytes, which was shown in different primary cell cultures from chicken (Wu et al., 1995).

Bacterial chondronecrosis with osteomyelitis lameness (BCO) can be triggered by DON and FUM

BCO presents a highly critical health and welfare issue in broiler production worldwide, and it is estimated that 1-2 % of condemnations in birds at the marketing age result from this disease. What is the reason? Today’s fast-growing broilers are susceptible to stress. This enables pathogenic bacteria to compromise epithelial barriers, translocate from the gastrointestinal tract or the pulmonary system into the bloodstream, and colonize osteochondrotic microfractures in the growth plate of the long bone. This can lead to bone necrosis and subsequent lameness.

In their experiment with DON and FUM in broilers, Alharbi et al. (2024) showed that these mycotoxins reduce the gut’s barrier strength and trigger immunosuppressive effects. They used contaminations of 0.76, 1.04, 0.94, and 0.93 mg DON/kg of feed and 2.40, 3.40, 3.20, and 3.50 mg FUM/kg diet in the starter, grower, finisher, and withdrawal phases, respectively. The team observed lameness on day 35; the mycotoxin groups always showed a significantly ($P<0.05$) higher incidence of cumulative lameness.

The increase in uric acid leads to gout

In general, mycotoxins, which damage the kidneys and, therefore, impact the renal excretion of uric acid, are potentially a factor for gout appearance.

One of these mycotoxins is T-2 toxin. With the trial mentioned before (Yangzhou goslings, 21 days of exposure), Gu et al. (2023) showed that the highest dosage of the toxin (2.0 mg/kg) significantly increased uric acid in the blood ($P<0.05$), possibly leading to the deposit of uric acid crystals in the joints and to gout.

Huff et al. (1975) applied Ochratoxin to chicks at 0, 0.5, 1.0, 2.0, 4.0, and 8.0 µg/g of feed during the first three weeks of life. They found ochratoxin A as a severe nephrotoxin in young broilers as it caused damage to the kidneys with doses of 1.0 µg/g and higher. At 4.0 and 8.0 µg/g doses, uric acid increased by 38 and 48%, respectively (see Figure 2). Page et al. (1980) also reported increased uric acid after feeding 0.5 or 1.0 mg/kg of Ochratoxin A to adult white Leghorn chickens.

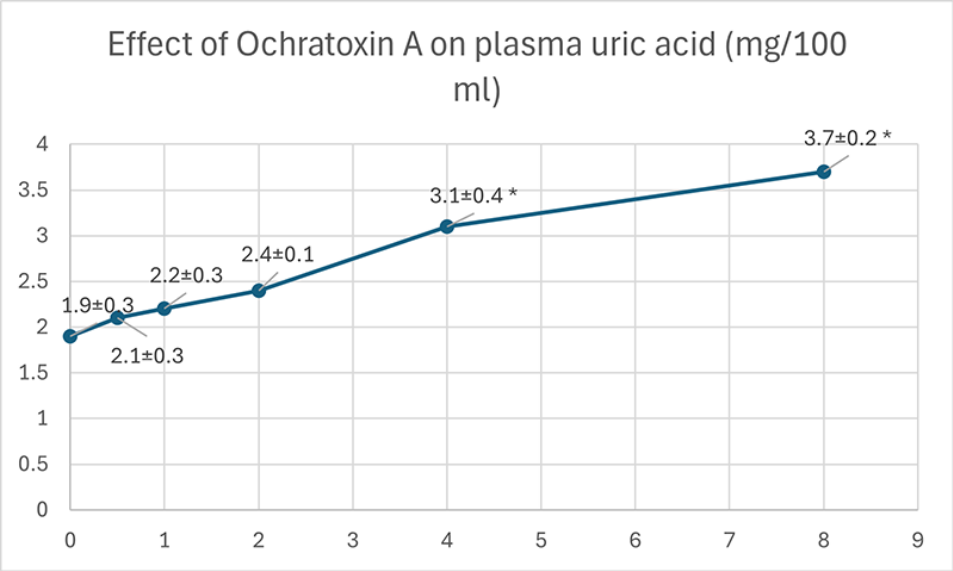

Figure 2: Effect of Ochratoxin A on plasma uric acid (mg/100 ml) (according to Huff et al., 1975)

Foot pad lesions – a further hint of mycotoxicosis

Foot pad lesions often result from wet litter, originating from diarrhea due to harmed gut integrity. Frequently, mycotoxins impact the intestinal tract and create ideal conditions for the proliferation of diarrhea-causing microorganisms and, therefore, secondary infections. Some also negatively impact the immune defense system, allowing pathogens to settle down or aggravate existing bacterial or viral parasitic diseases. In general, mycotoxins affect the physical (intestinal cell proliferation, cell viability, cell apoptosis), chemical (mucins, AMPs), immunological, and microbial barriers of the gut, as reported by Gao et al. (2020). Here are some examples of the adverse effects of mycotoxins leading to intestinal disorders and diarrhea:

- Mycotoxins can modulate intestinal epithelial integrity and the renewal and repair of epithelial cells, negatively impacting the intestinal barrier's intrinsic components; for instance, DON can significantly reduce the transepithelial electrical resistance (TEER)(Grenier and Applegate, 2013). A higher permeability of the epithelium and a decreased absorption of dietary proteins can lead to higher protein in the digesta in the small intestine, which serves as a nutrient for pathogens including *perfringens* (Antonissen et al., 2014; Antonissen et al., 2015).
- The application of Ochratoxin A (3 mg/kg) increased the number of S. typhimurium in the duodenum and ceca of White Leghorn chickens (Fukata et al., 1996). Another trial with broiler chicks at a concentration of 2 mg/kg aggravated the symptoms due to an infection by S. gallinarum (Gupta et al., 2005).
- In a trial by Grenier et al., 2016, feed contaminated with DON (1.5 mg/kg), Fumonisin B (20 mg/kg), or both mycotoxins aggravated lesions caused by coccidia.
- DON impacts the mucus layer composition by downregulating the expression of the gene coding for MUC2, as shown in a trial with human goblet cells (Pinton et al., 2015). The mucus layer prevents pathogenic bacteria in the intestinal lumen from contacting the intestinal epithelium (McGuckin et al., 2011).
- Furthermore, DON and other mycotoxins decrease the populations of lactic acid-producing bacteria, indicating a shift in the microbial balance (Antonissen et al., 2016).
- FB1 causes intestinal disturbances such as diarrhea, although it is poorly absorbed in the intestine. According to Bouhet and Oswald (2007), the main toxicological effect ascertained in

vivo and in vitro is the accumulation of sphingoid bases associated with the depletion of complex sphingolipids. This negative impact on the sphingolipid biosynthesis pathway could explain other adverse effects, such as reduced intestinal epithelial cell viability and proliferation, modification of cytokine production, and impairment of intestinal physical barrier function.
- T-2 toxin can disrupt the immune response, enhance the proliferation of *coli* in the gut, and increase its efflux (Zhang et al., 2022).

All these mycotoxins can cause foot pad lesions by impacting gut integrity or damaging the gut mucosa. They promote pathogenic organisms and, thus, provoke diarrhea and wet litter.

Mitigating the negative impact of mycotoxins on bones and feet is crucial for performance

Healthy bones and feet are essential for animal welfare and performance. Mycotoxins can be obstructive. Consequently, the first step to protecting your animals is to monitor their feed. If the analyses show the occurrence of mycotoxins at risky levels, proactive measures must be taken to mitigate the issues and ensure the health and productivity of your poultry.

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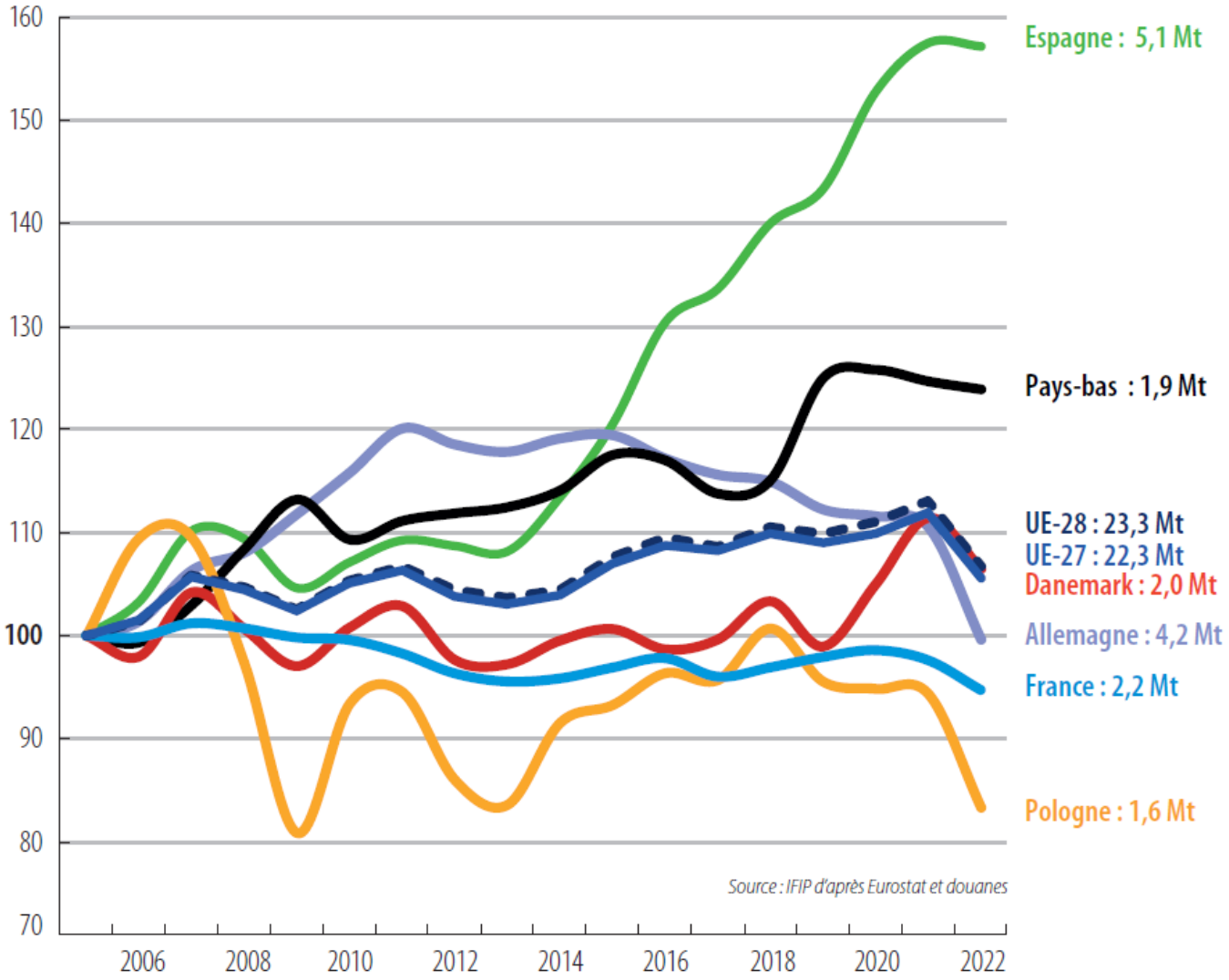
The Global and European Pork Industry: An Overview from IFIP



Institut du Porc (IFIP), the French pork research and development institute and a key player in the French agricultural sector, has recently published its 2024 report, titled Porc par les Chiffres 2023-2024. The document provides a comprehensive overview of the global, European, and French pork industries and is a critical resource for all industry professionals.

The Global Pork Industry

The global pork industry has experienced significant changes over recent years. In 2021, global pork production reached approximately 108 million tons of carcass weight equivalent (CWE), largely driven by China's recovery from African Swine Fever (ASF). By 2022, global production continued to rise, though at a slower pace due to the stabilization of China's pig herd. However, the global landscape remains varied with notable regional differences.

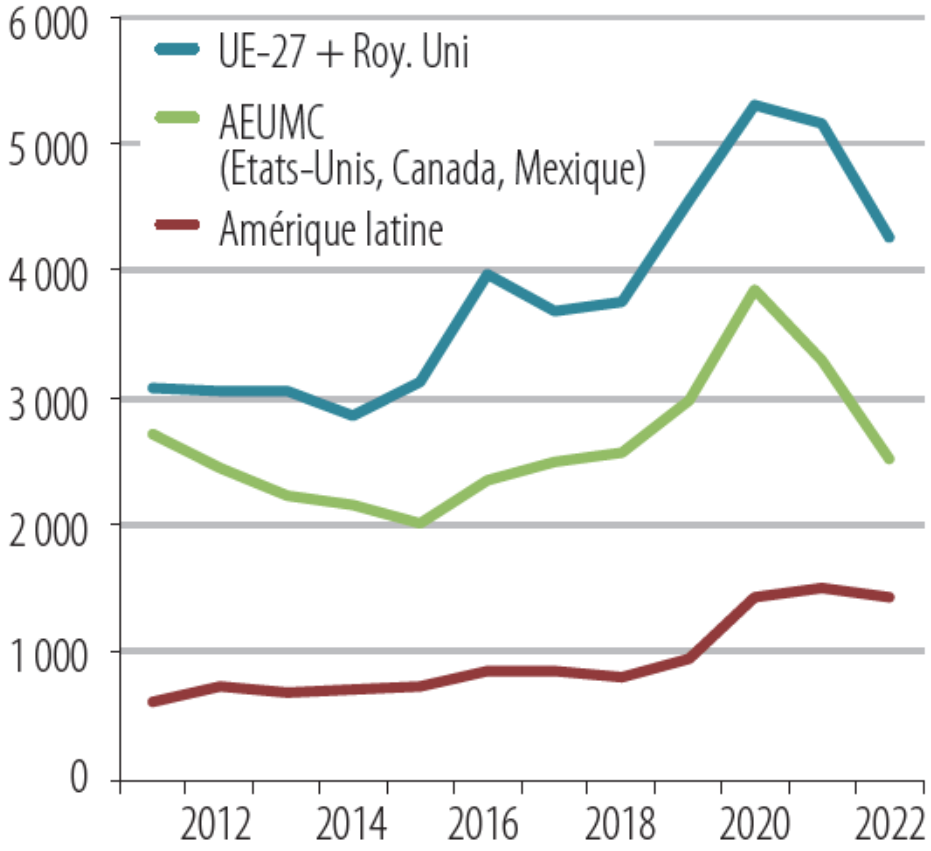


*Figure 1. Main pork exporters (in 1000 tons)**

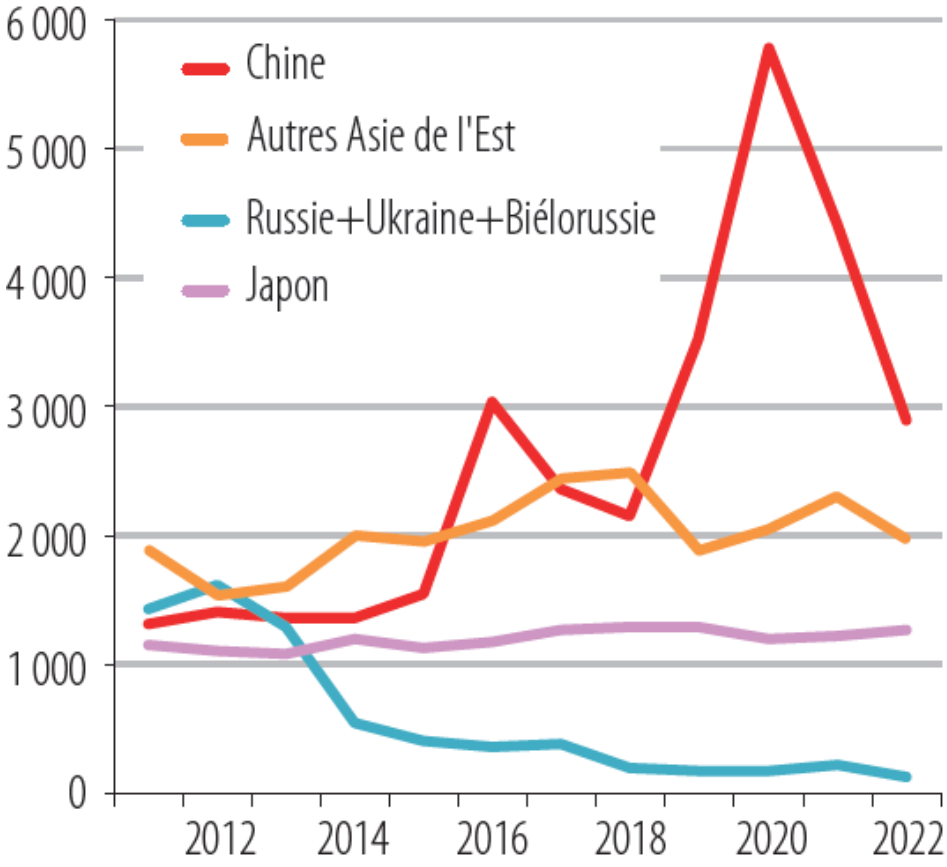


*Figure 2. Main pork importers (in 1000 tons)**

**Excluding intra-EU and intra-EUMCA-EU trade evolving: EU15 (2000-2003), EU25 (2004-2006), EU27*

(2007-2013), EU28 (2014)

In Asia, China dominates pork production, contributing 47.5 million tons in 2021. Other significant producers include Vietnam, Japan, South Korea, and the Philippines. In Europe, the EU-28 collectively produced 24.6 million tons, with Germany, Spain, and France being the leading producers. In the Americas, the United States and Brazil are major contributors, with the U.S. producing 12.6 million tons and Brazil 4.4 million tons. The production in other regions like Africa and Oceania remains relatively small in comparison.

The global pork trade is equally dynamic. In 2022, the major exporters included the European Union, the United States, and Canada. Key importers were China, Japan, and Mexico. The shifting demands and production capacities have led to fluctuating trade patterns, impacting global pork prices and market stability.

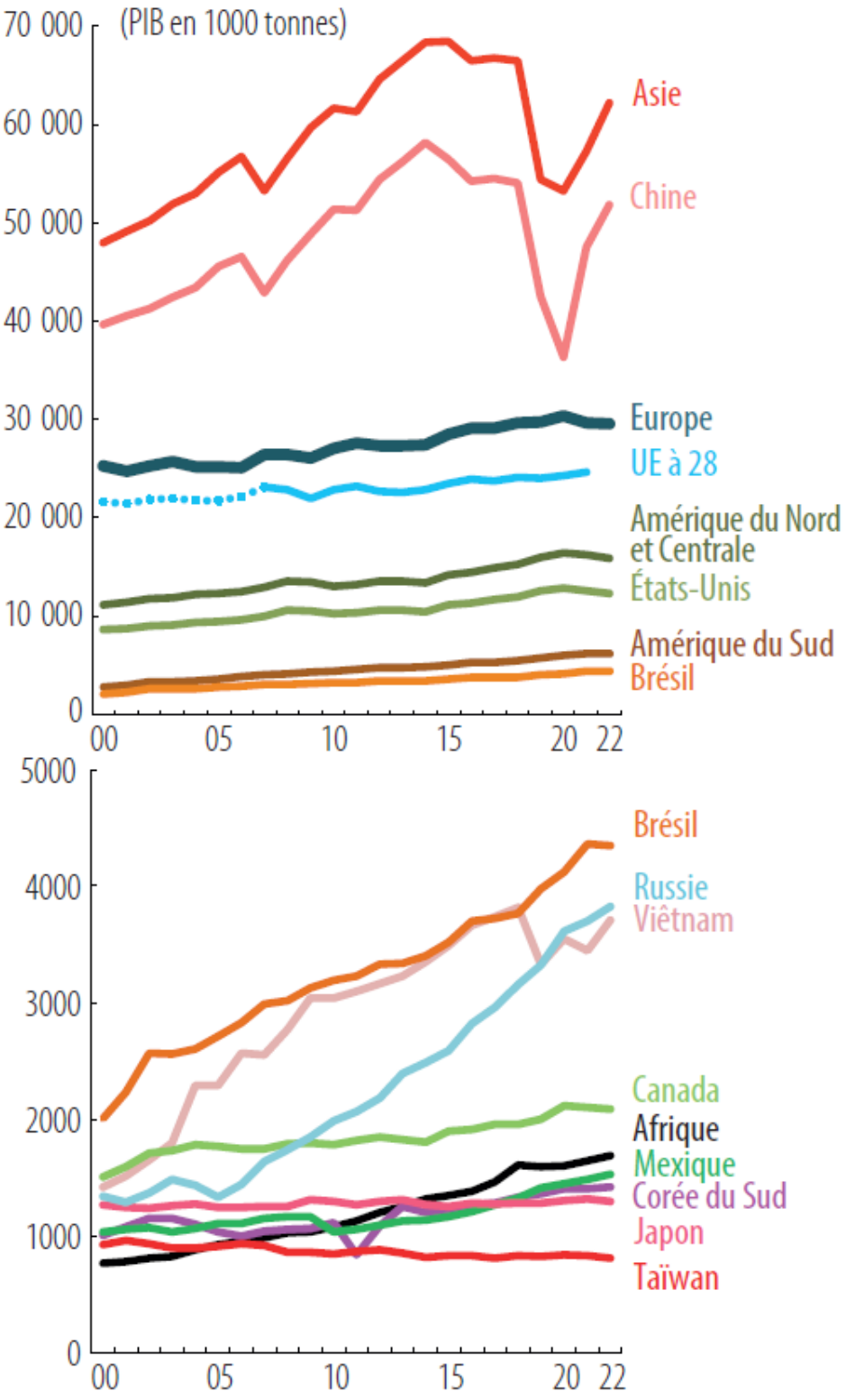


Figure 3. Evolution of global pork production (GDP in 1000 tons)

Pork Industry in the European

Union

The European pork industry faced a challenging year in 2022, marked by a decline in production and various economic pressures. The EU's pork production fell by approximately 5%, equating to a loss of over 12.6 million pigs for slaughter. Germany, historically one of the largest producers, saw a significant 10% reduction in output due to ongoing economic and sanitary crises. Spain, while typically a growing market, experienced its first production decline since 2014 due to increased piglet mortality rates from health issues.

Despite these challenges, some regions showed resilience. France managed a relatively smaller production decrease of 2%, maintaining its position as a key player in the European market. The economic environment, characterized by rising inflation and high feed costs, pushed pork prices to record levels across the continent, with French pork prices ranking high in Europe, just behind Spain.

The consumption patterns within the EU also varied significantly. Countries like Denmark and Spain exhibited high per capita pork consumption rates, while others like the United Kingdom and Italy showed more moderate consumption levels. This disparity reflects both cultural preferences and economic conditions across the region.

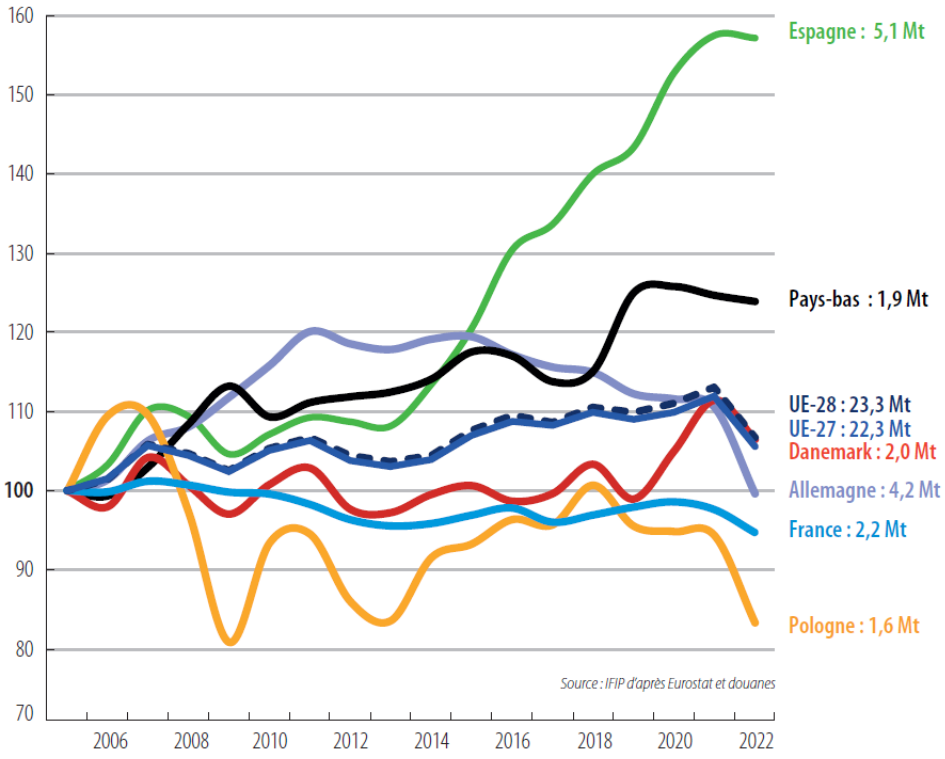


Figure 4. Evolution of pork production in the main EU countries (tons, from a base of 100 in 2005)

The French Pork Industry

In France, the pork industry in 2022 faced a year of significant adjustments. The country produced 2.19 million tons of carcass weight equivalent, a 3% decrease from the previous year. This decline was attributed to reduced slaughter weights and lower export volumes of live pigs. Despite these challenges, France remained the third-largest pork producer in the EU, following Spain and Germany.

Regionally, pork production is concentrated in areas like Brittany and Pays de la Loire. Brittany alone accounts for a substantial portion of the national production. The distribution of pork farms across France highlights the regional specialization, with significant variations in production volumes from one region to another.

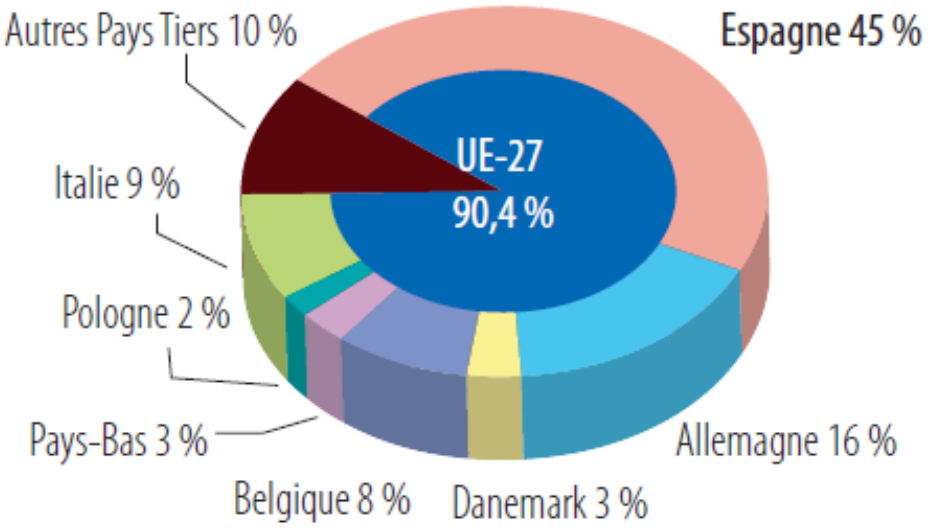


Figure 5. Suppliers to France (percentage of total imports)

French pork exports faced hurdles due to reduced demand from China, which saw a 35% drop in imports from France in 2022. However, increased sales to other Asian markets like the Philippines and Japan partially offset this decline. In terms of value, the higher pork prices helped mitigate the impact of lower export volumes, with total export values reaching 1.76 billion euros.

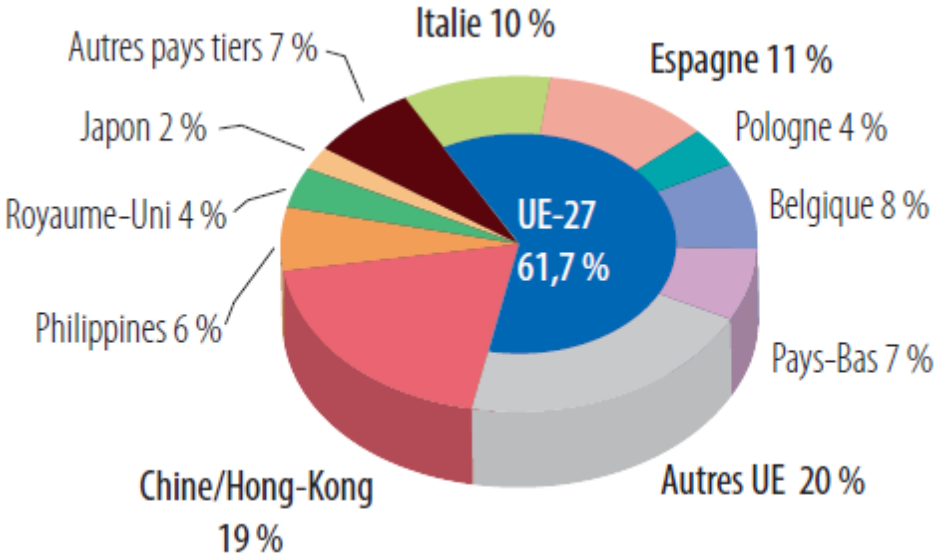


Figure 6. Export targets for France (percentage of total exports)

Economic and Production Challenges

The pork industry globally and within the EU faces several ongoing challenges. Rising feed costs, largely driven by global commodity price increases, have significantly impacted production costs. In Europe, the economic downturn and ongoing health crises like ASF and PRRS (Porcine Reproductive and Respiratory Syndrome) continue to challenge producers.

In France, inflation and high production costs have led to a tightening of profit margins for pig farmers. The high costs of feed and energy, coupled with lower production volumes, have made it difficult for many producers to remain profitable. The industry has responded with efforts to improve efficiency and sustainability, though these measures take time to implement and yield results.

Future Outlook

In Asia, China’s recovery from ASF will likely stabilize, but the focus will shift towards improving biosecurity and production efficiency. In Europe, the industry will need to navigate economic challenges and health crises while adapting to changing consumer preferences towards more sustainable and ethical production practices.

For France, the key to future success will lie in balancing production efficiency with market demands. Investments in technology, biosecurity, and sustainable practices will be crucial. Additionally, expanding export markets beyond traditional partners will help mitigate the risks associated with market fluctuations.

The pork industry, both globally and within the EU, is at a pivotal point. The combination of economic pressures, health challenges, and shifting market dynamics necessitates strategic adjustments. By focusing on efficiency, sustainability, and market diversification, the industry can navigate these challenges and continue to thrive in the coming years.

The report can be read in full here.

EW Nutrition unveils revolutionary xylanase Axxess XY at Victam 2024

Singapore – March 12, 2024 – EW Nutrition, a leading innovator in the animal nutrition industry, officially launched its newest product, Axxess XY, in VICTAM 2024, at the BITEC Exhibition Center in Bangkok.

Axxess XY is an intrinsically thermostable xylanase that breaks down both the soluble and insoluble fiber fraction from feed ingredients such as corn, wheat, grain by-products and oilseed cakes. It releases nutrients trapped in cell wall fractions and improves the gut environment by reducing viscosity. The newly launched product thus gives feed producers peace of mind when working with various feed processing conditions, as well as significant feed cost savings with flexibility in feed formulation.

"The successful launch of Axxess XY in VICTAM 2024 demonstrates our commitment to provide cutting-edge solutions to address the evolving needs of animal production and to contribute to the growth of the industry in the region." said Ramakanta Nayak, regional director for EW Nutrition South East Asia/Pacific.

Dr. Ajay Awati, Global Director of Enzymes, EW Nutrition, expressed enthusiasm about the product launch, stating, "We are excited to have had such an amazing response to Axxess XY during and after our launch at VICTAM 2024. Axxess XY is the result of EW Nutrition R&D team's hard work and dedication to pushing the boundaries of enzymes technology in animal nutrition."

Axxess XY is touted as the most advanced xylanase yet, making EW Nutrition an important player in the enzyme market.

About EW Nutrition

EW Nutrition offers animal nutrition solutions to the feed industry. The company's focus is on gut health, supported by other product lines. EW Nutrition researches, develops, produces, sells, and services most of the products it commercializes. In 50 countries, key accounts are served directly by EW Nutrition's own personnel.

For more information, please visit https://staging-ewnutritioncom.kinsta.cloud.

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EW Nutrition acquires BIOSTABIL product line from dsm-firmenich

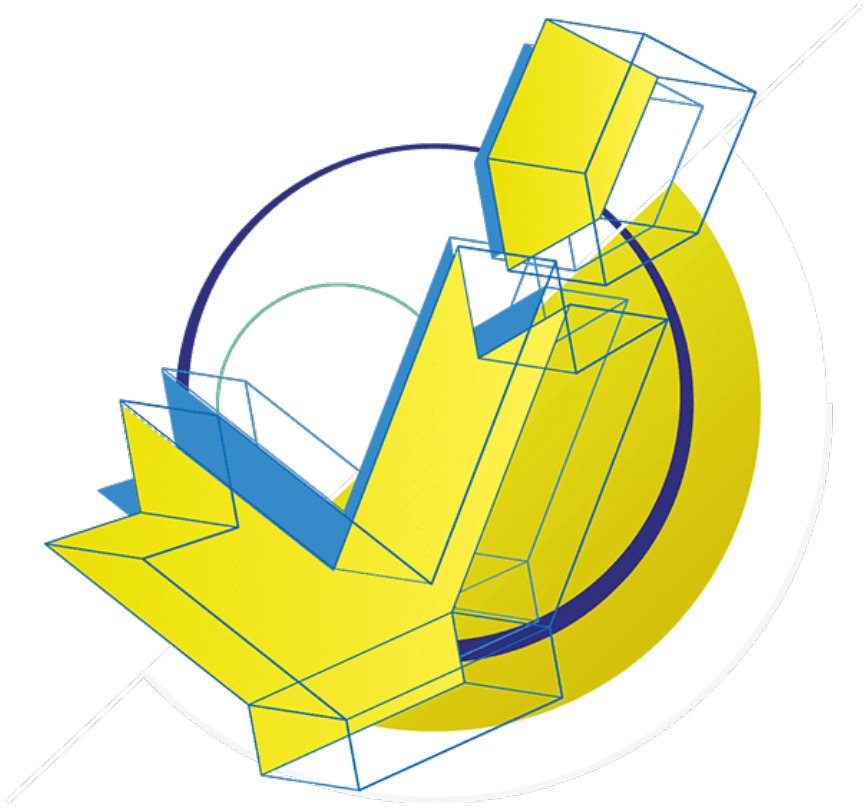
VISBEK, 5 March 2024 – EW Nutrition, a global provider of animal nutrition solutions, announced today that it has acquired the BIOMIN BIOSTABIL product line from dsm-firmenich. The deal gives EW Nutrition ownership over an established and successful line of silage inoculants.

“The agreement we have concluded gives us a solid foothold in a sector where we are currently developing a more substantial presence” says Jan Vanbrabant, CEO of EW Nutrition. “EW Nutrition continues to expand strategically, enriching its portfolio with market-leading solutions, developed in-house or through acquisitions. The Biomin Biostabil line joins an innovative portfolio that has been growing tremendously in the last three years with the launch of Ventar D and Pretect D, our Feed Quality and Pigment lines acquired in 2021, and yet another momentous global launch coming up shortly.” This solid, well-proven line of silage inoculants, says Vanbrabant, will be an important addition to customers of EW Nutrition’s On-Farm Solutions business around the world.

The transaction was closed on March 1, 2024. Under the services agreement concluded, all customers will be actively supported over the next months, while the asset, brand, and go-to-market will be transitioned to EW Nutrition in the coming period.

The financial details of the sale remain confidential.

Gustavo Tesolin appointed Regional Director of EW Nutrition LATAM



Gustavo Tesolin

29 January 2024, Visbek – German-based company EW Nutrition, a global provider of functional animal nutrition solutions, has appointed Gustavo Carlos Tesolin as its Regional Director for Latin America.

An agricultural engineer by training, Gustavo Tesolin has forged an international career in the Animal Health business during the last 25 years. With different leadership roles in several major international organizations such as Novartis, Elanco, and Erber Group, Mr. Tesolin brings along important experience in Commercial Operations, P&L drive, and Strategy execution, with special emphasis on team development and geographic expansion.

“I am really excited to join a company as innovation-driven and science-focused as EW Nutrition,” Tesolin said. “The recent launch of VENTAR D, a novel phytogenic specifically designed and developed to improve animal husbandry results, will continue to strengthen our position in the region, together with our winning brands PRETECT D and ACTIVO” and added, “I am eager to take on the challenge and better acquaint the market with an excellent portfolio centered on Gut Health Management, Digestibility, and Feed Quality.”

Jan Vanbrabant, CEO of EW Nutrition, noted that Gustavo Tesolin is “the perfect combination of the right experience and the right attitude. We are happy to have found in him a proven leader with not just

excellent market knowledge, but with the same values we share in EW Nutrition: a passion for innovation in the service of our customers, and relentless curiosity and energy to find the right solution."

This appointment comes on the heels of several top-tier global hires over the last 18 months and reflects the company's commitment to the Latin American market.

Tesolin will move to Mexico to coordinate EW Nutrition's expansion in Latin American countries.

About EW Nutrition

EW Nutrition is a German-based international animal nutrition company that offers comprehensive solutions for animal gut health, toxin risk management, growth performance, and more.

Press contact

marketing@ew-nutrition.com

EW Nutrition welcomes Jan Vanbrabant as new CEO

VISBEK (Germany), 1 September 2023 — EW Nutrition, a leading global provider of functional animal nutrition solutions, welcomes Jan Vanbrabant as its new Chief Executive Officer.

Jan has a PhD degree in microbiology and is an experienced manager in animal health and nutrition, having held leadership roles at DSM, Erber Group, Biomin and Kemin.

"We are very pleased that we have found a strong management lead in Jan, who embodies the philosophy of EW Nutrition", says Jan Wesjohann, Managing Director of parent company EW Group. "EW Nutrition is an innovation-driven company, with intensive investment in R&D. Together with Jan we are looking to enter the next growth phase of EW Nutrition."

"I am very excited to be joining the EW Nutrition team," said Jan Vanbrabant. "EW Nutrition's long-term focus has created an extremely competitive portfolio. EW Nutrition is uniquely positioned to support its

customers in mastering the challenges of the changing animal health and nutrition environment."

Former CEO Michael Gerrits is heading into retirement after six years leading EW Nutrition. "I want to thank Michael Gerrits for his essential stewardship in bringing the company to the next level," said Jan Wesjohann.

About EW Nutrition

EW Nutrition is a global animal nutrition company that offers integrators, feed companies, and veterinarians comprehensive solutions for animal gut health and performance, feed quality, digestibility, and more. It is focused on promoting sustainable growth through reduced FCR, natural support against challenges, reduced need for antibiotics, and planet-friendly protein production.

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EW Nutrition showcases customer-focused solutions for the animal nutrition industry at VIV Asia 2023

Singapore – March 1, 2023 – EW Nutrition will participate in VIV Asia 2023 to showcase science-backed solutions that meet the challenging needs of the animal nutrition industry. Held in Bangkok, Thailand, from March 8 to 10, 2023, VIV Asia is one of the biggest and most complete feed to food events in Asia, dedicated to the world of livestock production and animal husbandry.

"We are constantly innovating to provide best-in-class concepts and solutions for the industry. Our participation in VIV Asia 2023 will be a good opportunity to connect and discuss with our partners on how to collaborate to provide customised solutions in line with their needs." said **Ramakanta Nayak**, regional director for EW Nutrition South East Asia/Pacific.

Located at Booth 3550, guests are invited to explore EW Nutrition's new solutions and initiatives at this year's VIV Asia, such as:

- **Ventar D**
  Ventar D is a high-ROI, innovative proprietary blend of phytomolecules with efficient delivery, formulated to consistently support gut health and improve performance.
- **Pretect D**
  Pretect D acts as a natural solution to support the efficiency of coccidiosis control. Pretect D, a unique proprietary blend of phytomolecules, offers natural support during Eimeria-related challenges, making it an effective addition to programs focused on coccidiosis control.
- **Spearhead**
  EW Nutrition strives to contribute to sustainability in the animal protein production chain through the new initiative "Spearhead", focusing on highly improved feed conversion, reduced energy use, reduced contaminants, and reduced emissions from farms.

Partnering with industry experts and key opinion leaders, EW Nutrition is also inviting VIV guests to attend a series of topical presentations at the booth. Under the title "Showtime", these presentations aim to provide actionable insights and encourage discussion about the trends and challenges of the animal nutrition industry. "Showtime" covers a variety of topics, including:

- Why is it important to measure outside temperature properly, 8 March, 11am
- Coccidiosis Vaccination: Don't take it for granted!, 8 March, 3pm
- Antibiotics reduction – the way forward for safe & sustainable food production, 8 March, 4pm
- Feed cost optimization, 9 March, 11am
- Better gut health, better egg shells, 9 March, 3pm
- Water – the central nutrient for growth, 10 March, 11am

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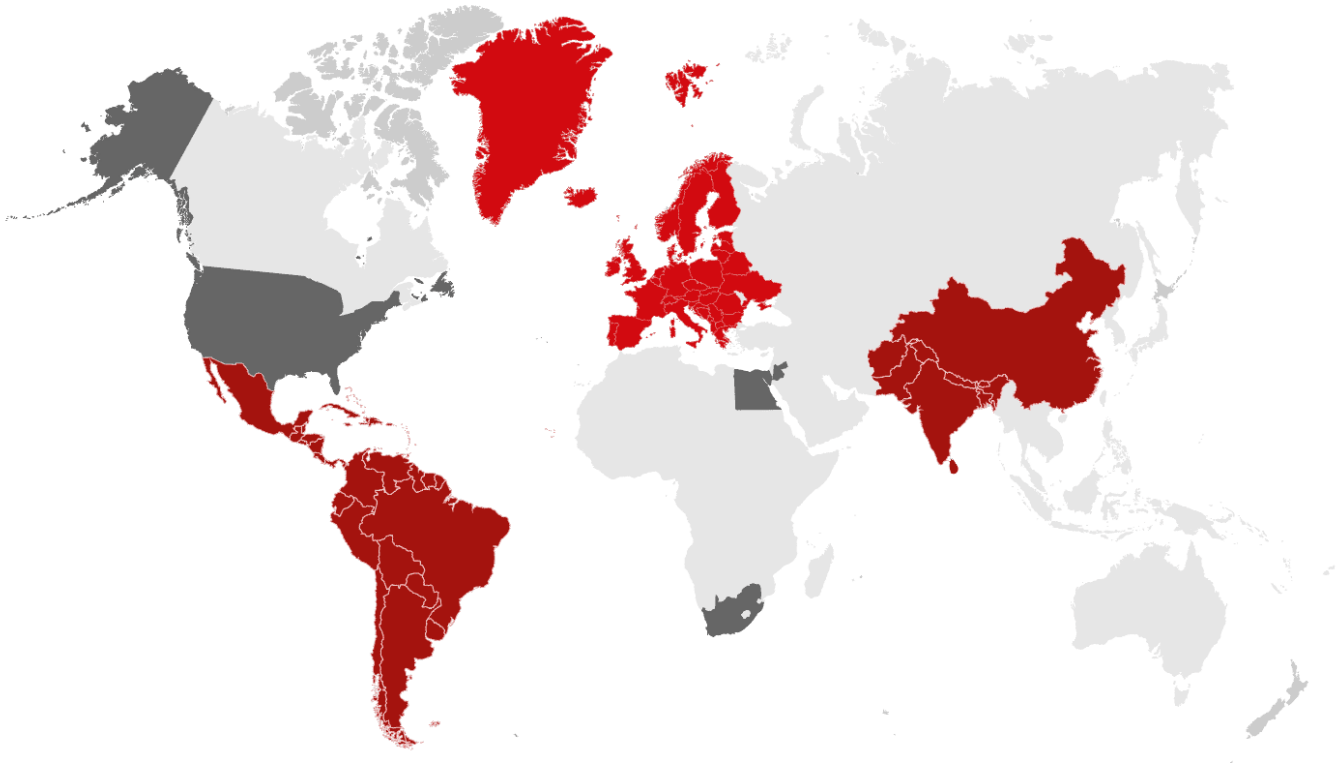
Global mycotoxin report: Jan-June 2022 | Find the pain points



*By Marisabel **Caballero**, Global Technical Manager Poultry, and Vinil Samraj Padmini, Global Category Manager Feed Quality, EW Nutrition*

The pressure of climate change is taking a severe toll – not just on weather-dependent industries, but already on society in general. For feed and food, the impact is already dramatic. Extreme weather events, increased temperatures, and rising carbon dioxide levels are facilitating the growth of toxigenic fungi in crops, severely increasing the risk of mycotoxin contamination. Once feed is contaminated, animal health can be impacted, with chain reactions affecting productivity for animal farming, as well as, ultimately, the quality and availability of food.

***** Download the full report for an analysis of mycotoxin contamination risks around the world**

EW Nutrition showcases innovative solutions at International Dairy Week 2022

Singapore – January 14, 2022 – EW Nutrition will participate in Australia's International Dairy Week (IDW) in Tatura, Victoria, from January 16 to 20, 2022. Visitors will learn about innovative solutions for ruminant nutrition. Located at Site 37, EW Nutrition also invites attendees to explore topics such as toxin risk management and respiratory issues.

"We are excited to be here at IDW 2022. This is a great opportunity for us to showcase our cutting-edge dairy solutions. We look forward to connecting and working with our valued customers to enhance ruminant health and performance," said **David Sherwood**, commercial director for Oceania at EW Nutrition.

Within the portfolio, the showcased products are Pasturefed Cattle Assurance System (PCAS) certified:

Activo Premium
Activo Premium contains standardized amounts of selected phytomolecules.

Mastersorb Gold
Mastersorb Gold is part of EW Nutrition's Toxin Risk Management Program, which also includes services, on-site advice, and expert consultancy.

Prote-N
Prote-N is a slow-release source of nonprotein nitrogen (NPN).

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Email: zack.mai@ew-nutrition.com

EW Nutrition achieves PCAS Certification in Australia

Singapore – November 1, 2021 – EW Nutrition has successfully passed an external audit conducted by the Cattle Council of Australia (CCA) and achieved Pasturefed Cattle Assurance System (PCAS) certification for three products: Activo Premium, Mastersorb Gold, and Prote-N.

The PCAS is a certification program that enables grassfed cattle producers to prove claims relating to pasturefed or grassfed production methods. EW Nutrition also achieved two optional modules under the PCAS Standards relating to the freedom from antibiotics and hormone growth promotants (HGPs). As a certified supplier, EW Nutrition is able to provide feed products to the industry to support pasturefed or grassfed production methods.

“We are pleased to receive the certification for our solution offerings in Australia. The qualification of these products is a testament of our commitment to work together with the industry to mitigate the impact of antimicrobial resistance. By pursuing our objectives in animal nutrition, our work contributes to increasing the efficacy of human healthcare.” said David Sherwood, Commercial Director Oceania with EW Nutrition.

The PCAS certified products are:

Activo Premium
Activo Premium contains standardized amounts of selected phytomolecules.

Mastersorb Gold
Mastersorb Gold is part of EW Nutrition's Toxin Risk Management Program, which also includes services, on-site advice, and expert consultancy.

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For more information, please visit https://staging-ewnutritioncom.kinsta.cloud.
For more information about PCAS, please visit https://pcaspasturefed.com.au/

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