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The animal feed industry: A true testament to resilience

By Anina Hunter, chairperson, AFMA

As we approach the close of another year, I would like to reflect on the journey we, as the Animal Feed Manufacturers Association of South Africa, have embarked upon. The year 2023 to 2024 has been one of profound challenges, resilience, and triumphs that remind us of the indomitable spirit of our people.

Since the end of 2023, global commodity prices have faced a bearish trend, yet domestic prices have held steady. The season, which began with much promise thanks to December rains, quickly became challenging with the onset of extreme heat and dry conditions during critical production stages – courtesy of El Niño.

Maize prices have shifted from Durban export parity to Cape import parity, while the local soya bean crop has suffered a significant reduction of one million metric tons compared to the previous season. Soya bean crush margins, once robust, have deteriorated, leading to a rally in local meal base prices.

Despite these hurdles and the uncertainty surrounding the true size of the maize crop due to low delivery figures, we remain hopeful. We look forward to the possibility of La Niña bringing favourable rains and abundant summer crop supplies in the upcoming season.

Challenges on several fronts

The outbreak of avian influenza remains a stark reminder of the vulnerabilities in our agricultural sector, particularly within the poultry industry. The impact has been far-reaching, affecting not only poultry producers but also our feed manufacturing sector, which is intricately linked to the health and productivity of our nation's flocks.

As an association, we have worked tirelessly to support our members through this crisis, advocating for stronger biosecurity measures, ensuring that affected producers receive necessary aid, and promoting research into innovative feed solutions that could help mitigate the effects of such outbreaks in the future. This fight is far from over, but we remain committed to standing by our members and navigating these turbulent waters together.

Amid these environmental impacts, we continue to face the persistent challenges posed by load shedding. The erratic power supply has tested our resilience and forced us to find innovative ways to keep our operations running.

Our strength defines us

It is this perseverance and creativity that unite and bind us as an industry. While the national government grapples with its own struggles, we have not allowed political uncertainties to deter us from our goals. Instead, we have risen above them, finding strength in our shared purpose and commitment to feeding our nation and beyond.

As we reflect on our industry's journey, we cannot overlook the recent successes that South Africa has enjoyed on the sports fields. Whether it's rugby, cricket, soccer, or swimming – our athletes continue to remind us of the power of dedication, teamwork, and the relentless pursuit of excellence. These victories are more than just wins on a scoreboard – they are a testament to the resilience and strength that define us as a nation.

As we look to the future, let us draw inspiration from these achievements. Like our athletes, we too have faced adversities, yet we continue to prevail. Let us harness the power of artificial intelligence responsibly, tackle the challenges of load shedding with ingenuity, and navigate the complexities of our national landscape with unwavering determination. Our strength, our resolve, and capacity to triumph against all odds will ensure that together, we will continue to build an industry that not only survives but thrives, contributing to the success of our beloved country.

Anina Hunter.

I cannot help but foster a deep sense of national pride and notice the remarkable display of mutual respect that I have experienced among industry members. It is this spirit of comradery and encouragement that resonated with me. Without our suppliers, customers, and stakeholders we do not have a business. We need to constantly cultivate an environment that nurtures and supports our industry and ensure the advancement of our industry and ecosystem.

To contact Anina Hunter, send an email to anina.hunter@epol.co.za.

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NEWS & VIEWS

Important dates on the AFMA calendar

25 November
AFMA Trade Committee Meeting

4 December
AFMA BoD Meeting

Falling feed wheat prices drive down maize demand

A significant reduction in feed wheat prices is intensifying competition with maize sourced from Ukraine and other regions in the animal feed market, with feed mills likely to adjust the ratios on their input grains as a result.

Maize is the most widely used feed grain globally, with production of 1,2 billion tonnes in 2023/24, of which 764,9 MMt was used as animal feed, according to the United States Department of Agriculture. That compares with wheat production of 789,6 MMt and feed usage of 158,9 MMt.

In Ukraine, traders have expressed growing concerns regarding the weakened maize market, especially with the new harvest season underway. A procurement trader at one Spanish feed mill remarked that imported wheat has become more competitive than maize.

As the market continues to evolve, the interplay between feed wheat and maize prices will be crucial in shaping the future of the animal feed industry. – *Hellenic Shipping News*

Tanzanian producers to benefit from tax exemption

The government of Tanzania through its Ministry of Agriculture announced a strategic tax exemption strategy that will see horticultural and cereal crop producers in the country reduce post-harvest losses. "We are looking at offering farmers technologies at low costs so that they will not only be able to enhance their productivity and sustainability, but also use them to manage post-harvest losses through value addition approaches and timely sales," said Gerald Mweli, Permanent Secretary in the Ministry of Agriculture.

He explained that a farmer with ten acres of sunflower could invest in a machine costing just Tsh3 million, sufficient to produce cooking oil for the local community. This dedication to enhancing agricultural practices is evident in the impressive surge in sunflower production, which has skyrocketed from 490 000 tonnes to 1,1 million tonnes within a single year, driven by government subsidies for high-quality seeds.

Tanzania is dedicated to empowering producers to add value to their crops and prepare them for the market.
– *Farmers Review Africa*

Five-year low for maize harvest reported

Monitoring the 2023/24 harvest forecasts has been interesting following an El Niño-induced heat that decimated Southern African crops earlier in the year. After the initial optimism of 14,36 million tonnes in the first estimate despite the drought conditions, the National Crop Estimates Committee (CEC) downgraded their forecast in the subsequent updates.

In September, the maize harvest estimates fell below 13 million tons for the first time in five years at 12,8 million tonnes, which is down 22% year-on-year (y/y) and 5% below the ten-year average of 13,47 million tonnes, according to the CEC's eighth production forecast.

On other crops, the CEC downgraded the sunflower harvest estimate by 2% from the previous month to 635 750 tons, which is 11,7% lower y/y. Soya bean was, however, revised upwards by 1,8% m/m to 1,81 million tonnes but still down by 34,6% y/y, thus indicating a potential increase in imports of oilcake after building domestic self-sufficiency over the past few years.

The harvest and delivery season for 2023/24 has tailed off and the next focus for producers is production conditions with La Niña back in the forecast for the 2024/25 agriculture season. This bodes well for the summer crop producers as we head into increased activity of planting for the 2024/25 agriculture season. – *Farmers Review Africa*

Orffa: Expanding its presence in Asia

Founded in Belgium in 1967, Orffa has evolved from a distributor into a global leader in animal nutrition. The company is now expanding its presence in Asia, focussing on delivering cutting-edge science-driven feed additive solutions to enhance animal health, productivity, and sustainability.

Ramakanta Nayak was appointed as the new managing director for the Asia-Pacific region. With his in-depth knowledge of the local market, Ramakanta will spearhead Orffa's initiatives to provide science-driven feed solutions that address the specific needs of Asian livestock producers.
– *Press release, Orffa*

Feed processing equipment market sees growth

According to a Future Market Insights analysis, the animal feed processing equipment market was expected to reach a valuation of US$23,1 billion in 2023, with a projected compound annual growth rate of 4,2% from 2023 to 2033, reaching US$34,8 billion by 2033.

The increasing demand for high-quality feed and the rapid industrialisation of livestock production, particularly in the aquaculture sector, are driving opportunities for equipment manufacturers in this market. The development of advanced, automated machinery by key players to meet growing demand from livestock producers is anticipated to fuel market growth over the next decade.

Additionally, rising demand for feed additives and compound feed, especially in emerging economies, has created opportunities for machinery manufacturers to supply more advanced equipment. The expansion of feed-based industries across Asia Pacific is also expected to support market growth during the forecast period. – *Access Wire*

Animal feed derived from flies to be trialled

A research project set to commence in October this year across three Pacific islands will use black soldier flies to help producers turn food waste into nutrient-rich animal feed and fertiliser. Initial research will take place in Fiji, Vanuatu, and Papua New Guinea, followed by farm trials the next year. Unlike your regular house fly, the black soldier fly only feeds on organic waste and does not carry any disease.

Black soldier flies offer opportunities to reduce organic waste, and are high in protein, necessary for the livestock industry. "The larvae that it produces are good for livestock feeds," said Mai Alagcan, Pacific regional manager for the Australian Centre for International Agricultural Research. – *ABC Pacific*

AFMA IWC Literature Review winner: Jamie Fourie

Jamie Fourie is the overall winner of the 2024 AFMA Intervarsity Writer's Cup (IWC) in the Literature Review category. The IWC was first introduced in 2017 and AFMA awarded the first winner in 2019. The competition promotes student participation in the animal feed industry, recognising and encouraging scientific contributions by animal nutrition students. The initiative is in support of AFMA's training and skills development strategy and complements other student outreach activities, career days, and a job opportunity portal.

Jamie Fourie.

Fourie's study focusses on phosphorus digestibility in broilers and layers, moving towards formulations containing digestible phosphorus, where most of the current phosphorous formulations are based on total phosphorus.

This is important for the purpose of environmental and economical sustainability in agriculture. "I believe that the agricultural environment needs to advance in precision nutrition just as technology and genetics have advanced." The advancement of sustainability, according to Jamie, is possible in poultry and can be achieved with the use of her findings.

This award serves as encouragement not only for Jamie but for other students in the field as well. Students are able to attend conferences not as students but as individuals who are part of big industries, adding more value to the development of agriculture.

Fourie aims to complete her master's degree before the end of the year. She also aims to continue her research for a PhD specifically in broiler nutrition, focussing on macro- and microminerals, similar to this sphere. – *Elmarie Smit, Plaas Media*

To watch a recent Plaas/Farm TV interview with her, scan the QR code:

Record attendance at SACOTA AGM

Southern Africa's drought and high grain prices attracted a record 150 attendees to the annual general meeting of the Southern African Cereals and Oilseeds Trade Association (SACOTA) at the Centurion Golf Club on 18 September. The attendees included representatives from all 31 member companies, government officials and several industry guests.

Dr André van der Vyver, executive director of SACOTA, noted in a press release that due to dry conditions over the past season, South Africans have experienced sharp increases in the prices of maize and soya beans. "This is despite lower international prices and a stronger rand. Prices increased by approximately 20% between January and May 2024, and although they have pulled prices back somewhat from their highs, another spike is not impossible," he remarked. This will depend on local demand and the demand from neighbouring countries also affected by the drought.

Another factor drawing industry attention is the final size of the crop, with the harvest completed in August 2024. Some maize and soya beans are still being stored on farms, making it difficult to finalise the numbers.

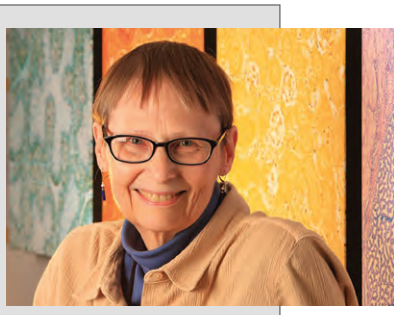
SACOTA's members collectively handle approximately 85% of South Africa's commercial grain and oilseed trade, including imports and exports. Physical grain traders account for roughly two-thirds of its membership, while the balance are associated members who provide supporting services to grain traders. – *www.agriorbit.com*

Novus remembers pioneering poultry scientist

Novus recently announced that a founding member of its research team, Julia J Dibner, PhD, had passed away in the week of 30 September. She dedicated nearly 30 years to poultry research, many of those spent at Novus where she served as director of biology research and then senior research consultant and distinguished science fellow before retiring from the industry in 2014.

She earned her doctorate in cellular and development biology from Washington University in St. Louis, Missouri in 1980. She was first employed by the Monsanto Company and moved to work for Novus when the company was created in 1991.

Authoring over 140 research papers and having presented at conferences and seminars around the world, Dibner's cutting-edge work touched nearly every part of the animal nutrition additive and health industry. – *Press release, Novus*



The late Julia Dibner.

Mighael van Schalkwyk.

AFMA IWC Own Research winner: Mighael van Schalkwyk

Mighael van Schalkwyk is the overall winner of the 2024 AFMA IWC in the Own Research category. His study focussed on the digestion of amylose through chitinase enzymes and the effect it has on water stability of abalone feed.

"My research revealed interesting things in terms of water stability when we tried to add the enzyme to feed. Water stability is essential for abalone feed." They found that the chitinase enzyme has a notable effect on water stability – decreasing it. This led to them having to think out of the box to solve the issue of decreased water stability. "It is a novel mode of action for the enzyme that has never before been written in literature and opens a few new avenues for future research."

Van Schalkwyk currently resides in Stellenbosch where he completed his undergraduate and post-graduate studies in aquaculture. He focussed on feed specifically for abalone, finishing his master's degree on this subject in 2023. "To end my research with not only a master's degree in hand but also this award, completes this chapter of my life on a high note. This is a great honour."

Mighael finds himself in a privileged position as he finished his undergraduate degree having already secured a job – he works at a consultation company headed by one of his study advisors, Lourens de Wet. "The consultation company is a nice combination of being on farms and the technical aspects of the industry." – *Elmarie Smit, Plaas Media*

To watch a recent interview with him on Plaas/Farm TV, scan the QR code:

Statutory measure for winter grains announced

The minister of agriculture, John Steenhuisen, has announced the statutory measures for winter grains to be collected as of 1 October 2024. The goal of the statutory levies is to provide the winter grains industry with financial assistance in terms of market information, research, and transformation.

The newly established SA Winter Cereal Industry Agency NPC (SAWCIA) will administer the statutory measure. Levies for the marketing year from 1 October 2024 to 30 September 2025 are:

- Wheat, R12 per metric tonne.
- Malt barley, R12 per metric tonne.
- Oats, R10 per metric tonne.

The levies can be collected at the first point of trading or delivery. – *www.agriorbit.com* ❖

Animal feed regulation modernisation: The *Feeds and Pet Food Bill*

By Siyabonga Mbambo, AFMA consultant

The *Fertilizers, Farm Feeds, Agricultural Remedies, and Stock Remedies Act, 1947 (Act 36 of 1947)* has been the cornerstone of regulating the manufacture, sale, and distribution of animal feeds in South Africa for over 77 years. Initially introduced during a period of agricultural industrialisation and rapid agribusiness growth, the *Act* provided stability by ensuring that commercial animal feeds were safe, effective, and fit for purpose, thereby protecting both buyers and sellers.

However, as the global landscape shifted towards a greater emphasis on food safety, animal welfare, and international trade, *Act 36* has become outdated. *Act 36 of 1947*, while foundational, falls short in embracing the modern concept of 'farm to fork' – a holistic view of the food supply chain that includes traceability, food safety, and quality assurance. Moreover, the *Act* lacks a clear framework for supporting the growth of export markets, an increasingly vital sector in global trade and market development.

As it stands, the *Act* primarily focusses on pre-market authorisation for animal feed sales and compliance monitoring, but institutions responsible for implementing these regulations have not kept pace with industry growth and changes over the past three decades, rendering the *Act* outdated.

Modernising regulations

Recognising the need for reform, the former Department of Agriculture, Land Reform, and Rural Development (now the Department of Agriculture), in partnership with industry stakeholders, initiated a review of the regulatory framework in 2008. This process began with the publication of a South African policy on animal feeds and subsequently led to the development of a new draft *Feeds and Pet Food Bill* in 2019 (the *Bill*), which aims to modernise the regulation of animal feeds.

The *Bill* recognises the critical role that animal feed plays in food safety, nutrition, food security, and the need for a traceability system for both feed and pet food industries. This modernisation effort is vital to protecting consumers and ensuring that manufacturers and suppliers of feed and pet food adhere to stringent food safety standards.

The implementation of the *Feeds and Pet Food Bill* will mark a pivotal step in modernising South Africa's animal feed regulatory framework, supporting both local production and international trade while ensuring food safety and human health. The *Bill* aims to reduce regulatory burdens, incorporate scientific advancements, and create a more competitive environment for the animal feed industry. In so doing, it promotes sustainable agricultural practices and potentially strengthens South Africa's position in global markets.

> The *Bill* recognises the critical role that feeds play in food safety, nutrition, food security, and the need for a traceability system for both feed and pet food industries.

In addition to enhancing industry competitiveness, the *Bill* aligns directly with the Animal Feed Manufacturers Association's (AFMA) vision of safe feed for safe food, and its commitment to ensuring the production of high-quality, safe animal feed for sustainable food systems. AFMA will continue to collaborate with the Department, the Pet Food Industry Association of South Africa, and other key stakeholders to advocate for the *Bill's* implementation in parliament.

Scope of the *Bill*

The *Bill* introduces a comprehensive regulatory framework covering feed ingredients, feed, and pet food, including their import and export. It proposes regulating facilities involved in the manufacture of animal by-products, feed additives, feed, pet food, or premixtures, alongside the registration of products. Additionally, it includes the appointment of a registrar, supported by advisory committees, technical advisers, inspectors, and assignees, to administer the *Act* and related issues, and ensuring its proper enforcement.

In alignment with the *Bill*, AFMA has proposed licensing the following facilities:

- **Rendering facilities:** Responsible for processing animal by-products. Includes both wet and dry processing.
- **Feed mills:** Includes both wet and dry plants, both medicated and non-medicated.
- **Feed and pet food plants:** Dedicated lines.
- **Home or on-farm mixers:** For food-producing animals, game animals, and breeders.
- **Feed additives:** Agricultural grade facilities involved in the production of feed additives.
- **Premixtures:** Facilities involved in manufacturing feed additive premixtures for animal nutrition.
- **Warehouses and distribution:** Includes facilities handling, storing, and distributing animal by-products, feed additives, feed, pet food, or premixtures.

These facilities would be licensed based on their operations and size (micro, small, medium, or large), with fees determined on a sliding scale. AFMA proposed that applicants would only pay an application and inspection fee, adjusted according to facility size and type (e.g., warehouse, feed mill, pet food plant).

It has also been proposed that the following products be registered:

- Feed ingredients.
  - Raw materials: Animal and plant products, micro-minerals.

  - Feed additives: Pharmaceutical and food grades.
  - Nutraceuticals.
  - Herbal supplements.
- All imported products.

Safety and compliance

The draft *Bill* places a strong focus on food safety, proposing a traceability system to track feed and pet food products. A risk assessment process is also suggested to identify ingredients classified as 'generally regarded as safe', allowing certain exemptions from regulatory requirements.

To address compliance and capacity challenges, the framework proposes the appointment of officials and institutions to perform specific duties. Inspectors would be responsible for market surveillance, investigations, prosecutions, and sampling. Assignees will conduct audits, provide expert advisory services, serve as witnesses in court processes, refer transgressions to inspection services, and take samples. Analysts will focus on sampling, conducting analyses, offering advisory services, and acting as witnesses during court proceedings.

Support for export markets

The draft *Bill* recognises the importance of supporting South Africa's growing export market. To this end, a process has been proposed for licensing exports based on international standards such as the International Organisation for Standardization, good manufacturing practices or GMPs, and other industry benchmarks. It also proposes the issuance of free sale certificates and export facility certification, in partnership with veterinary services, to ensure that South African feed products meet the requirements for international trade.

An advisory committee will assist the Registrar in overseeing the execution of these activities and any other matter incidental thereto, ensuring that the regulatory framework is implemented effectively and that industry stakeholders are adequately supported.

Small-scale and rural producers

One of the more inclusive aspects of the new *Bill* is its provision for small-scale and rural producers who keep livestock for personal or ceremonial use. These producers will be exempted from the more stringent regulatory requirements, allowing them to continue their practices without being burdened by the new framework.

Conclusion

The draft *Feeds and Pet Food Bill* represents a significant step forward in modernising the regulation of animal feeds in South Africa. By prioritising food safety, traceability, and support for export markets, the *Bill* aims to bring the feed industry in line with global standards while encouraging growth and development. As the regulatory framework evolves, it will be crucial for industry stakeholders to remain engaged in the process to ensure that the new regulations effectively address the needs of both the industry and consumers.

For more information, visit *www.afma.co.za*.

Factors contributing to elevated feed costs

By Lucius Phaleng, AFMA trade advisor, and Heiko Köster, Feed First

Continuous high feed prices have become a significant concern for producers and livestock owners globally. In South Africa, the steep costs associated with feed are escalating, driven by a combination of factors that mostly lie outside the control of feed manufacturers.

Fixed costs, including labour, electricity, and transportation, have been on the rise annually due to a prevailing inflationary environment. These fixed expenses account for approximately 25 to 30% of the total feed cost, while raw materials represent a substantial 70 to 75% of expenses, with their prices subject to considerable fluctuations both year on year and within a single year.

CBOT impact on prices

A central player in the global agricultural commodity market is the Chicago Board of Trade (CBOT). This marketplace significantly influences the pricing of essential raw materials for animal feed, such as maize and soya bean meal. Local maize prices in South Africa are primarily determined by CBOT trends, as well as the currency exchange rate, logistics costs, supply and demand, and weather conditions.

The CBOT creates a platform for trading futures and options on these commodities, enabling producers and consumers to hedge against price fluctuations. The implications of this interplay can be drastic, as seen in 2020 when the price of South African yellow maize surged by 30% within months, correlating with rising futures prices at the CBOT. Given that approximately 15% of South Africa's agricultural production is linked to livestock farming, any shifts in raw material costs driven by CBOT prices can resonate widely throughout the sector.

Prices follow market conditions

Recently, the local dynamics surrounding feed prices have shifted notably. Maize prices in Cape Town have transitioned from export parity to import parity, while soya bean meal prices are influenced by import parity costs in Durban and Cape Town. The fluctuations reflect a broader change in global and local market conditions. For instance, local yellow maize prices traded at R5 442 per ton for October 2024, a significant increase from R3 600 in May 2023. This volatility is simply illustrated by projections for raw material prices.

A few months back, estimates for maize, sunflower meal, and soya bean meal were R4 476, R6 750, and R9 100 per ton, respectively. These have now adjusted to R3 850 and R6 050, and the soya bean meal price remains the same at R9 100 per ton. As such, future pricing hinges significantly on how feed millers hedge their raw material costs.

The depreciation of the South African rand against major currencies such as the Unites States (US) dollar and the euro has exacerbated the situation. Currently valued between R17,23 and R19,26 against the dollar and euro, the rand has shown itself to be one of the world's most volatile currencies. This volatility complicates the pricing of commodities and significantly impacts food production costs. For every R1 depreciation of the rand against the US dollar, local maize prices at current CME levels can increase by R170 per ton.

Geopolitical uncertainties

Geopolitical uncertainties have also played a role in disrupting raw material supply chains. For example, conditions around the Red Sea have altered shipping routes, leading to an average increase of 15 days in travel time. Compounding this, low river levels in the Panama Canal have redirected shipping flows, contributing to recent spikes in container prices due to limited availability. Such inefficiencies, coupled with rising freight costs, have further affected the import of raw materials needed for animal feed production.

Unavoidable costs

Transportation and energy costs are also pivotal in the overall cost structure of animal feed. Transporting feed ingredients entails significant logistical expenses from farms to feed mills and then to livestock producers. Rising fuel prices directly increase transportation costs, with fixed logistics costs, such as salaries and maintenance, also on the rise. Interestingly, despite fuel prices quadrupling from May 2020 to May 2024, it is fixed costs that have surged even more dramatically.

Electricity costs contribute similarly to escalating feed prices; South Africa has seen these costs rise at rates exceeding inflation for the past decade. The need for backup generators – prompted by ongoing energy crises – adds a layer of expense, accentuated by rising diesel costs that have more than doubled in the past four years.

In conclusion

The factors contributing to high feed prices are complex and multifaceted. These increases must be carefully explained in respect of fixed and variable costs, as fixed costs in South Africa are increasing at rates surpassing current inflation.

Variables such as currency depreciation, geopolitical instability, global market fluctuations, and escalating energy and transportation costs have converged to create a perfect storm, driving up the costs of animal feed production. Consequently, producers and livestock owners are tasked with navigating an increasingly challenging financial landscape, striving for sustainability and profitability in a market defined by uncertainty.❖

For enquiries, email Lucius Phaleng at trade@afma.co.za.

AFMA honours excellence

By Izak Hofmeyr, Plaas Media

Anina Hunter of Epol Feeds was re-elected as chairperson of the Animal Feed Manufacturers Association (AFMA), while Michael Schmitz of Meadow Feeds was re-elected as vice-chairperson at the 77th AFMA annual general meeting (AGM) held at the Cathedral Peak Hotel. Two new members, Ruan Stander of Meadow Feeds and Francois du Toit of Nova Feeds, were elected to the board of directors.

During the proceedings, AFMA made three awards. Dr Vlok Ferreira received the Technical Person of the Year Award for his contributions to the industry. Wandile Sihlobo, chief economist at Agbiz, was awarded Person of the Year for his contribution to the industry. Chris Schutte, CEO of Astral Foods, received the inaugural Lifetime Achievement Award for his long-standing contributions, visionary leadership, and unwavering dedication to the agricultural industry.

During the closing session of the AGM, keynote speakers Sihlobo and Schutte addressed the attendees. Sihlobo discussed intergovernmental organisation developments and macro-economic conditions in the Brazil, Russia, India, China, South Africa and other countries (BRICS+) grouping, as well as South African agricultural policy considerations under the government of national unity (GNU). He highlighted specific policy priorities currently under consideration.

Policy considerations

- As BRICS+ evolves politically, the next logical step towards expanding the group's ambitions, particularly in agriculture, is to deepen regional economic integration and trade.
- Brazil, South Africa, and Russia typically have large surpluses of products that India and China, among others, import from the world market. Reducing import tariffs and non-tariff barriers, or opening tariff rate quotas for specific agricultural products, will assist in expanding the level of ambition in a more meaningful way.
- BRICS+ should therefore establish an intergovernmental working group to explore the scope for reducing import tariffs and removing non-tariff (phytosanitary) barriers among members. This group should develop terms of reference that establish the work of a negotiation platform for a BRICS+ preferential trade agreement.
- Promoting agricultural trade within the BRICS+ group is essential for food security and economic progress.
- A long-term, ambitious BRICS+ agricultural trade agreement should be explored, with measures for countries with industries still in the infancy stages and requiring protection.

Referring to the GNU and the role of agriculture in the economy, Sihlobo highlighted specific policy considerations for agriculture. "Disregard the political noise, and channel the energy on relentless implementation of the existing programmes at national and provincial level," he advised. "The *Agriculture and Agro-processing Master Plan*

Michael Schmitz, vice-chairperson of AFMA.

provides a useful framework, so don't change it. Focus on its implementation."

Agricultural priorities

According to Sihlobo, there are several priorities in agriculture at the moment:

- *Biosecurity*: We must focus on both animal and plant health issues as both are key for agricultural long-term productivity gains.
- *Agricultural product standards*: We have to address the practice of appointing assignees and their associated exorbitant costs.
- *Registrar of the Fertilizers, Farm Feeds, Seeds and Remedies Act, 1947 (Act 36 of 1947)*: The delays and major

From left to right are Liesl Breytenbach, executive director of AFMA, Dr Vlok Ferreira of RCL Foods, and Anina Hunter, AFMA chairperson. Ferreira received the Technical Person of the Year Award.

Wandile Sihlobo of Agbiz receiving the Person of the Year Award from Liesl Breytenbach and Anina Hunter.

Francois du Toit of Nova Feeds and Ruan Stander of Meadow Feeds were elected to the AFMA board of directors.

backlogs in the Registrar's office may slow South Africa's agricultural productivity.

- *Agricultural exports*: Inefficient ports and geopolitical tensions have raised concerns regarding exports.
- *State entities such as the Agricultural Research Council, National African Marketing Council, Onderstepoort Biological Products, and agricultural colleges*: These require a considerable relook and modernisation.
- *Water*: We need to ensure sensible collaboration with the Department of Water and Sanitation to improve the policy dispensation on irrigation water.
- *Rural crime*: Livestock theft and other forms of crime undermine investment in agriculture and the growth of small towns.
- *Roads and municipalities*: Improving roads and the effectiveness of municipalities should remain high on the agenda.
- *Statistics*: Our statistics on agriculture across all subsectors are critical and our government will have to up its game in this regard.

In conclusion, Sihlobo made the following points: BRICS+ is worth the trouble, as South Africa's export-oriented agricultural sector must consistently search for markets. China, India, Egypt, and Saudi Arabia must be the priority markets.

From a domestic policy side, the focus should be on the implementation of Operation Vulindlela and the relentless implementation of the *Agriculture and Agro-processing Master Plan* and *Poultry Master Plan* is essential.

The release of state land, paired with blended finance is vital and the government must act on this issue. Continuous partnerships between the government, commodity associations, and researchers are vital in supporting new entrant producers.

The revitalisation of municipalities and rural roads to support agriculture are key, with road-to-rail that must be part of the process.

Life is a DIY project

Chris Schutte, in his acceptance speech for the Lifetime Achievement Award, shared his philosophy that life is a do-it-yourself project. See our article elsewhere in this issue of *AFMA Matrix*.

For more information on other AFMA events and important dates, visit *www.afma.co.za*.

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Feed mill operator training Part 2: Practical

By Wimpie Groenewald, membership liaison officer, AFMA

The Animal Feed Manufacturers Association's (AFMA) Livestock Feed Mill Operator e-learning programme is designed to equip learners with the knowledge and practical experience needed to perform effectively at the operator level in a livestock feed milling environment.

In this article, we will provide an overview of the content covered in the practical modules (refer to *AFMA Matrix* July 2024 for Part 1).

Site-based training

Our programme follows a blended learning model that combines theoretical knowledge with practical, on-site training for optimal results. Each participating feed mill serves as a learning and evaluation site, where feed milling experts are trained as workplace coaches and facilitators to guide and support learners throughout the programme. All training sessions adhere to a structured approach based on recognised coaching and competency evaluation standards.

This work-based integrated learning (WIL) approach enhances information retention and enables learners to apply their skills directly to workplace operations. Companies benefit from on-site training and mentoring without the need to disrupt production for off-site courses.

What's included

The programme's modules are divided into two main areas: general modules relevant to feed milling environments (theory), and technical modules focussed on equipment and feed production processes (practical).

Learners can enrol in the full programme to qualify as a feed mill operator (seven modules) or opt for shorter programmes to become a stock controller, production operator, or pelleting operator (three or four modules).

The duration of the training programme is approximately six months, depending on the learner's effort. Industry-recognised certificates are awarded upon completion. Learners can register for the full course or select individual modules as short courses.

The practical application modules are structured as practical demonstrations over a period of exposure in a work environment, outlined in *Table 1*.❖

Table 1: Scope of the work integrated modules.

Work integration modules	Scope	Exposure
WIL Module 1 Bulk material intake and storage	The application of key knowledge areas and practices related to the receiving and storage of raw material delivered in bulk to the livestock feed mill.	Five shifts
WIL Module 2 Material warehousing and stock control	The application of key knowledge areas and practices related to the warehousing and stock control operations of the livestock feed mill.	Five shifts
WIL Module 3 Material reclaim from storage	The application of key knowledge areas and practices related to the release of material from storage to the livestock feed mill.	Five shifts
WIL Module 4 Proportioning, batching, mixing and milling	The application of key knowledge areas and practices related to batching, ingredient addition, mixing, and particle reduction operations.	15 shifts
WIL Module 5 Mixed feed processing operations	The application of key knowledge areas and practices related to feed processing operations such as conditioning, pelleting, crumbling, and extrusion.	25 shifts
WIL Module 6 Team leadership	The application of key knowledge areas and practices related to leading and directing the activities of work teams.	Five shifts

For more information or to register for this course, contact AFMA at admin@afma.co.za or 012 663 9097.

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The AFMA Transport Protocol

By Wimpie Groenewald, membership liaison officer, AFMA, and Joe Hanekom, Afri Compliance

As a responsible input supplier of animal feed in the food value chain and as a custodian of the 'safe feed for safe food' concept, the Animal Feed Manufacturers Association (AFMA) has introduced a certification protocol to ensure that transporters of feed ingredients in the animal feed industry adhere to safe and good transport practises.

The *AFMA Transport Protocol* contains the minimum requirements for a transporter to maintain the safe-feed-for-safe-food chain, including procedures to ensure good corporate governance. The major aim of this certification service is to provide assurances of good quality transport services to AFMA associated feed manufacturers, and to add value to the activities of transporters operating in the animal feed industry.

Transport protocol guidelines

The following key areas of importance are covered in the evaluation of the operational practices of transport companies:

- Proper procedures must be in place to avoid contamination of products if undesirable substances have been transported prior to loading of animal feed products. The general requirement is that the load compartments must be clean and dry, and free of residues and odours from previous loads. The driver must visually check this before the loading of each consignment.
- Procedures must be in place to avoid load contamination and to ensure that transportation is such, that basic quality can be maintained in respect of hygiene. Prior to the transport of raw materials, finished feed, and premixes the outside of the truck, including the chassis, must be free of visible traces of previous cargoes.
- Bulk compartments that held contaminated consignments (contaminated with undesirable substances/products and/or pathogenic organisms) must be cleaned in such a way that it is not possible for subsequent consignments to become contaminated.
- Drivers and loaders must be trained to understand the basic principles of biosecurity, biological contamination, and personal hygiene. Training records must be kept and may be required for audit purposes.
- Verification is done to ensure that proper procedures are in place regarding the pre-loading inspection of all vehicles.
- The transport company must ensure that vehicles are roadworthy and that competency certificates are available.
- A visual inspection must be carried out after each cleaning regime, and a procedure in this regard must be in place.
- The effectiveness of a particular disinfection technique used is verified and procedures must be in place regarding inspection after having transported any biological product.

Verification in respect of the aforesaid points is performed by means of an on-site audit at the premises of the transport companies. Following the audit, a report with findings is submitted to the client and they are then afforded sufficient time to rectify areas that need attention.

Benefits of protocol certification

- The transport protocol audit process verifies conformance to 167 critical areas of importance which are considered a necessity to operate as a responsible transporter in the animal feed industry, and which gives legitimacy to the operations of the transport company.
- Participation in the *AFMA Transport Protocol* certification programme demonstrates a transport company's commitment towards good corporate governance.
- It will confirm the bona fides of the transport company as a responsible role-player in the animal feed industry.
- It illustrates that the transport company is serious about conforming to regulatory and industry specific requirements.
- Conformance to the *AFMA Transport Protocol* will validate the company's legal conformance.
- Successful completion of the protocol audit will distinguish participating companies from non-participating transport companies.
- The transport company has the reassurance that the transport protocol audit is conducted by an independent and professional company with the necessary experience, backed by competent and qualified lead auditors.

The transport protocol audit is conducted bi-annually which means the audit costs are spread over a two-year period, making it a cost-effective and affordable service. Successful participants receive the AFMA Certificate of Compliance and the right to use the compliance mark on their trucks and marketing material.❖

Currently nine transporters have committed to the certification system, with the earliest verifying full compliance since 2013. They are Grain Carriers, Supreme Carriers, MV Transport, River North Carriers, Bloemdre Vervoer, L & T Boerdery, Unitrans Supply Chain Solutions, Mpilonkazimule Holdings, and Watson Transport. Visit *www.afma.co.za/afma-transport-protocol/* for their details.

For more information on the protocol and audit process, email admin@afma.co.za.

WINNER

Makiwa Simeon Mthana

Year:
2024

University:
North-West University

Effect of dietary oyster mushroom spent substrate in broilers fed diets supplemented with combined marula seed cake and mucuna seed meal

Mthana M.S* and Mthiyane D.M.N

Department of Animal Science, Faculty of Natural and Agricultural Science, North-West University, Mafikeng 2745, South Africa
* Corresponding author: ms.mthana@gmail.com

1. BACKGROUND

The massive production of broilers chickens is threatened by high price of soybean meal (SBM) (Shi *et al*., 2012). This suggest the need for exploration of cost-effective alternative protein sources such as Marula Seed Cake (MSC) and Mucuna seed meal (MSM) for replacement of SBM in broiler diets. Both MSC and MSM have a potential to replace SBM in broiler diets. However, they are fraught with potentially toxic chemical substances that serve as antinutritional factors (ANFs) in broiler nutrition. It was therefore hypothesized that dietary oyster mushroom (*Pleurotus ostreatus*) spent substrate (OMSS) will reverse the detrimental effects caused by combined MSC and MSM in broiler chickens. Thus, the aim of this study was to investigate the ameliorative effects of dietary OMSS in broilers fed diets supplemented with combined MSC and MSM replacing SBM.

2. METHODOLOGIES

2.1. Diets formulation

Diet 1 contained 100% SBM, Diet 2 with 60% MSC plus 40% MSM, Diet 3 with 60% MSC plus 40% MSM + 1.25% OMSS, Diet 4 with 60% MSC plus 40% MSM + 2.5% OMSS, and Diet 5 with 60% MSC plus 40% MSM + 5% OMSS.

2.2. Study design and data collection

400-day old chicks were randomly assigned to 5 dietary treatment. Each treatment was replicated 8 times with 10 birds per pen. Feed intake, body weight gain, and feed conversion efficiency, serum biochemistry, and carcass traits were measured.

2.3. Statistical analysis

Data was analyzed for analysis of variance using the general linear model (GLM) procedure of SAS (SAS, 2012).The LSmeans were separated using the probability of difference (PDIFF) option and differences among them were deemed significant at $P \leq 0.05$.

3. RESULTS AND DISCUSSION

Dietary 1.25% OMSS improved feed intake, body weight gain, and feed conversion efficiency at grower and finisher phases only ($P < 0.001$) whilst it decreased the gizzard weight ($P < 0.001$).The OMSS generally decreased ($P < 0.05$) serum SDMA and alanine transaminase whilst it abrogated and augmented increases in serum alkaline phosphatase ($P < 0.05$) and cholesterol ($P < 0.01$).

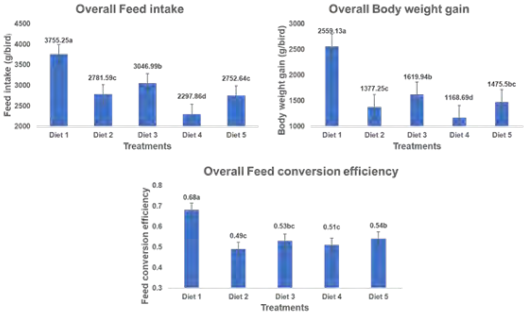

Figure 1. Overall growth performance of broiler chickens fed diets containing combines MSC & MSM plus varying levels of OMSS.

Table 1. Effects of OMSS inclusion in MSC & MSM containing diets on internal organ weights of broiler chickens.

Parameter (wt %)	Treatment					SEM	P-value
	SBM	MSC + MSM					
		Only	+1.25% OMSS	+2.5% OMSS	+5%O MSS		
Liver	2.39^{c}	3.17^{b}	3.03^{b}	3.79^{a}	3.17^{b}	0.186	P<0.001
Spleen	0.17	0.21	0.19	0.24	0.16	0.019	0.0562
Proventriculus	0.61^{b}	1.29^{a}	1.14^{a}	1.24^{a}	1.16^{a}	0.080	P<0.001
Gizzard	2.39^{c}	4.06^{a}	3.13^{b}	3.78^{ab}	3.75^{ab}	0.244	P<0.001
Duodenum	1.02^{b}	2.02^{a}	1.84^{a}	2.12^{a}	1.74^{a}	0.138	P<0.001
Jejunum	1.74^{b}	2.99^{a}	2.80^{a}	2.99^{a}	2.92^{a}	0.163	P<0.001
Ileum	1.38^{b}	2.33^{a}	2.15^{a}	2.44^{a}	2.19^{a}	0.116	P<0.001
Caecum	0.89^{b}	1.08^{b}	1.30^{ab}	1.50^{a}	1.15^{b}	0.108	P<0.01
Colon	0.16	0.27	0.31	0.17	0.18	0.049	0.1207

Table 2. Effects of OMSS inclusion in MSC &MSM containing diets on serum biochemistry parameters of broiler chickens.

Parameter	Treatment					SEM	P-value
	SBM	MSC + MSM					
		Only	+1.25% OMSS	+2.5%O MSS	+5%O MSS		
Glucose	153.06	161.81	160.25	166.69	165.19	6.63	0.635
SDMA	20.56^{a}	17.75^{ab}	16.31^{b}	16.06^{b}	19.19^{a}	1.177	P<0.05
Phosphate	7.81	6.73	6.71	6.72	6.99	0.299	0.059
Calcium	9.10	9.23	9.06	9.28	9.41	0.174	0.615
Total protein	3.52	3.11	3.08	3.29	3.31	0.180	0.445
Albumin	1.32	1.24	1.17	1.21	1.28	0.050	0.263
Globulin	2.21	1.88	1.91	2.09	2.08	0.143	0.463
Alb/glob	0.60	0.58	0.62	0.58	0.61	0.015	0.276
ALT	24.44^{a}	15.63^{b}	13.00^{b}	11.88^{b}	14.25^{b}	2.646	P<0.05
AKP	346.63^{b}	747.63^{a}	558.50^{ab}	590.77^{ab}	490.25^{b}	83.965	P<0.05
Cholesterol	93.06^{b}	107.75^{a}	111.63^{a}	119.94^{a}	110.82^{a}	4.600	P<0.01

4. CONCLUSION & RECCOMENDATION

Combined MSC plus MSM induced deleterious effects in broiler chickens that were limitedly abrogated by 1.25% inclusion of OMSS.

FIRST RUNNER-UP

Tony Ferreira

Year: 2024

University: University of Pretoria

The evaluation of modern-day phytase enzymes on broiler production efficiency and cost

T. Ferreira[1], K.M. Venter[2], C. Jansen van Rensburg[1], P.W. Plumstead[2], & B. Hillen[3]

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[2]Neuro Livestock Research, Kameeldrift, Brits, 0250, South Afric

[3]Danisco Animal Nutrition & Health, IFF, 2342 BH Oegstgeest, The Netherlands

Introduction

Calcium (Ca) and phosphorus (P) are vital minerals required for bone development and skeletal mineralisation in broilers. The P in most plant-based ingredients is in the indigestible form of phytic acid. Therefore, P must be supplemented to meet the birds' requirements. This supplementation is expensive due to P being the third most expensive nutrient in a broiler diet, adding significantly to production costs. One solution to the low digestibility of phytate P is the use of phytases enzymes, which hydrolyse phytic acid, thereby liberating Ca and P, as well as amino acids and energy. This will have an impact on the profitability and sustainability of the broiler production system.

Methodology

This trial tested the positive control diet (PC) against three different phytase enzymes at 1 000 and 2 000 FTU/kg each:

- a hybrid phytase expressed in *Aspergillus niger* (PhyA);
- an *Escherichia coli* phytase expressed in *Komagataella phaffi* (PhyB); and
- a novel consensus bacterial 6–phytase variant expressed in *Trichoderma reesei* (PhyC).

A total of 4 200, mixed-sex Ross 308 broilers were randomly assigned to one of seven treatments (50 birds/pen) with 12 replicates per treatment. The treatment diets were formulated using the manufacturer's Ca and digestible P (dP) matrix recommendations and 75% of the metabolisable energy and amino acid recommendations. All broiler diets were analysed for phytase activity prior to initiation of the study to ensure phytase enzymes were dosed at the correct levels. All diets were formulated using least cost and the weighted feed cost per tonne of feed based off feed intake was determined. Broiler bodyweight (BW) and feed intake (FI) were recorded on 0, 7, 16, 24, and 32 days of age, respectively. Average daily feed intake (ADFI), average daily gain (ADG), and mortality-corrected feed conversion ratio (mFCR) were calculated for each phase. On days 10 and 32, right tibia bones were sampled from two birds per pen with weights close to the pen mean. These were dried and defatted and used to calculate tibia ash percentage. Economic parameters were calculated on day 32, expressed as feed cost in R/kg broiler.

Results

Statistical analysis was conducted using JMP 17.0 (SAS institute) with a one-way ANOVA being used to compare the seven treatment diets. Means were separated using a protected Tukey honestly significant difference (HSD) test. Values without common superscripts differ significantly ($P < 0,05$).

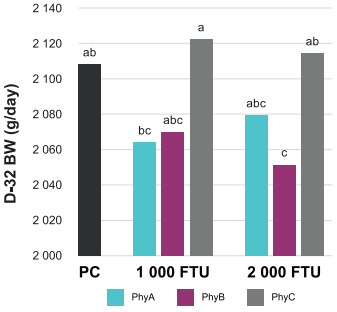

Figure 1 Day-32 bodyweight

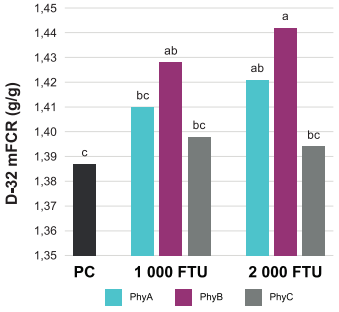

Figure 2 Day-32 mortality-adjusted feed conversion ratio

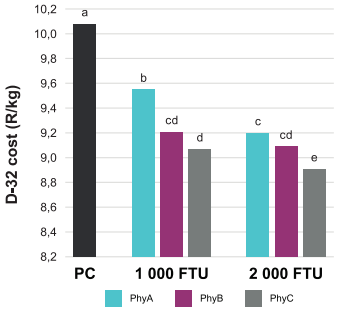

Figure 3 Day-32 feed cost per kilogram broiler

Conclusion

Supplementation with PhyC maintained broiler performance (BW, FCR), whereas PhyB did not, relative to the PC. When considering the cost of the treatment diets, utilisation of PhyC at 2 000 FTU was considered to be the most cost-effective diet, whereas the PC, followed by PhyA at 1 000 FTU was the most expensive. The use of PhyC at 2 000 FTU can lead to cost savings of R1,17 per kilogram broiler and R1020,61 per tonne of feed relative to the PC. These results illustrate that, based on current high feed ingredient prices, higher doses of phytase can result in improved production costs.

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SECOND RUNNER-UP

Ramokone Millicent Mokonyama

Year:
2024

University:
North-West University

Effects of enzymes inclusion in diets on internal organs, bone development and welfare in broiler chickens fed Kalahari melon oil cake (*Citrullus lanatus*)

Ramokone Millicent Mokonyama [1], Upenyu Marume [1]*, Sibongile Prudence Mcobokazi [1]

[1] Department of Animal Science, School of Agricultural Sciences, North-West University, P. Bag X2046, Mmabatho, 2735, South Africa

#Corresponding author: MillicentMokonyama12@gmail.com

BACKGROUND

- Broiler meat is the most rapid growing source of protein for human consumption (Mottet & Tempio, 2017).
- Poultry feed is expensive with protein constituting the major feed component.
- A potential alternative protein source such as Kalahari melon meal (*C. lanatus*) that allows for least cost diet formulations must be explored.
- However, it contains higher fibre content than SBM.
- Therefore, to offset the high fibre, enzymes can Sused (Singh & Kim, 2021).

AIM AND OBJECTIVE

- The objective of the study was to determine the effect of enzyme inclusion on internal organs and bone development in broilers fed Kalahari melon meal.

METHODOLOGY

- The study was conducted at NWU Molelwane Farm, South Africa, for 42 dys, *ad libitum* feeding
- 400, day old cobb 500 chicks were purchased from Chicken Ranch (Pty Ltd), KMM Highlands essential oils, other feed components Nutritec (Pyt Ltd) and Chemuniqué (Pyt Ltd), South Africa.
- Five experimental diets were formulated (n = 8 replicate pens per treatment)
- A standard broiler diet (Control), 10% KM, 10% KM was treated with 3 % Protease, 3 % XB and 3 %XAP
- Measurements post-slaughter; internal organs, and bone development parameters, latency to lie.
- Data was analyzed using the general linear model procedure of SAS (2010) in a CRD with diet as the major factor.

RESULTS AND DISCUSION

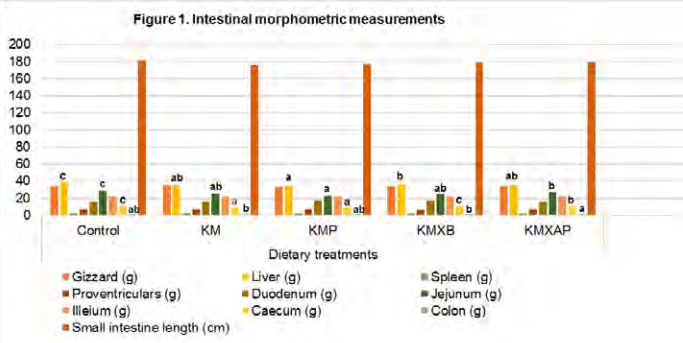

Table 1. Effects of enzyme inclusions on tibia biomechanics of broiler chickens fed Kalahari melon meal based diets

	Dietary treatments						
Parameters	Contr	KM	KMP	KMB	KMXAP	Sem	Sig
Latency-to-lie test (min)	9.69 [c]	9.21 [c]	8.79 [b]	7.32 [a]	8.84 [b]	0.72	P<0.05
Tibia weight (g)	16.89 [a]	17.85 [b]	18.20 [c]	22.09 [e]	20.07 [d]	1.08	0.04
Tibia diam prox end (cm)	1.73 [a]	1.83 [b]	1.60 [a]	1.96 [c]	1.93 [b]	0.07	0.04
Tibia diam mid (cm)	0.56 [a]	0.73 [c]	0.73 [c]	0.63 [b]	0.63 [b]	0.04	P<0.05
Tibia length (cm)	10.00	9.63	9.83	10.33	9.76	0.28	NS
Tibia diam distal end (cm)	1.56	1.60	1.50	1.66	1.56	0.06	NS
Bone breaking strength (N)	132.13	196.58	143.72	171.98	147.44	26.5	NS

[a, b, c] Means with different superscript are significantly different (P<0.05); Dietary treatments: control (commercial broiler diet), KM (10% KMM), KMP (10% KMMI+ protease), KMXB (10% KMM+ xylanase and β-glucanase) and KMXAP (10% KMM+ xylanase, amylase and protease); SEM: Standard Error Mean

- Diets significantly affected (P<0.05) the Latency-to-lie test which measures welfare of birds. Broiler chickens fed control and KM had the highest (P< 0.05) standing persistence.
- KMM or enzymes in diets improved (P<0.05) the tibia linear measurements and improved (P< 0.05) bone mineralization(Mg,Zn).
- No dietary effects (P> 0.05) were recorded on the internal organs apart from the weight of the liver, jejunum, caecum and colon which improved (P< 0.05).
- No dietary influence was observed on growth plate analysis (P>0.05)

conclusion and recommendation

- Inclusion of enzymes in Kalahari melon meal-based diet can effectively improve the utilization and digestibility of minerals for enhanced bone development and welfare in broiler chickens. Thus, KMM with enzyme inclusion has a potential to be used as an alternative protein source

References

Mottet, A. & Tempio, G., 2017. Global poultry production: current state and future outlook and challenges. World's Poult. Sci. J. 73, 245-256.

Singh, A.K. & Kim, W.K., 2021. Effects of dietary fiber on nutrients utilization and gut health of poultry: a review of challenges and opportunities. Animals. 11, 181.

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AFMA Symposium 2024 31 October 2024

INNOVATE
For Success in Disruptive Times

Diamond Auditorium, CSIR International Convention Centre

PROGRAMME

TIME		SPEAKER / TOPIC	SPONSOR
07:30 – 08:00		Student Research EXPO Set-Up	
08:00 – 09:00		Registrations & Refreshments • Student Research EXPO	
09:00 – 09:05		Welcoming & Opening Chantelle Fryer, AFMA Technical Program Committee Chairperson, Orchem	
SESSION 1: FROM POLICY TO PLATE: INNOVATIVE SOLUTIONS FOR SUCCESS IN DISRUPTIVE TIMES			
Chairperson: Chantelle Fryer, AFMA Technical Program Committee Chairperson, Orchem			
09:05 – 09:45		KEYNOTE SPEAKER **The Dynamics of the Government of National Unity – Still under construction!** Prof Theo Venter, Professor of Practise, University of Johannesburg, South Africa	AFMA SAFE FEED FOR SAFE FOOD Animal Feed Manufacturers Association
09:45 – 10:25		KEYNOTE SPEAKER **Optimising the Farm-to-Fork Continuum through Nutritional Innovation** Dr Burak Sarpel Ruperez, Technical Sales Manager, EMEA, Spain	Chemuniqué Knowledge Inspired
10:25 – 10:55		**Integrated intelligence: How modern farm animals manifest the power of plant genius** Dr David Bravo, Chief Science Officer, Nutreco, Switzerland	Westside
10:55 – 11:05		Q & A	
11:05 – 11:40		Tea / Coffee Break • Student Research EXPO	
SESSION 2: NUTRITIONAL INNOVATIONS FOR OPTIMIZED PERFORMANCE			
Chairperson: Gay Boomgaard, AFMA Technical Chairperson, Meadow Feeds			
11:40 – 12:10		**Smart choices: Selecting the right feed additives for success** Natasha Snyman, Chief Operations Officer, Chemuniqué, South Africa	Chemuniqué Knowledge Inspired
12:10 – 12:40		**Cracking the Code: Proving Nutritional Matrix Values for Phytogenic Feed Additives through Modeling** Manu De Laet, Phytogenic Poultry Technical Lead, Cargill, Belgium	Nutribase Feed supplements for Africa
12:40 – 12:50		Q & A	
12:50 – 13:50		Lunch • Student Research EXPO	

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TIME		SPEAKER / TOPIC	SPONSOR
SESSION 3: ANIMAL HEALTH & FEED SAFETY UNLEASHED			
Chairperson: Michel Bradford, Pig & Poultry Product Manager, De Heus			
13:50 – 14:20		**From the rumen to mammary gland – a microbial and cellular continuum to consider in cow performance and health optimisation strategies** Dr Lysiane Duniere, Research Scientist, Lallemand Animal Nutrition, France	Vitam International
14:20 – 14:50		**Organic Selenium in Animal Nutrition: From the improvement of Se status to general health** Prof Peter Surai, Professor at Vitagene and Health Research Centre, Scotland (UK)	ADISSEO A Bluestar Company
14:50 – 15:20		**Mycotoxin decontamination approaches for safer animal feed** Caitlyn de Vos, Ruminant Development Manager, Vitam International, South Africa	Vitam International
15:20 – 15:30		**Q & A**	
15:30 – 16:05	**Tea / Coffee Break • Student Research EXPO**		
SESSION 4: FUELING THE FUTURE OF FEED MILLING			
Chairperson: Janke Bestbier, AFMA Technical Vice-Chairperson, Alltech			
16:05 – 16:15	**Rising Scholars: Student Excellence Awards** AFMA Student of the Year Award 2024 AFMA Intervarsity Writer's Cup Overall Winner – Literature Review AFMA Intervarsity Writer's Cup Overall Winner & IWC Champion – Own Research Student Research EXPO Winner		AFMA Safe Feed for Safe Food – Animal Feed Manufacturers Association
16:15 – 16:25	**AFMA Student of the Year Winner Presentation (TBC)** Student (TBC)		AFMA Safe Feed for Safe Food – Animal Feed Manufacturers Association
16:25 – 16:35		**The Effect of Dietary Chitinase on Feed Quality of Extruded Abalone Pellets** Mighael van Schalkwyk, University of Stellenbosch, South Africa	AFMA Safe Feed for Safe Food – Animal Feed Manufacturers Association
16:35 – 17:05		**Feedmill of the future connects digitalization and new sensor technology to boost production efficiency & sustainability** Dr Tom Verleyen, Director, Kemin, Belgium	KEMIN Compelled by Curiosity™
17:05 – 17:15		**Q & A**	
17:15 – 17:20	**Closing** Janke Bestbier, AFMA Technical Vice-Chairperson, Alltech		
17:20 – 17:40	sasas	**Empowering animal scientists for the future** Heiko Köster, SASAS Council Member, South Africa	
18:00	**Meet and Greet Function**		

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Integrated intelligence: How modern farm animals manifest the power of plant genius

By Dr David Bravo, chief science officer, and Emma Wall, director of ingredient development, Nutreco

Science has always had a major impact on society and human civilisation. This is particularly poignant when considering Newtonian physics, which lies at the very foundation of most educational systems. It has shaped our way of thinking and the way we view and solve problems. For the last 400 years, the scientific paradigm has postulated determinism, predictability, and linear causality between events and effects. It also expects a stable world operating in a steady state.

In such a paradigm, the inability to understand a response is due to contingent ignorance; improved knowledge would solve the problem, and universal law, once elucidated, will explain and predict it all. This paradigm uses reductionism, assuming the problem of the whole is the sum of the problems of the parts. This is the clockwork universe paradigm. In the clockwork universe, everything is predictable.

At the basis of these predictions is the certainty that everything follows rules, these rules are quite simple, and they create all behaviours. As such, the universe, nature, and all associated problems function as a machine: a clock. Furthermore, designing solutions for the challenges we face requires us to apply this paradigm.

The clockwork universe is the very definition of a complicated system. Complicated comes from Latin *plic* which means to fold. A complicated system hides its inner structure, but time, resources, and talent will enable understanding. A complicated system responds to processes, procedures, and recipes. When something is not complicated, it is simple.

Clockwork animal nutrition

Seventy years ago, producing animal protein to meet demand was practically a mathematical equation, as simple as providing balanced feed to animals with good genetics. Over time, the complicated nature of clockwork animal nutrition increased, and our industry adapted to it. This started around 2000, with consumer bans on antibiotics in some countries, and then the ban on antibiotic growth promoters in the European Union.

Suddenly, animal performance also relied on new variables including gut health and farm management.

The industry responded by enlarging research and development teams to acquire other types of skills to support innovation initiatives. Solutions were found through process and continuous improvement, often bringing combinations of multiple ingredients, still a process, still a clockwork.

A relevant example of the application of the clockwork universe paradigm is the development of plant extracts, aka phytogenics. Indeed, to develop these products, we applied determinism, reductionism, and causality, and we considered the animal as a steady-state system. For instance, the first candidates were selected because of their antimicrobial effects (causality), as a logical approach to meeting the challenge of regulatory constraints (i.e., removal of antibiotic growth promoters from feed).

Some have been documented to have physiological impacts on the animal via specific receptors. For example, capsaicin contained in capsicum products activates the TRPV1 receptor, and it leads to additional, unexpected benefits for animals. A molecule, a receptor, a response: the epitome of reductionism!

This work was trailblazing but also trivialised the complex plant down to a single active in a very pharmaceutical approach to replace chemicals in feed. The result is that most offerings on the market today contain a combination of pure, single compounds. Everything within the plant that we cannot explain has been removed, so the products fit nicely into a story that is comfortable and explainable in every detail. Perfect for a clockwork universe, where the animal industry has always existed. That is, until now.

Complex animal production

The challenge of modern animal production is no longer focussed on producing as much as possible; it is about how we produce. Constraints have been added around sustainability, carbon footprints, climate change, food safety, changing consumer behaviour, avoiding certain ingredients, animal welfare, etc. All are legitimate and pressing issues, but they have pushed animal production from a complicated challenge to that of a highly complex and unpredictable system. Changes in feed composition, animal husbandry, and constraints around animal production are increasing complexity for the animals themselves.

Growth is a complex biological process *per se*. It is even more so in production animals, which were selected for fast production cycles and unprecedented efficiency of metabolism. Certainly, the way modern production animals react to challenges demonstrates the complexity of their environment and the balancing act they must perform.

The industry – and the animals themselves – exists inside a network in which geopolitical tensions can impact animal performance as much as genetic improvements or dietary nutritional content. Outcomes are disproportionate, unexpected, unpredictable, and unexplainable.

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VACANCY
Quantum Foods has a career opportunity within its Nova Feeds division with the following vacancy:

ANIMAL SCIENTIST I (Formulation)
TASK Grade 13
This position will primarily be responsible for providing technical support to the business and customers as well as feed formulation. Position will be based in Malmesbury and report directly to the Technical Manager.

PURPOSE OF THE ROLE
- Manage feed raw materials matrixes and conduct new formulation feasibility studies.
- Design and maintain feed specifications.
- Provide technical support to production.
- Monitor and assist in final product monitoring.
- Procurement and pricing support.
- Manage NIR data and information.

REQUIREMENTS FOR THE ROLE
- Relevant agricultural degree (M.Sc Agric, B.Sc. Agric).
- Post graduate studies in animal nutrition would be advantageous.
- Minimum of 4–6 years' experience.
- Understanding and knowledge of formulation software.
- Advanced computer and Excel skills.
- Knowledge and experience of statistical analyses will be an advantage.
- Planning and reporting skills.
- Good communication skills.
- Highly motivated and self-starter.
- Team player.
- Valid driver's license.
- Own transport.

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APPLICATIONS
Interested candidates should send their CVs to Chandre Lesch at chandre.lesch@quantumfoods.co.za.

CLOSING DATE: 20 November 2024
Please note that candidates who do not receive a response from us within 14 days after the closing date should accept that they were not successful.

This is a complex environment, and this is where animal production exists today. Complex is rooted in Latin *plex* which means to weave. A synonymous word for complex is connected. When something is not complex, it is independent. Mathematically, interactions between agents are deemed complex when the result of the interactions is unpredictably higher than the numerical sum of the agents.

With such overwhelming challenges, there is the reflex of our industry to respond with the traditional clockwork universe paradigm. However, a complex challenge never responds to processes or procedures. Tackling complex animal production challenges with our traditional Newtonian way of thinking will continuously block us from progress. Instead, the law of requisite complexity states that only complexity can defeat complexity.

To bring complex animal production to the next level, we must respond with complexity. This requires integrative approaches, interoperability, non-linearity, and considering situations as dynamic systems. It requires us to tackle complexity with complexity. It requires acceptance of and respect for observations we cannot explain. It requires a paradigm shift.

Complex plant genius

Let's go back to the plants, which up to now have been stripped of their complexity so that we can apply them comfortably in animal nutrition. Although plants cannot walk, they are found virtually everywhere thriving in the most unlikely places, demonstrating the success of their evolutionary strategy. Plants are the only means to convert solar energy into chemical energy with ubiquitous ingredients such as water, soil minerals, and carbon dioxide.

Producing chemical energy is not the only hallmark of plants. Indeed, while energy is primarily used for movements in animals, plants use energy differently and are virtuoso of biochemistry, with no equivalence in animals. In no uncertain terms, plants are highly complex, with unexplainable power of evolution, and they should be respected as such.

Plants synthesise up to one million diverse small molecules, the majority of which are specialised metabolites. Plant genius is considered as the information stored within a given plant – in the form of its constellation of specialised metabolites – that helps it respond, adapt to and communicate with its environment. These metabolites not only change across plant species, but across plants of the same species and sometimes even across parts of the same plant. Together, these sophisticated constellations of specialised metabolites produce a response that is larger than just the sum of the metabolites. One specialised metabolite will never bring the power required; they must all be retained together as a complex tool for survival.

Considering the complex challenges we face, if we let go of the clockwork universe and embrace complexity, we can appreciate and respect the complexity of plant genius. If we accept a paradigm shift and respect the observations that we cannot explain, we can harness the power of plant genius to empower modern production animals to better cope with their complex environment.

Integrated intelligence

In the past, we simply sought improved performance in animals. Now, science and technology have enabled a granular understanding of the problems animals face, combined with the ability to isolate the root cause so they can be mitigated more effectively.

For example, we can now identify a performance issue associated with inflammation, glucose metabolism, hepatic function/health, etc. This empowers a deeper translation at a molecular level so that instead of finding one candidate that might solve the problem at high inclusion and low consistency, plant and animal scientists can identify a plant containing the plant genius that can tackle the physiological problem at low inclusion, consistently, holistically, and in a multifaceted way. This, in turn, consistently improves the production issue of which the physiological problem is the root cause.

On top of this, today's technology provides tools that allow for handling data from nonlinear and complex systems, such as the interaction between plant-specialised metabolites and animal physiology. This is what I call integrated intelligence, and it describes this interface where the animal physiology decodes the information that comes with plant genius. To appreciate integrated intelligence, we must apply methods such as algorithm dynamics, multilayer network analysis, statistical mechanics or complex system thinking.

There will be components we understand, but there will be many more components that we do not. It is critical to respect observation and the power of this complex interaction between plants and animals.

When the progress in understanding of root causes of underlying problems is combined with machine learning, this allows for the development of integrated intelligence and opens the door for exploiting plant genius, which provides production animals with powerful tools to tackle root causes and improve resilience during increasingly complex challenges.

Conclusion

Modern animal production exists in a complex environment, with complex challenges that are interrelated, unexpected, and unpredictable. These challenges cannot be understood in isolation because they are interdependent; they are systemic problems. Such challenges will never be solved by the traditional process-driven approaches of traditional research and development programmes. Rather, they demand complexity in solutions that are non-linear, and dynamic, brought about by systems thinking.

Plants are the embodiment of complexity and contain within them plant genius – chemical information key to evolutionary success that does not exist in animals. Integrated intelligence is the interface between plant and animal complexity and allows animals to decode plant genius and use it as a tool for their adaptability in an increasingly challenging environment. Having been previously trivialised to fit into deterministic paradigms, plants and the field of phytotechnology will surely benefit from this evolution of thinking. And with that, the animals too.❖

For more information, send an email to Dr David Bravo at david.bravo@nutreco.com or visit *www.nutreco.com*.

Smart choices: Selecting the right feed additives for success

By Natasha Snyman, chief operations officer, Chemuniqué

In the competitive world of animal agriculture, optimising feed efficiency while maintaining livestock health and productivity is essential. With rising global demand for animal products, producers face intense pressure to deliver high-quality outputs while managing costs.

Feed additives are crucial in this equation, offering benefits such as enhanced growth rates, better feed efficiency, and improved animal health. However, the wide array of available options can make selecting the right feed additive daunting. This article guides you through making informed decisions aligned with your specific needs and goals.

Understanding feed additives

Feed additives are substances added to animal feed to improve its nutritional value, enhance performance, and promote health. These additives are broadly categorised into three types: nutritional, zootechnical, and sensory.

Nutritional additives: These include essential micronutrients such as vitamins, minerals, and amino acids, which are vital for meeting animals' physiological and metabolic needs. The purpose of adding these to your formulation is to ensure livestock receive a balanced diet, supporting optimal growth, reproductive efficiency, and overall health. To realise the full potential of nutritional additives, optimal integration into the formulation is key.

Zootechnical additives: This category comprises probiotics, enzymes, and other substances that enhance the nutritional value of feed. Enzymes improve the digestibility of nutrients, leading to better absorption and growth, while probiotics support gut health, boost immunity, and reduce the negative effects of stress and disease.

Sensory additives: Additives such as flavours and colourants make feed more palatable, encouraging animals to consume it more readily. Although they do not directly enhance nutritional value, they play a crucial role in ensuring consistent feed intake, particularly in young or sick animals.

Business goals and animal needs

Before diving into the specifics of feed additives, it is essential to clearly understand your business objectives and your animals' needs. What are you aiming to achieve? Are you focussed on increasing growth rates, improving feed conversion ratios, enhancing animal health, or reducing the environmental impact of your operation?

If your primary objective is to enhance growth rates, you might prioritise additives that improve feed efficiency or support rapid weight gain. If animal health is a concern, additives that boost immunity or improve gut health might be more suitable. Aligning your choice of feed additives with your business goals ensures that you address immediate needs while contributing to the long-term success of your operation.

Evaluating scientific evidence

In selecting feed additives, decisions should be based on rigorous scientific evidence. The effectiveness and safety of any additive must be supported by reliable research, including peer-reviewed studies, trials, and empirical evidence.

The importance of trial design cannot be overstated. As opportunities for improvements in animal performance become more limited, detecting even subtle differences between additives is crucial. Well-designed trials involve carefully controlled experiments with large sample sizes and robust statistical analyses. These trials help uncover the smallest advantages that one additive might have over another, enabling well-informed decisions based on reliable evidence.

For instance, if you are considering an enzyme additive, seek studies demonstrating its effectiveness in improving feed conversion ratios or nutrient absorption. Consider the conditions under which the trials were conducted – diet composition and environmental factors can significantly influence outcomes. The trial facilities where studies are conducted play a crucial role in accurately detecting

An additive that improves animal health and productivity could yield higher returns over time, even with a substantial initial investment.

the increasingly narrow margins for improvement.

Cost-benefit analysis

While feed additives can offer significant benefits, they often come at a high cost, making cost-benefit analysis crucial. Start by evaluating the direct costs of the additive and then consider potential savings from improved animal performance, reduced veterinary costs, and other economic benefits. For instance, an additive that enhances feed efficiency might lower overall feed costs, while one that boosts immunity could reduce disease incidence and veterinary expenses.

Additionally, consider the long-term impacts. An additive that improves animal health and productivity could yield higher returns over time, even with a substantial initial investment. Conversely, a cheaper additive with minimal benefits may not justify the savings in the long run. The costliest additive is the one that delivers no benefit.

Sustainability considerations

As the agricultural industry prioritises sustainability, the choice of feed additives is increasingly influenced by environmental concerns. Additives that promote eco-friendly practices can enhance your business's sustainability and appeal to environmentally conscious consumers.

For example, certain additives can reduce mineral excretion or improve nitrogen utilisation in pigs and poultry, lowering your environmental footprint. Additionally, sourcing additives from sustainable and ethical suppliers can further enhance your business's sustainability credentials.

Incorporating sustainability into your feed additive selection process helps the environment, improves your brand's reputation, and opens new market opportunities.

Practical implementation

Once you have selected a feed additive, the next step is to integrate it into your feed formulation. This involves ensuring proper dosing, mixing in your feed mill, and monitoring results on the farm.

One of the most promising developments is using precision nutrition technologies that allow for the customisation of feed formulations based on the needs of individual animals or groups.

A systematic approach is essential. Start with small-scale trials to assess the additive's performance in your specific conditions. Regular monitoring and record-keeping will help you track benefits and identify issues early. Adjustments may be necessary based on the results – what works well in one context might not be as effective in another.

For example, if you are introducing a probiotic additive, monitor livestock health and growth over several weeks. If improvements are noticed, you can consider expanding its use. If results are mixed, you may need to adjust the dosage or explore alternative additives.

Future trends and innovations

The field of animal nutrition is continuously evolving, with new research and innovations emerging regularly. Staying informed regarding the latest trends and advancements in feed additives can give your business a competitive edge.

One of the most promising developments is the use of precision nutrition technologies. These tools allow for the customisation of feed formulations based on the specific needs of individual animals or groups, optimising nutrient intake and improving overall efficiency.

Novel additive formulations are also being developed, targeting specific health issues or enhancing particular aspects of performance. For instance, additives that promote gut health or reduce stress in livestock are gaining attention, particularly in intensive farming systems.

Additionally, the integration of digital tools for better feed management is transforming the industry. Software that tracks feed consumption, animal performance, and environmental conditions can provide valuable data, enabling more informed decisions regarding feed additives and overall nutrition strategies.

Making informed choices

Choosing the right feed additive for your business is a multifaceted decision that requires careful consideration of various factors. By understanding the different types of additives, aligning your choice with business goals, evaluating scientific evidence, ensuring regulatory compliance, conducting cost-benefit analyses, considering sustainability, and planning for practical implementation, you can make informed decisions that enhance the health and productivity of your livestock.

In an industry where every decision counts, selecting the right feed additives can be the difference between success and failure. With a well-informed approach, you can ensure that your choices contribute to both the immediate well-being of your animals and the long-term success and sustainability of your business.❖

For more information, send an email to Natasha Snyman at natasha.s@chemunique.co.za or visit *www.chemunique.co.za*.

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VACANCY
Quantum Foods has a career opportunity at its Nova Feeds division with the following vacancy:

ANIMAL NUTRITIONIST/SCIENTIST I (Ruminants)
TASK Grade 13
This position will report directly to the Regional Manager R&D and will be based in Paterson (Gqeberha, Eastern Cape). This position will mainly be responsible for providing technical support to dairy customers advising on nutrition and feed product choice.

PURPOSE OF THE ROLE
- Providing technical support to our dairy customers primarily on pasture-based systems through advising on nutrition, feed product choice and pasture management.
- Technical support and training of the sales team.
- Product development and application of current research and new technology in ruminant nutrition.
- Formulating new feeds as well as maintaining formulas of existing products on BESTMIX.
- Identification of and feasibility studies on alternative or additional raw materials.
- General support to all interdependent departments.
- Product registration.

REQUIREMENTS FOR THE ROLE
- Relevant agricultural degree.
- Relevant post-graduate degree in agriculture (e.g., M.Sc. Agric) will be an advantage.
- Three to five years' experience in a similar position in the dairy feed industry will be an advantage.
- Experience in ration formulation for dairy cows (experience of formulating with current CNCPS biology will be beneficial).
- Efficient in the use of Microsoft Office.
- Good communication skills.
- Highly motivated and self-starter.
- Pri.Sci.Nat. registration (SACNASP).

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Cracking the code: Proving nutritional matrix values for phytogenic feed additives through modelling

By Manu De Laet, global phytogenic technical poultry lead, Cargill

One of the objectives of any poultry producer is to feed chickens a balanced diet at the least cost. Feed constitutes the highest variable cost in poultry production, accounting for at least 60% of such costs, especially in an intensive rearing system. It is the role of the nutritionist to work with the different tools available, and a phytogenic feed additive can play an important role in the least cost formulation and sustainability of feed.

The more we learn about phytogenics, the more important their role becomes. The key is identifying and combining specific plant extracts that can act synergistically to improve nutrient digestibility while being safe, residue-free, and efficacious.

The undigested part of feed

A balanced feed is offered to broilers in modern poultry production, but this can vary depending on the feedstuffs available. For more than 20 years, feed additives have been used to improve feed digestibility and allow more raw materials to help animal producers reduce their feed costs. Feed must undergo a series of physical and chemical actions before becoming simple, absorbable constituents called nutrients.

Not all ingested feed is absorbed by the body – part of the feed is not used and passes through the digestive tract to be excreted in faeces. Regarding energy, not more than 75% is available to metabolism at the end of the gastrointestinal tract (GIT). In comparison, ileal digestibility of 80% is currently observed for protein, which means that 20 to 25% of the organic matter is generally not available for animal metabolism.

In birds, the transit of feed through the GIT is relatively fast and lasts an average of 24 hours. In addition, modern poultry genotypes have been selected primarily to enhance their appetite and, thus, challenge their digestive abilities. This means that the speed of digestion and absorption of the feed is essential.

A lot of *in vitro* studies have been carried out to estimate the digestibility of nutrients. These studies showed that both transit time and enzyme concentration play a significant role in digesting nutrients such as crude protein (CP). For example, CP digestibility can vary from 59 to 93% with different pepsin concentrations (*Figure 1*). Pepsin is an endopeptidase that breaks down proteins into smaller peptides. It is produced in the gastric chief cells of the stomach lining and is one of the main digestive enzymes in the digestive systems of poultry, where it helps digest the proteins.

Phytogenic feed additives

The inclusion of phytogenic feed additives in feed enhances the performance of broilers. There are several categories of phytogenic feed additives and all of them have a different effect in the animal, including essential oils, pungent and bitter substances, and saponins. Essential oils have a positive effect on the secretion of digestive juices and on nutrient absorption. Pungent and bitter substances will have an additional effect on increased bile flow in the gut which is important for fat digestion. Lastly, saponins improve the permeability of the gut wall leading to improved absorption of nutrients and minerals.

When phytogenic feed additives were added on top of the feed, *in vivo* trials showed that trypsin production was increased by 13%. Trypsin is an important enzyme involved in protein digestion. Other enzymes associated with carbohydrate digestion were also increased, including amylase (+ 25%, digestion of starch), sucrase (+ 15%, digestion of sucrose), and maltase (+ 11%, digestion of disaccharide maltose) (*Figure 2*).

Figure 1: Digestibility of crude protein with different pepsin levels.

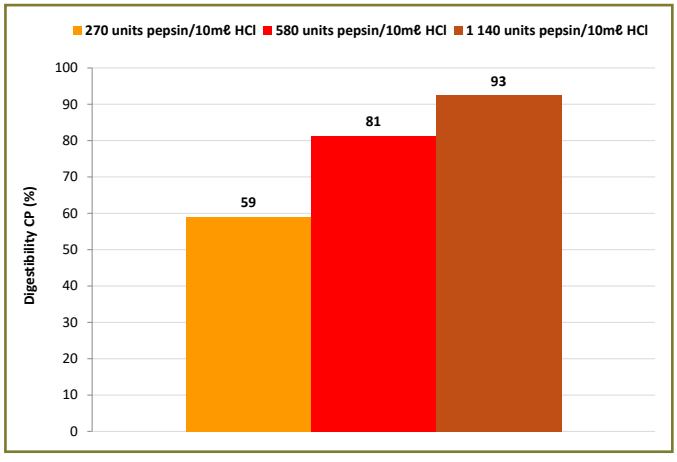
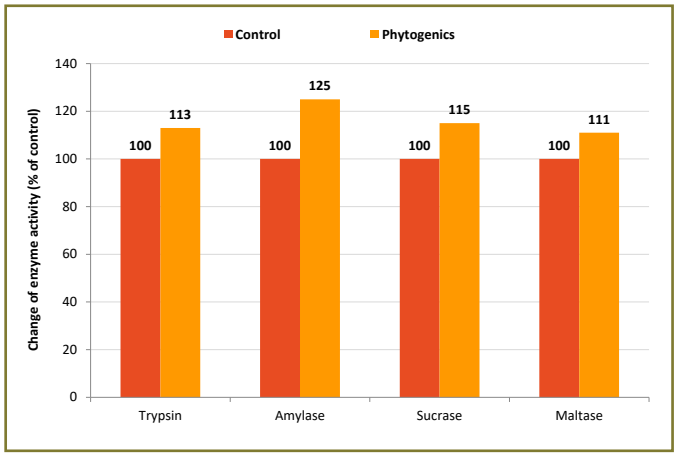


Figure 2: Change of enzyme activity when a mix of phytogenics is added to the feed.



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Farmwise grains

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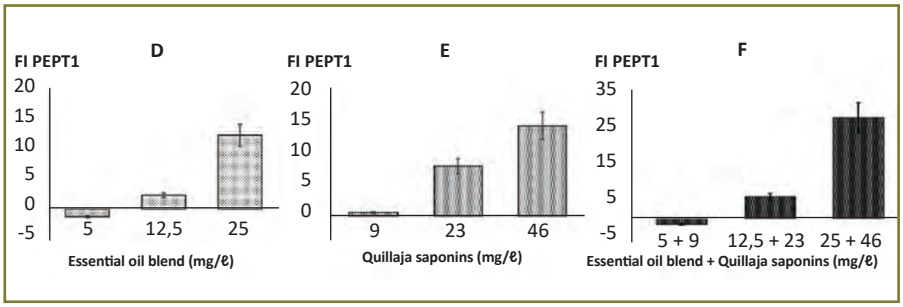
Figure 3: Fold change of membrane recruitment of peptide transporter 1 (PEPT1) by addition of essential oils, quillaja saponins, or both phytogenic preparations at concentrations of 5, 12,5 and 25mg/ℓ (essential oils) or 9, 23 and 46mg/ℓ (quillaja saponins).



Reyer *et al*. (2017) showed with *in vitro* cell models using Caco-2 cells that phytogenics can increase the number of nutrient transporters in cell membranes (*Figure 3*). These transporters include peptide transporter 1 (PEPT1), a cell membrane transporter involved in the uptake of peptides into the cells and sodium-glucose transporter 1 (SGLT1), a glucose transporter found in the intestinal mucosa (enterocytes) of the small intestine and that contributes to renal glucose reabsorption.

When Caco-2 cells were incubated with either quillaja saponins, essentials oils or a combination of saponins and essential oils, the synergy of the specific essential oil mixture and saponins stimulated a greater increase in the number of transporters than either essential oil or saponins alone.

The physiological stimulation by these phytogenics leads to better feed digestion and absorption, and improved animal performance. An analysis of 79 broiler trials where phytogenic feed additives were used demonstrated an average increase in bodyweight of 1,4% and a reduced feed conversion ratio of 1,2%.

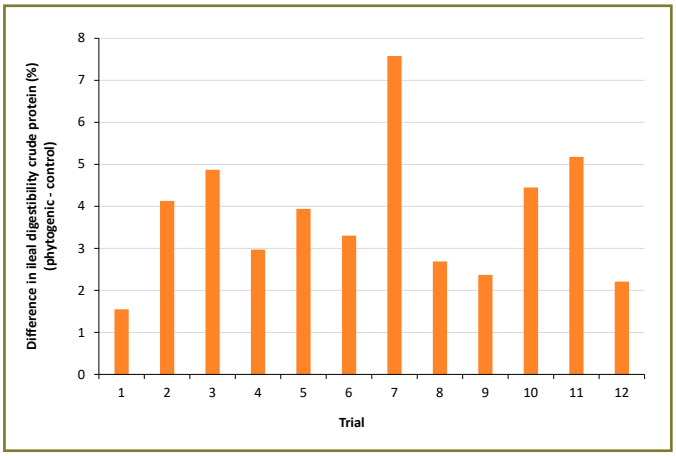
Alongside improved performance, the gut health of birds will also be influenced beneficially. Since digestion of the feed is improved using phytogenic feed additives, fewer nutrients should be available for undesirable bacteria, hence limiting their population growth and the detrimental consequences typically associated with this uncontrolled growth.

Use of nutritional matrix values

The nutritional matrix values can be generated/validated in different ways. One is the traditional way, *in vivo* digestibility trials, an established and standard method for many years. Another option is via mathematical modelling, providing matrix values based on previous performance trial results.

Analysis of 12 ileal nutrient digestibility experiments and four amino acid digestibility experiments on both broilers and layers-fed soya/maize rations supplemented with phytogenic feed additives demonstrated increased ileal digestibility of CP, amino acids, fat, calcium, and phosphorus. The increase in CP digestibility from these trials is shown in *Figure 4* (as CP digestibility phytogenic feed additives – CP digestibility control) as an example.

Figure 4: Differences in ileal digestibility crude protein as (phytogenic – control) %.



Mathematical modelling

Based on performance broiler trial results and diet formulations, mathematical modelling can be used to validate the digestibility effects of a given feed additive used. A non-invasive method, such as mathematical modelling, can be used to calculate digestibility. Furthermore, when considering all aspects of this method, a large amount of data from multiple performance trials can be used within the model – as you can use historical data to the present day.

The model can account for diet nutritional content/values, age, breed, and trial length. Therefore, establishing a correlation between nutrient intake and the animal's performance and then applying that regression to the improved performance of the animals fed the phytogenic feed additives will provide a theoretical value for intake required for the improved performance result. This is the basis of the nutritional matrix value calculation.

We undertook the 'mathematical modelling' technique to validate the digestibility and performance results observed from previous studies. The analysis included an impressive 79 broiler trials (from 2002 to 2022). Diet formulation, performance results, age, and breed were some of the critical inputs required for the model. The results from the modelling validated the already existing nutritional matrix values obtained from the classic digestibility trials.

Conclusion

Creating a dataset to support a phytogenic nutritional matrix is not without challenges. It is important to have a margin of safety and limit the risk of a performance decrease. Consequently, the larger the dataset, the greater the confidence in the conclusions generated. If a dataset of 12 digestibility experiments and four amino acid digestibility trials is used, next to a mathematic modelling exercise with 79 performance trials, we can conclude that the matrix values are safe to use.❖

For more information, visit *www.cargill.com*.

From the rumen to mammary gland:

A microbial and cellular continuum to consider in cow performance and health optimisation strategies

By Dr Lysiane Duniere, research scientist, Lallemand Animal Nutrition

The ruminant, as is the case with most mammalian animals, can be considered a holobiont, defined as an indissociable entity between the host animal and its microbiome (i.e., the microbiota and its environment). The host body harbours diverse microbiomes across various sites, including the buccal cavity, gastrointestinal tract (GIT) (e.g., rumen, small intestine, large intestine, faeces), mammary gland, reproductive tract, and skin. These microbiomes can interact with one another to respond to changing environmental conditions, such as dietary shifts, physiological and hormonal changes, or the presence of pathogens.

In the last decade, a tremendous amount of research has been devoted to understanding the gut microbiome, and we have learnt that GIT microbiota influences not only GIT function but also, beyond the GIT, many key functions of the host, including immunity, metabolism, and behaviour.

The rumen ecosystem represents a classic example of host-microbiome symbiosis. In this obligatory relationship the fermentations performed exclusively through a complex set of microbial metabolic cascades supply the host animal with essential sources of energy and nitrogen. This makes ruminants unique, as they can digest complex plant cell wall polymers solely due to the activity of specialised microbial communities in the rumen.

More and more, it is understood that what happens in the rumen can cascade into gastrointestinal function, metabolic status, liver function, immune response, and the mammary gland. This progression is illustrated by disruptions that may start in the rumen and have measurable consequences on milk production, for example. Sub-acute ruminal acidosis (SARA) and its consequences are a good example.

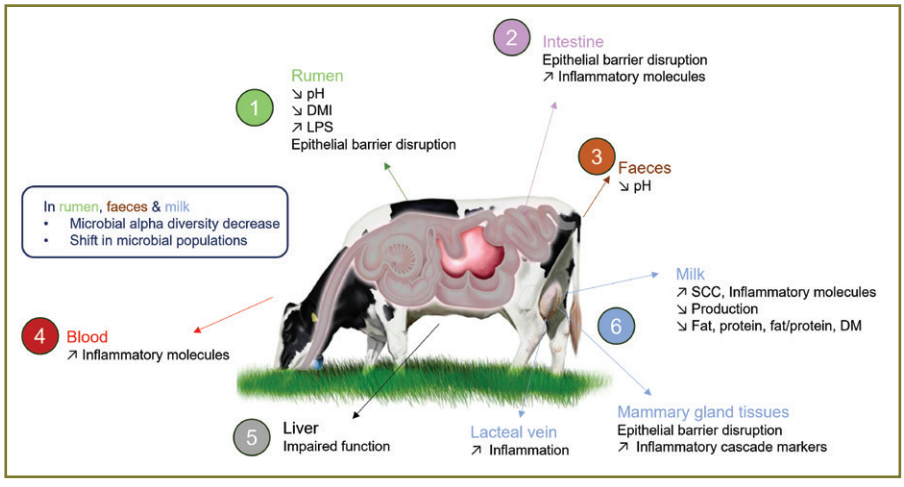
Microbial changes during SARA

SARA is characterised by reversible rumen pH depression and often occurs after the replacement of fibre by rapidly fermentable carbohydrates to meet high energy requirements (Kleen *et al*., 2003; Plaizier *et al*., 2012). Indeed, large amounts of readily fermentable starch or sugars alter rumen microbial communities and functions, leading to a decrease in rumen pH.

As rumen pH decreases, lactate producers may outnumber lactate utilisers, leading to deeper changes in the structure of rumen microbiota and the SARA situation. The abundances of fibre-adherent *Ruminococcus* sp. and *Fibrobacter succinogenes* were shown to decrease in the rumen of cows switching from a roughage to a high-grain diet, and in contrast, the lactate utilisers *Selenomonas ruminantium* and *Megasphaera elsdenii* increased.

Lactobacillus and *Streptococcus* were present in the rumen of acidotic cows, probably reflecting the tolerance of these species to low pH and their ability to proliferate on an excess of fermentable carbohydrates (Petri *et al*., 2013, 2017, 2018). Low rumen pH for a prolonged period can negatively affect feed intake, microbial metabolism, and feed efficiency as it inhibits fibre-degrading communities (Villot *et al*., 2018).

Figure 1: The influence of sub-acute ruminal acidosis on an animal.



From rumen to inflammation

It is well-established that SARA induces the release of large amounts of cell-free lipopolysaccharide (LPS) in the bloodstream (Plaizier *et al*., 2012). LPS is a component of bacterial structures that is mainly released when bacteria die. This component has been shown to trigger inflammation patterns at the rumen-wall level. Diets associated with ruminal acidosis may induce bacterial death and also increase the turnover rate of bacteria, leading to a strong LPS increase in the rumen.

Other inflammatory compounds, such as histamine, may be released in the rumen during SARA. Histamine is produced by low-pH tolerant bacteria

(Garner *et al*., 2002) and can accumulate in case of acute acidosis (Golder *et al*., 2013, 2014; Silberberg *et al*., 2013).

A high level of rapidly fermentable dietary carbohydrates (as with high-concentrate or grain-based diets) promotes the production of volatile fatty acids that are an important energy source for the animal. However, this type of diet will also increase the production of harmful lactic acid, which may accumulate in the rumen. High acid concentrations may have a damaging effect on the rumen wall, leading to papillae erosion, epithelium destruction and an overall increase in permeability.

In addition to morphological damage to the epithelium (Steele *et al*., 2011), gene expression of the rumen epithelium is also modified under acidosis (Steele *et al*., 2011; Zhang *et al*., 2016b, 2017; Bach *et al*., 2018), leading to malfunction of this tissue and impaired transport mechanisms (Plaizier *et al*., 2018). The barrier function of the rumen epithelium can also be compromised, and a reduction in the expression of genes encoding for tight junctions has been reported (Bach *et al*., 2018; Zhang *et al*., 2019).

Because of this rumen wall permeability, inflammatory molecules such as LPS and histamine may pass easily from the rumen to the bloodstream, triggering systemic inflammation that involves a greater glucose requirement (Kent-Dennis and Penner, 2021) and increased energy demand. The inflammatory response elicited by the animal diverts nutrients essential for milk component synthesis (Dong *et al*., 2011). Additionally, histamine may induce inflammation in the hooves, leading to laminitis (Garner *et al*., 2002).

Moreover, ruminants experiencing SARA also have an increased risk of bacterial dysbiosis and LPS release in their hindgut, probably because of the increased hindgut fermentation of feed that was not digested in the disturbed rumen (Metzler-Zebeli *et al*., 2013). For example, goats fed high-concentrate diets exhibited ruminal alterations characteristic of SARA, namely decreased rumen pH and elevated LPS concentrations, as well as mucosal epithelium damage at the colon level and the destruction of intracellular tight junctions (Tao *et al*., 2014).

Thus, it is clear that under acidic conditions associated with high-concentrate diets, toxins, secondary metabolites, or other microbial-derived molecules can interact with the epithelia and translocate into systemic and lymphatic circulation (Plaizier *et al*., 2018).

Impact on mammary gland health

LPS can be transported via the bloodstream to the mammary gland (Dong *et al*., 2011, Zhang *et al*., 2016a), where it can invade and elicit a localised immune response (Aditya *et al*., 2020). This immune response might impair the defence of the teat and even destroy its barrier function (Dong *et al*., 2011), increasing the animal's exposure to bacterial invasion and the risk of mastitis.

Besides affecting both the rumen and lower gut microbiota, SARA has been suggested to alter the composition of the milk microbiota. In particular, bacterial species commonly involved in mastitis have been enriched in milk from cows experiencing SARA (Zhang *et al*., 2015). Recent studies suggest a possible transfer of bacterial fractions or even viable bacteria via an entero-mammary route (Oikonomou *et al*., 2020). Hu and colleagues demonstrated that rumen microbiota disturbance was associated with the occurrence of mastitis in cows (Hu *et al*., 2022). In addition, they observed that a higher abundance of a specific bacteria (*Stenotrophomonas*) in the rumen was closely associated with the development of mastitis.

In addition to the reduction of energy available for body maintenance and milk component synthesis, the presence of toxic compounds in the bloodstream will impact immune responses and inflammation in the udder. Interestingly, inflammatory responses in the udder have been associated with a reduction of milk protein content (Zhang *et al*., 2016a). Similar observations have been made with histamine (Chang *et al*., 2018). As a result, SARA, through disturbances of the rumen, can impair the maintenance of body condition and reduce milk production.

In conclusion, the interconnectedness of the body's tissues and organs highlights the need for a holistic approach to disease management. A strong focus on maintaining gut microbiota balance is crucial when addressing diseases that affect organs such as the mammary gland.❖

For more information, send an email to Dr Lysiane Duniere at lduniere@lallemand.com or Caitlyn de Vos at caitlynv@vitam.co.za.

Organic selenium in animal nutrition: From the improvement of Se status to general health

By Prof Peter Surai, Vitagene and Health Research Centre, and consultant, Feed Food

In commercial animal production, a range of stressors are responsible for economic losses due to decreased productive and reproductive performance and compromised health. Within the antioxidant network, selenium (Se) is of paramount importance. Indeed, there are currently 25 selenoproteins identified in animals, and more than half are involved in the maintenance of the body's redox balance and antioxidant defences (Surai, 2024).

Since Se levels in major feed ingredients, including grains, oilseeds and forages, are quite variable and, in many countries worldwide they are quite low, dietary Se supplementation is key to prevent Se deficiency. A range of Se supplements are used in animal nutrition, including inorganic Se sources (sodium selenite and selenate) and organic Se sources (e.g. Se-Yeast, Se-Met, Zn-SeMet and OH-SeMet; Surai *et al*., 2018). For the last three decades, information has been accumulated to prove that organic Se sources are more effective in animal nutrition compared to inorganic Se sources, and it will be briefly summarised here.

Se sources in animal nutrition

Detailed analysis of the literature suggests that organic Se in the form of selenomethionine (SeMet) is a natural form of Se in animal and human diets and that the digestive system adapted to this nutrient form during evolution. This can explain why there are principal differences in assimilation and metabolism between organic and inorganic forms of Se (Surai, 2002; 2006; 2018; 2021; 2024).

Recent findings support the view that SeMet can be non-specifically incorporated into muscle proteins building Se reserves, which can be used in stressful conditions when Se requirement is increased, but feed consumption is usually decreased. In stressful conditions, protein catabolism by proteasomes can release SeMet, which could serve as a source of Se for newly synthesised selenoproteins, such as GSH-Px, thioredoxin reductase, methionine sulfoxide reductase, etc. Those enzymes can deal with the overproduction of free radicals, maintain redox homeostasis and prevent a decrease in the productive and reproductive performance of production animals.

It is important to mention that only SeMet is able to build the Se reserves, while other Se forms are metabolised directly to H_2Se with further *de novo* selenocysteine SeCys and selenoprotein synthesis. Therefore, since SeMet is not synthesised by animals, its dietary supplementation is a key strategy to meet the optimal Se status of production animals under commercially relevant stress conditions.

Three generations of supplements

There are three generations of Se supplements on the global market (Surai *et al*., 2018). The first includes inorganic forms of Se, such as sodium selenite and selenate. It seems likely that these supplements, first introduced in the 1970s, helped solve Se deficiency in monogastric animals reared in optimal conditions, but were characterised by comparatively low efficacy for ruminants.

The second generation of Se supplements includes Se-Yeast and pure SeMet. These products were a substantial step ahead in animal nutrition and found their way to the worldwide animal feed supplement market. However, the proportion of active compound of Se-Yeast, namely SeMet, is characterised by great variability (usually, from 20 up to 70%) and it is practically impossible to guarantee a specific percentage of SeMet in the Se-Yeast-based products.

Indeed, SeMet proportions in Se-Yeast depend on many factors involved in yeast fermentation and some of them, for example, molasses, a main energy source, cannot be standardised (Surai, 2018; 2021; 2024). Furthermore, the recent discovery of a substantial proportion of Se in Se-Yeast in the form of elemental Se (Vacchina *et al*., 2021; Hachemi *et al*., 2023a; Angaits *et al*., 2024) further complicates the issue. At the same time, pure SeMet being a good source of high concentrations of the active Se compound has some problems with stability, especially after feed heat treatment (Surai, 2018).

Therefore, it seems likely that OH-SeMet possesses advantages of both pure SeMet, as a highly concentrated organic Se source with guaranteed concentration, and Se-Yeast, as a stable product. Therefore, OH-SeMet could be considered the third generation of Se supplements (Surai *et al*., 2018). In fact, in comparison to other organic Se sources, including Se-yeast, OH-SeMet provides the highest Se reserves in chicken (Surai, 2018) and pig (Surai, 2021) muscles, as well as being highly effective in poultry, pigs and ruminants (Surai, 2018; 2021; 2024).

It should also be emphasised that selenium chelates and proteinates cannot be considered as organic Se sources. In fact, their chemistry and advantages in comparison to sodium selenite are not proven (Surai *et al*., 2018; Surai, 2024). Furthermore, nano-Se received tremendous attention in recent years, however, a fundamental question related to molecular mechanisms of elemental Se (in nano form) conversion into H_2Se with the following

synthesis of selenoproteins is not resolved yet, and there is an urgent need for more research in that area.

Benefits for ruminants

It has been proven that in the rumen sodium selenite could be reduced to elemental Se, which is not available for animals. This rumen feature explains the low efficacy of sodium selenite in the nutrition of ruminant animals. Therefore, beneficial effects of SeMet-based organic Se in ruminant nutrition can be related to improvements in the health and production of both the animal and her progeny as a result of improved Se status.

Organic Se sources are responsible for the improvement of:

- Se status of dairy and beef cattle maintaining optimal antioxidant defences.
- Se reserves in muscles in the form of SeMet improving adaptive ability to stresses.
- Se transfer via placenta improving Se status and antioxidant defences of newly born calves.
- Se concentration in colostrum and milk improving Se status and antioxidant defences of weaning calves.
- Redox balance (GSH-Px, TrxR, SOD, catalase, total AOA, Nrf2, NF-κB, etc.) maintaining animal health under stressful commercial conditions.

The improvements in Se status and antioxidant defences are a background for an improvement of immunocompetence, including prevention of inflammation, decreased somatic cell counts, mastitis, and other immunity-related problems. Furthermore, an optimal Se status of the cows would have a positive effect on the health status and productivity of progeny calves.

Benefits for poultry

The main advantages of organic Se for poultry include:

- Improved Se status of breeders with enhanced Se transfer to the egg leads to increasing antioxidant defences of the developing embryos and newly hatching chicks, providing them with high viability and health.
- Improved Se status of breeders could have a positive effect on the progeny chick growth and development.
- Improved Se reserves in the muscles of breeders can improve their stress resistance.
- Maintenance of optimal Se status of cockerels helps maintain high semen quality, fertility, and hatchability.
- Improved Se status of broilers through building Se reserves in muscles leads to enhanced resistance to stresses, leading to maintaining gut health; supporting optimal immunocompetence; preventing over-inflammation; and maintaining meat quality (water-holding capacity and drip loss).
- Improved Se status of commercial layers can help with their health and production, including maintaining production in ageing layers (after 50 to 70 weeks of age); preventing eggshell gland inflammation and maintaining eggshell quality; improving internal egg quality (Hough units); and possibility of producing Se-enriched eggs.

Benefits for pigs

The main advantages of organic Se for pigs include:

- Improved Se status of sows leads to increased antioxidant defences of the breeder animals and improved Se status of the foetus and newly born piglets, providing them with an important advantage at the beginning of postnatal life. There are also long-term maternal effects on the progeny's health and development.
- Improved Se concentration in colostrum and milk is associated with the increased adaptive ability of piglets during the stressful period of weaning, helping maintain their optimal immunity and gut health.
- Optimal Se status of growing piglets helps with maintaining gut health (optimal feed conversion ratio), high immunocompetence (prevention of inflammation and vaccination efficacy), and improved meat quality (decreasing drip loss).
- There is an opportunity to produce Se-enriched meat.

Protective effects in cattle

The protective effects of selenium in production animals are associated with optimal selenoprotein expression in tissues helping maintain optimal redox balance in the body. These effects are effectively controlled and directed via major redox-active selenoproteins, including GSH-Px, TrxR, MsrB, SelF, SelH, SelK, SelM, SelN, SelO, SelP, SelS, SelT, and SelW; transcription factors, including activation of Nrf2, responsible for the synthesis of more than 200 protective antioxidants, and inhibition of NF-κB, responsible for the synthesis of proinflammatory cytokines; and vitagenes, including SOD, thioredoxin- and glutathione systems, main regulators of the redox balance.

Under optimal Se status of production animals, the results of interactions between the aforementioned factors are optimal immune response (due to maintenance of immunoreceptor integrity), prevention of over-inflammation (due to reduction of NF-κB expression), improved resistance to stress (due to Se reserves, vitagene and Nrf2 activation) and maintenance of general health, productive and reproductive performance under commercially relevant stress conditions.

Conclusion

The analysis of the recent literature reinforces the importance of Se in animal nutrition and health. Optimisation of Se nutrition of production animals helps to maintain their health, productivity and reproductive performance under commercially relevant stress conditions. From the data presented here it is clear that organic selenium is an effective choice to achieve this goal. Indeed, the development of the organic Se concept, based on the understanding of the pivotal role of Se reserve building in the form of SeMet, to improve stress adaptability of farm animals and poultry is of great importance for commercial milk, meat, and egg production.

For more information, send an email to Prof Peter Surai at psurai@feedfood.co.uk.

Mycotoxin decontamination approaches for safer animal feed

By Marie Gallissot and Leandro Royo, Mycotoxin Solutions Olmix, and Caitlyn de Vos, ruminant development manager, Vitam International

Producing safe feed is essential for the health and productivity of livestock. Mycotoxin contamination presents a significant risk globally, and decontamination is necessary. This work aims to provide a scientific review of the different detoxification methods available on the market.

Three primary approaches to mitigate the harmful effects of mycotoxins on animals have been identified (*Figure 1*). The most common strategy for reducing animal exposure to mycotoxins involves decreasing mycotoxin bioavailability by incorporating various mycotoxin-detoxifying agents in the feed. These agents target a reduction of mycotoxin uptake and distribution to the blood and target organs.

Depending on their mode of action, these feed additives may function either by reducing mycotoxin bioavailability through adsorption (adsorbents, also known as binding agents, or binders) or by degrading the mycotoxins into less toxic metabolites (biotransforming agents).

Major adsorbing agents

Mycotoxin adsorbing agents are large molecular weight compounds that are not digested by the animals and are excreted in the faeces. Adsorbing agents must be able to effectively bind mycotoxins in contaminated feed without dissociating along the animal's gastrointestinal tract, ensuring that the toxin-adsorbing agent complex is eliminated via the faeces.

Adsorbing agents can be mineral or organic compounds, and their mode of action is based on intermolecular interactions between the toxin and the adsorbent. These interactions depend on electrostatic and hydrophobic interactions (namely, hydrogen binding, ionic binding, and Van der Waals forces), as well as shape compatibility (planar or non-planar geometry), which vary according to the nature of the adsorbent and the type of mycotoxin. Multiple mycotoxins, each with distinct chemical and physical properties, can co-occur in feed.

Mycotoxins can differ significantly in terms of hydrophobicity/polarity and potential bonding types (both in number and nature). While mycotoxins from different families can be of a similar size, their 3D conformation and volume can vary greatly. For example, aflatoxins are planar, zearalenones are flexible, and trichothecenes are globular and rigid molecules, even though they are all of comparable size. The efficacy of adsorbing agents in binding to different mycotoxins is further influenced by the distribution of total charges and the size of pores or accessible surface of the adsorbing agents.

Evaluating adsorbing agents

Given the numerous adsorbing agent candidates, screening methods are essential to evaluate their efficacy. *In vitro* tests serve as a valuable tool for screening potential mycotoxin detoxifying agents. If a sequestering agent does not adsorb a mycotoxin *in vitro*, it is unlikely to do so *in vivo* (EFSA 2009). The *in vitro* efficacy of adsorbing agents can be tested either in static or dynamic conditions, with static *in vitro* models, namely the single concentration method, being the most widely used.

However, the static model has limitations that may result in an overestimation of binding capacity (Versantvoort *et al*., 2005). In fact, Vekiru *et al*. (2007) demonstrated that adsorbents perform less effectively under the simulated gastrointestinal conditions of dynamic *in vitro* models. Thus, dynamic models are strongly recommended for accurate evaluation.

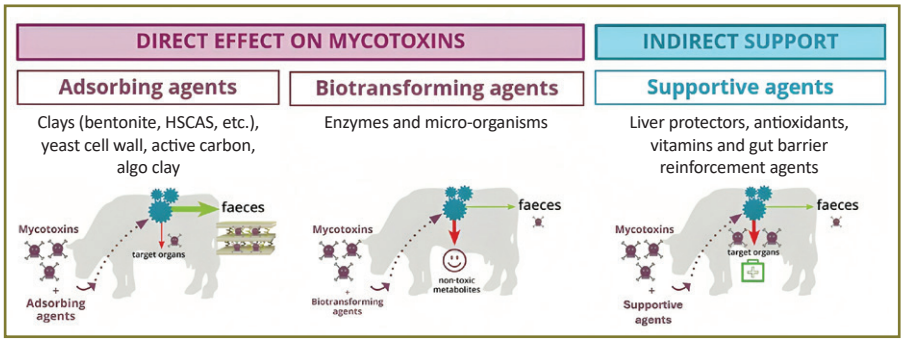
Efficacy of main adsorbing agents

Activated carbon, also known as activated charcoal, is a form of carbon processed to have small, low-volume pores that significantly increase the surface area (up to 3 500m^2/g) available for adsorption or chemical reactions. The efficacy of activated carbon to bind various mycotoxins has been proven in both static and dynamic *in vitro* models (Avantaggiato *et al*., 2003 and 2004).

However, activated carbon is non-selective, meaning that it also efficiently binds small molecules such as vitamins (Vekiru *et al*., 2007). Consequently, activated carbon is no longer commonly used in animal feed, but continues to serve as a reference material in several studies.

Silicate minerals are the most common mycotoxin adsorbing agents available on the market. Silicates can be classified into phyllosilicates (e.g., smectites) or tectosilicates (e.g., zeolites), with the latter having a limited efficacy compared to phyllosilicates, particularly smectites (Lemke *et al*., 2001; Vekiru *et al*., 2015). The interlayer space (d-spacing) of smectites enables the entry and efficient binding of planar molecules such as aflatoxins (Diaz *et al*., 2002), but the effectiveness of this binding varies depending on the smectite quality (Vekiru *et al*., 2007). Smectites have very limited or no efficacy in adsorbing mycotoxins other than aflatoxins (Döll *et al*., 2004; Avantaggiato *et al*., 2005).

Figure 1: Three different approaches to reduce and mitigate mycotoxin exposure.



The adsorption spectrum of smectites can be enhanced by increasing their interlayer space (d-spacing), as demonstrated by De Mil *et al.* (2015). This approach is more effective than strategies that aim to increase the cationic exchange capacity of clays (e.g., modified smectites enriched in cations) which have shown limited efficacy.

An innovative material based on a combination of smectite and algae extracts has been developed to increase the interlayer space of smectite up to 5nm to allow for the binding of larger molecules such as deoxynivalenol and fumonisins (Demais and Havenaar, 2006). This material has demonstrated efficacy against a wide range of mycotoxins in a dynamic *in vitro* model (TNO, Netherlands), as well as various *in vivo* models (e.g., Samitec, Brazil, and a toxicokinetic model Gallissot *et al*. 2024) without affecting nutrient availability.

Organic adsorbing agents, such as yeast cell walls, derived from *Saccharomyces cerevisiae* are also commonly used in the feed market for their ability to bind certain mycotoxins without reducing the bioavailability of nutrients. Yeast cell walls are primarily composed of polysaccharides, namely beta-glucans and mannan-oligosaccharides (MOS), which are involved in the formation of both hydrogen bonds and Van der Waals interactions with mycotoxins (Yiannikouris *et al*., 2006). The capacity of yeast cell walls to adsorb flexible mycotoxins such as zearalenone and ochratoxins has been widely demonstrated in static *in vitro* models (Joannis-Cassan *et al*., 2011; Yiannikouris *et al*., 2013).

However, the adsorbing efficacy varies substantially depending on the beta-glucan, MOS and chitin content of the yeast cell wall (Fruhauf *et al*., 2012; Yiannikouris *et al*., 2004), although no direct correlation between yeast composition and adsorption capacity has been found (Joannis-Cassan *et al*., 2011). Nevertheless, yeast cell walls exhibit very limited efficacy in binding deoxynivalenol and fumonisins (Döll *et al*., 2004, Avantaggiato *et al*., 2005 and 2006) and even aflatoxins (Joannis-Cassan *et al*., 2011).

Biotransformation strategies

Several micro-organisms possess some capacity to degrade or detoxify certain mycotoxins into non-toxic metabolites (Abrunhosa *et al*., 2014; Piotrowska *et al*., 2021; Ndiaye *et al*., 2022). These micro-organisms or their microbial-derived enzymes form the basis of many commercially available products, though very few have demonstrated efficacy (Hahn *et al*., 2015).

Among the serious candidates is a gram-positive anaerobic bacterium isolated from rumen fluid, which produces an enzyme (epoxidase) responsible for deoxynivalenol detoxification. This micro-organism is available for use in feed, but the detoxification reaction only occurs under strict anaerobic conditions (King *et al*., 1984; Kollarczik *et al*., 1994) and requires 24 hours to complete (Hahn *et al*., 2015). This may explain why several studies have failed to demonstrate the de-epoxidase activity of the product (Karlovsky, 1999; Döll *et al*., 2004; Avantaggiato *et al*., 2004). Furthermore, *in vivo* studies have demonstrated that this product is not able to alleviate the toxic effects of deoxynivalenol in various animal species (Danicke *et al*., 2010).

Another enzyme, carboxylesterase, found in *Sphingopyxis* sp. isolated from soil, has been identified to detoxify fumonisins, but data on its efficacy is very limited.

While biotransformation strategies have shown promising results under specific *in vitro* conditions, their true efficacy *in vivo* remains to be clarified.

Health support agents

The third approach uses substances to mitigate the adverse effects of mycotoxins. Given that mycotoxins significantly impact the digestive and immune systems, as well as the liver, it is common to use liver protectors, intestinal protectors, and immunity-boosting agents.

Conclusion

There are several strategies to mitigate the detrimental effects of mycotoxins on animals. Numerous adsorbing agents have demonstrated their efficacy in adsorbing certain mycotoxins *in vitro* under conditions of mono-contamination. Smectite-based adsorbing agents have a well-proven efficacy against aflatoxins, while yeast cell wall-derived agents are effective against zearalenone and ochratoxins, depending on their quality.

Although biotransformation is a promising strategy based on *in vitro* studies, further research is necessary to validate the effectiveness of various agents under *in vivo* conditions. To date, algae-modified smectite is the only adsorbing agent capable of effectively binding hard-to-bind mycotoxins, such as trichothecenes and fumonisins, without compromising nutrient bioavailability.❖

For more information, send an email to Caitlyn de Vos at caitlynv@vitam.co.za or visit *www.vitam.co.za*.

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The feed mill of the future

By Dr Tom Verleyen, director, Kemin Industries

Industry buzzwords such as Industry 4.0 and smart factories are terms that describe the current technological revolution, gradually taking hold in industrial settings. This technological revolution is all about a new exploration of automation and data exchange in industrial environments using modern, smart digital technologies.

We can create an integrated value chain by linking machines to an industrial Internet of Things (IoT) platform. This leads to improved communication, self-monitoring, and production improvements of smart machines that can analyse and diagnose issues without the need for human intervention.

As Industry 4.0 signals a change in the manufacturing landscape, it also creates enormous opportunities for the animal production industry. As we look ahead, digitalisation efforts are set to play a pivotal role in advancing the feed mill industry towards efficiency gains and sustainability goals. Industry 4.0 and IoT technology are reshaping industries into smarter and more efficient ecosystems.

Harnessing sensor data

The journey starts by collecting data, and typically a huge set of data points is needed to extract information and knowledge. In a feed mill setting, sensors are used to collect the data. These data inputs can come from different machines or a variety of sensors, which can include readings such as moisture levels, temperature, relative humidity, steam quality, pressure or volume, amperage, and more. Data will drive the decisions of the future. The sensor market is developing quickly, making it a hugely competitive and rapidly developing space.

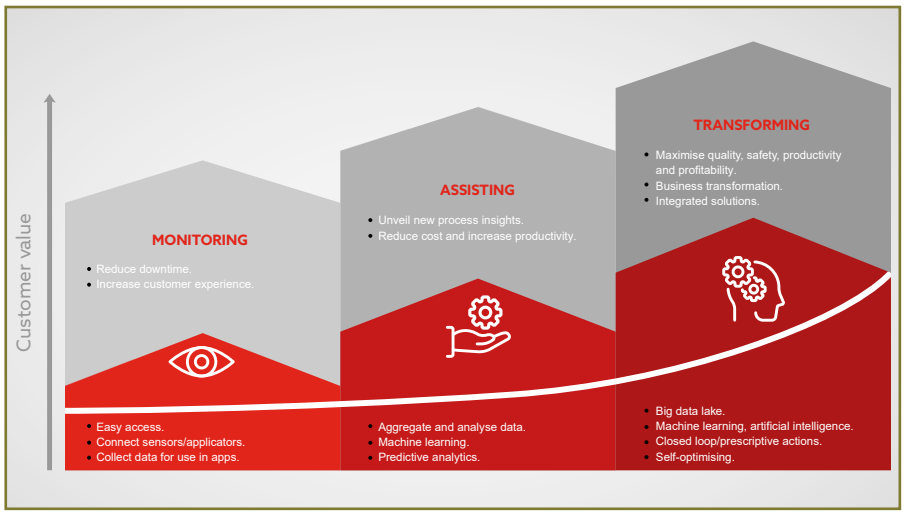
The sensor data, together with other relevant process parameters, needs to be securely transferred via an industrial IoT gateway into a cloud-based platform. The information should be automatically validated, aggregated, and safely stored in the system to ensure users have real-time data from multiple applications at various locations when they need it, yielding insights and system alerts.

A crucial element of any platform is data security and data integrity. The platform should also offer insights that enable customers to better understand their production process and must allow for easy data-driven decision-making.

As an organisation goes through a digitalisation journey, it typically moves through three phases (*Figure 1*):

- The first phase is the monitoring stage, which is all about gathering and analysing data collected by the sensors. The insights generated are limited, but the advantage is that you start to generate data points.
- The second phase is the assisting stage, which helps create a full picture by aggregating and analysing the data collected at different points to provide the customer with new process insights that allow for predictive actions and analytics. This allows for increased productivity.
- Lastly, the transforming phase provides prescriptive insights, including artificial intelligence and machine learning, to enable self-optimising processes that help improve quality, safety, productivity, and profitability across all processes. Only a few industries operate at this level.

Figure 1: The digital journey.



Kemin's digitalisation journey

In terms of extending its feed safety and feed milling programme, for many years Kemin has supported the application of quality feed products through its liquid application systems, and has a vast network of engineers who survey, install, and service these application systems. Through a cloud-based solution, a better service can be offered, allowing customers to extract insights from the database to improve their production processes and productivity. This is fully aligned with the Industry 4.0 concept.

In terms of digitalisation, Kemin started its journey in the monitoring phase and is now actively progressing work in the assisting phase and experimenting in the transforming phase. Let's review a few examples of how the company's digital platform adds value.

In the monitoring phase, an applicator monitoring module has been developed that tracks the accuracy of the application treatment per formulation. By transitioning from preventative maintenance to scheduled, predictive maintenance, the module increases the reliability and uptime of the application system and reduces the overall maintenance costs.

Another example is a bulk-tank monitoring module. This is an industrial

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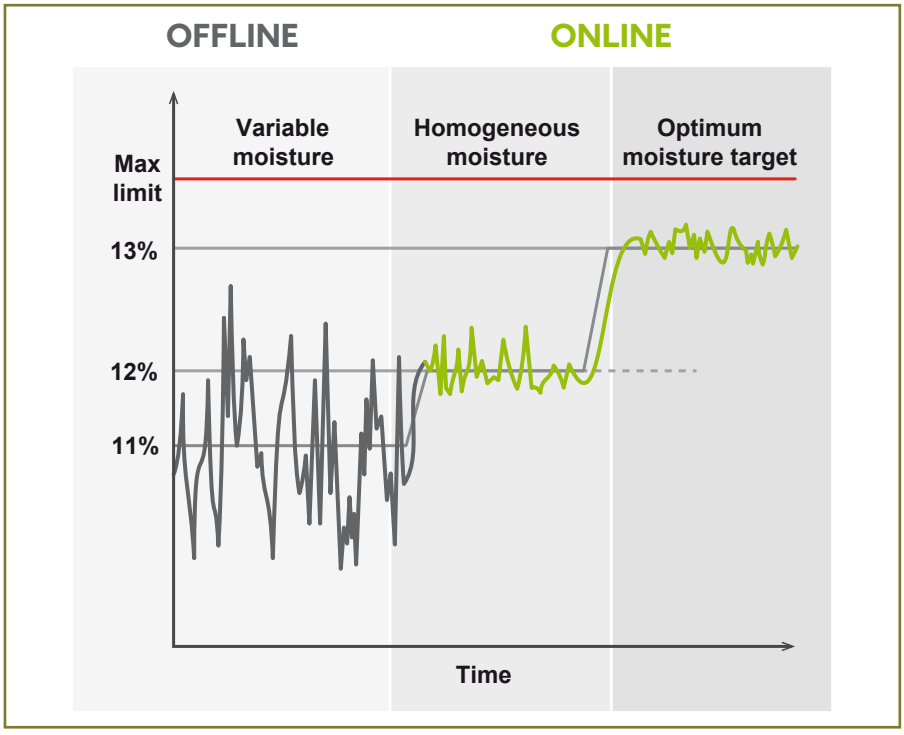
Figure 2: How the moisture sensor tracks moisture in each mixer batch and harmonises the moisture during feed production.



monitoring solution that uses sensors to provide accurate insights on tank levels and eliminates the need for dispatching staff to the bulk tank site. The algorithm predicts when a tank will reach the critical re-order point.

Moisture regulation

Unique sensors are now entering feed mills to collect data in the assisting phase to improve feed production and quality, as can be seen in *Figure 1*. Feed mill operators are underestimating the variation in moisture in their processing, both within and between batches, and this impacts the performance of the mill and quality of the final product.

An important variable is the moisture level, as moisture levels in raw materials vary between batches and over seasons. This means there is a huge variation in the moisture level of the mash feed in the mixer, which leads to variation in the remainder of the feed processing parameters, including the moisture in the final pellets. By reducing the variation both within and between batches in the mixer, the operators can run their operations to their full potential.

Technology has been developed with inline moisture sensors installed in the mixer. By installing a fast-reading sensor in the mixer, the moisture level can be monitored in real time during dry mixing. This sensor is linked to the application system, which immediately adjusts the amount of preconditioning surfactant solution to be sprayed in the mixer. Through this real-time monitoring technology linked to software and hardware, the process variability is reduced, thereby leading to improved efficiency (*Figure 2*).

The digital module in the assisting phase demonstrates the benefits of this technology and assists the feed mill in identifying where additional gains can be generated in the production process. The programme includes a key performance indicator dashboard which gives customers a bird's eye view of its consolidated benefits for processes, along with a sustainability calculator. Customers can then drill down per feed formulation and see how the system adjusted the mixer to the target moisture level.

The programme also assists and suggests which additional formulations to calibrate to gain additional benefits from the sensor-based application system. The information on the dashboard helps customers get the best value from the technology, assisting them in producing feed with a consistent moisture level when it leaves the mixer.

Optimising the process

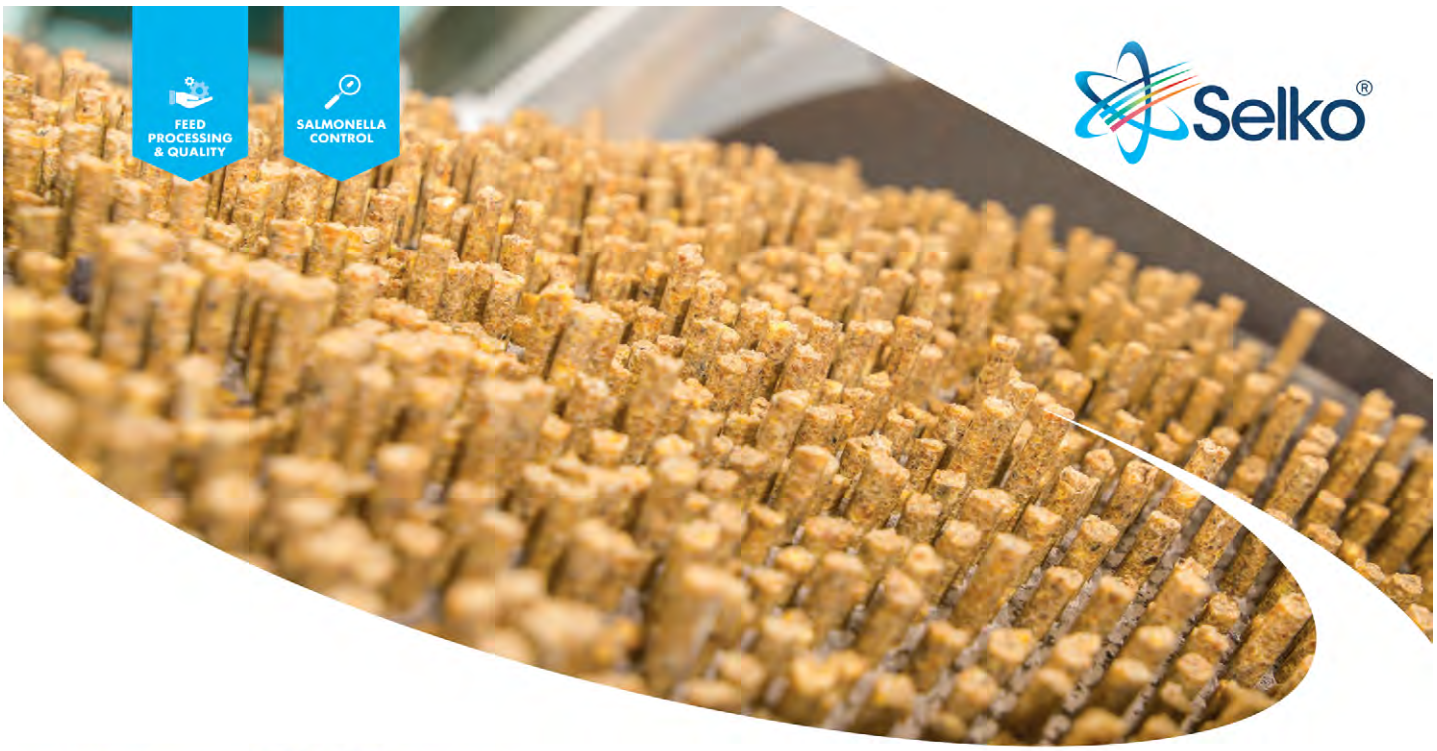
Feed milling is a dynamic process with many variables that impact productivity, feed quality, and profitability. To better understand these dynamics, it is necessary to install additional inline sensors to measure important key performance indicators of the production process, raw materials, and the finished feed. Novel inline sensors have been developed to map the moisture level not only in the mixer, but also in finished feed pellets. Additional sensors can measure the feed pellet durability characteristics inline.

The data from these sensors can be processed, analysed with powerful algorithms, and visualised in digital platforms, providing operators with real-time decision-making tools, at their fingertips. This enables data-driven decisions for the operators to optimise the production process, ensuring optimal feed quality and feed safety. Additionally, it leads to efficiency gains and improved profitability while it has a direct impact to lower the carbon footprint of the feed production process.

Sustainable feed production is a growing theme in our industry. Through digitalisation, feed mills can improve their carbon footprint and contribute to the market challenge for a more sustainable animal protein industry.

The critical takeaway is that the possibilities for improvements in feed manufacturing are endless and we are just at the start of this journey. Changes and advances made in feed processing technology and conditioning techniques will significantly impact feed mill profitability. Therefore, a key component of any improvement programme is to identify and quantify the distinct variables and make appropriate changes to eliminate variation. Through additional sensor technology and connecting the data in an IoT platform, we believe such a solution will be achieved.❖

For more information, email tom.verleyen@kemin.com, francois.vandevyver@kemin.com or visit *www.kemin.com*.



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Why Fysal® Flow

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Fysal Flow
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Enterobacteriaceae contamination in feed can threaten animal health

Pelleted feed can easily be recontaminated with *Enterobacteriaceae* after the cooler in the feed mill process, which makes feed hygiene management critical.

Moisture content influences *Enterobacteriaceae* Inhibition efficacy and feed mill efficiency

During the feed production process an average of 1% of moisture is lost. This results in a sub-optimal moisture and temperature ratio in the conditioner and subsequently a lower throughput of the pelletiser due to increased friction. This decreases the efficacy to eliminate *Enterobacteriaceae* due to a sub-optimal D-value (temperature vs moisture level required to inhibit *Enterobacteriaceae* in the heating process).

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Organic acids and formaldehyde in animal feed: A review

By Tatenda Guta, Trouw Nutrition

Animal feed industries use blends of organic acid and formaldehyde (FA), which are a 'magic bullet' for the control of *Salmonella* and other biological risks in animal feed production. Subsequently, there have been more insights into the interactions of FA with feed, thereby exposing more implications regarding the use of FA as an affordable solution for the management of biological risk in feed.

The dilemma that feed manufacturers face is striking a balance between the cost, plausibility, and effectiveness of feed hygiene solutions. In the interest of the effective cost benefits of FA, it cannot be ignored that using FA does have latent drawbacks in terms of final feed quality and animal performance.

Formaldehyde risk in human health

Formaldehyde is widely found in feed mills, hatcheries, domestic air, tobacco smoke, garments, paint, and industrial and medical products. In addition to endogenous sources, the body can also encounter environmental FA, since several commonly used products contain either FA or FA-releasing substances. Moreover, foods such as coffee, codfish, meat, poultry, and maple syrup naturally contain FA (Dhareshwar and Stella 2008; De Groot *et al*. 2009). So, this ubiquitously present compound can enter the human body by inhalation, ingestion, or through the skin.

Mounting evidence indicates that FA is toxic to mammals, especially inducing impairment in learning and memory, as well as neurotoxicity in the central nervous system. Epidemiological data has shown that chronic exposure to FA causes neurocognitive and neurobehavioral impairment in histology technicians and workers.

In several experimental models, it has been shown that FA exposure induces apoptosis and neurotoxicity in the cultured cortical neurons and PC12 cells and elicits behavioural, learning, and memory disorders in rats and mice. Excess FA accelerates glycolysis and glutathione export in neural cells, and FA-induced alterations in brain metabolism and oxidative stress may contribute to the pathological progression of neurodegenerative disorders.

This aldehyde is a well-established neurotoxin that affects memory, learning, and behaviour. In addition, in several pathological conditions, including Alzheimer's disease, an increase in the expression of FA-generating enzymes and elevated levels of FA in the brain have been reported. Although a vast body of literature describes the neurotoxicity of FA, there is no effective way to defend FA-induced neurotoxicity.

The European Union has banned FA as a feed hygiene solution since 2018 due to significant health concerns. Scientific research showed that FA is carcinogenic because of inhalation and lower local concentrations are known to produce DNA adducts, which can initiate carcinogenesis. The Environmental Protection Agency has classified FA as a "probable human carcinogen".

Increased levels of DNA adduct in humans are translated as oxidative burden. It is not only cancer that may arise, but other downstream health conditions that emanate from oxidative stress. In a meta-analysis reviewing 18 retrospective human studies, inhalation exposure to FA led to increased risks of spontaneous abortion and other adverse pregnancy outcomes. No safe level of FA was identified.

Despite the multiple endogenous and exogenous sources of FA, a low physiological level of FA in body fluids and tissue is maintained by the continuous action of cellular FA-metabolising enzymes. The FA oxidation product formate is generated by two independent pathways mediated by either the mitochondrial aldehyde dehydrogenase 2 (ALDH2) or the cytosolic ADH3 (Teng *et al*. 2001; Friedenson 2011; MacAllister *et al*. 2011).

ADH3, also known as glutathione-dependent FA dehydrogenase, oxidises DA to formate in a two-step process (Harris *et al.* 2003; Staab *et al*. 2009; Thompson *et al*. 2010; MacAllister *et al*. 2011). Therefore, the increase in FA titres demands more exploitation of glutathione. The aggregation of xenobiotics and endobiotics that are glutathione-dependent increases oxidative burden. Once oxidative burden manifests there is a domino effect of oxidative burden-driven maladies that present themselves. Consequently, there is an increase in the disability-adjusted life years (DALYs).

Animal performance

Feed hygiene products such as organic acids and FA have been known to effectively inhibit *Salmonella* in livestock and poultry feeds (Wales *et al*., 2009). The FDA (1996) approved the use of FA as an antimicrobial food additive for poultry feeds. Aldehyde substances such as FAs in poultry feeds serve as fixative agents, giving them antimicrobial and mould-inhibition properties (Spratt, 1987; Ricke *et al*., 2019).

Formaldehyde and organic acids have been used to sanitise layer feed to reduce the contamination of table eggs. Broiler breeder feed sanitation is a practice that needs further exploration as it could improve breeder performance and offspring liveability.

Scientific research shows that FA can react with groups of amino acids, including lysine. The reaction with lysine may explain why FA reduces the total amount of available lysine and alters protein utilisation, ultimately reducing growth rates. Studies done in various species suggest that FA affects growth

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performance through the feed's nutritive content as well as by affecting the microbial community within the feed.

Effects of FA on lysine

Recent studies have shown that FA has negative interactions with amino acids such as lysine. Formaldehyde can react with several amino acids including the epsilon-amino group of lysine, the primary amide groups of asparagine and glutamine, and the sulfhydryl group of cysteine, among others. This differential reactivity for amino acids could account for some of the variation seen in feed protein additive studies and the interaction with the gastrointestinal tract (GIT) microbial community, as proteins become modified with FA linkages and potentially present unique targets for protein hydrolysis by GIT micro-organisms.

Formaldehyde in pigs

A study on nursery pigs showed that treating diets with FA reduced their growth rate. While FA reduced bacterial concentration levels in feed, it also altered faecal microbial communities. Another study also provided evidence that the inclusion of FA has a negative impact on growth performance. The use of FA reduced the incidence of *Lactobacillaceae* species, but increased that of *Clostridiaceae* species.

Effects of FA in broilers

Studies in broiler production have shown negative impacts on average daily weight gain. The reactions between FA and amino acids, especially lysine, could render these amino acids unavailable which could alter growth performance.

Effects of FA in ruminants

Lambs fed untreated diets had better ($p < 0,01$) daily gain compared to those fed FA-treated diets. Lambs fed untreated soya bean gained 248g/d while lambs fed FA-treated soya bean gained 182g/d.

Conclusion

Formaldehyde is linked to occupational risks that increase DALYs and is linked to drawbacks that compromise the quality of the final feed. Feed industry studies have more emphasis on the bacteria-killing efficiency of FA and have oversight on the chemical interactions with other feed ingredients and their resultant downstream effects. Little is known regarding the subsequent metagenomic (microbial DNA composition) signatures associated with FA.

There are echoes that post-FA treatment of feed favours the recolonisation by *Clostridium*, which is responsible for significant enteric infections in monogastric animals. Reflecting on the evolution of FA in the animal feed industry will provide more insight into why there should be consideration of organic acids and insurance for biological hazards in feed. Exploring various models for addressing biological risks in animal feed production is essential. ❖

For more information, visit *www.trouwnutrition-mea.com/en-za* or phone 011 524 0440.

Focus on fats

By Dr Elrisa Taljaard, Labworld

Animal nutrition is the science of preparing or formulating feed for animals that produce food (e.g., meat, milk) or non-food materials (e.g., wool). It is also an integrative science, as it deals with the different steps by which the animal assimilates feed and uses it for its growth, health, and performance.

In addition to the health, welfare, or productivity of the animal, animal nutrition is also essential due to economic (e.g., feed cost) and environmental aspects (manure and undigested, wasted nutrients such as phosphorus and nitrogen, contaminating air, soil, and water), as well as nutritional quality (eggs, meat, milk).

Solubility of lipids

One of the key nutrients is fat and oils. Lipids are a group of substances that, in general, are soluble in ether, chloroform, or other organic solvents but are sparingly soluble in water. However, due to the water solubility of certain molecules, different extraction and analysis methodologies are applied to determine fat content.

> The acid hydrolysis method is also often used when high fat products, such as calcium salts of fatty acids, are analysed for crude fat and for emulsified fats.

Some lipids, such as triacylglycerols, are very hydrophobic. Other lipids, such as di- and monoacylglycerols, have both hydrophobic and hydrophilic moieties in their molecules and are soluble in relatively polar solvents. Short-chain fatty acids such as C1 to C4 are completely miscible in water and insoluble in non-polar solvents. Triacylglycerols are fats and oils that represent the most prevalent category of the group of compounds known as lipids.

The terms lipids, fats, and oils are often used interchangeably. The term 'lipid' commonly refers to the broad, total collection of food molecules, fats generally refer to those lipids that are solid at room temperature, and oils generally refer to those lipids that are liquid at room temperature.

Ether-soluble materials in feed include different organic compounds that are soluble in organic solvents. In animal feeds, ether extract may include fats, fatty acid esters, and fat-soluble vitamins and hence are often referred to as crude fat. The primary goal of ether extracts is to isolate the fraction of the feedstuff that has a high caloric value. Provided the ether extract contains fats and fatty acid esters, this approach is valid. However, in samples that contain high levels of other compounds soluble in organic solvents, such as plant waxes or resins, it may not give a true estimate of feed caloric value.

Determining fat content

Although this error is generally small in typical animal feedstuffs, various methods are available to ensure the accurate determination of the fat content. The extraction methods are also very dependent on the fat source being used.

The acid hydrolysis method facilitates the extraction of fatty acids from glycerides, glycolipids, phospholipids, and sterol esters that might otherwise be left un-extracted due to covalent and ionic bonding. However, it can also facilitate co-extraction of additional non-lipid materials. The addition of hydrochloric acid breaks covalent and ionic bonds of lipids to proteins and carbohydrates, so that the lipids commonly bound to these fractions can be extracted.

When the crude fat analysis value is lower than expected, especially for any animal food product that has been heat processed or containing ingredients that have been heat processed, acid hydrolysis should be considered as the method of choice. The acid hydrolysis method is also often used when high fat products, such as calcium salts of fatty acids, are analysed for crude fat and for emulsified fats.

Products containing milk or milk products are preferred to be analysed using the Rose Gottlieb method. In this case the fat is dissolved in ammonia and ethyl alcohol. The ethyl alcohol breaks the emulsion and combination of fats and proteins, avoiding the formation of a gelatinous mixture. The ethyl ether acts as a solvent for the fat, but to prevent it from also dissolving other components present in the aqueous phase, it is combined with petroleum ether to reduce the solubility of the aqueous phase in the ethyl ether.

The 'gold standard' in lipid biochemistry for the extraction of lipids from animal tissues is the method developed by Folch, which uses chloroform ($CHCl_3$) and methanol (MeOH) mixed with water. In this method, a biphasic system is generated with an upper phase containing non-lipidic

material and a lower phase containing lipidic compounds. Improved lipid extraction protocols such as the Bligh and Dyer protocol found that more lipids can be extracted from animal and animal by-product samples by using a monophasic extraction solvent first before converting it to a biphasic solution.

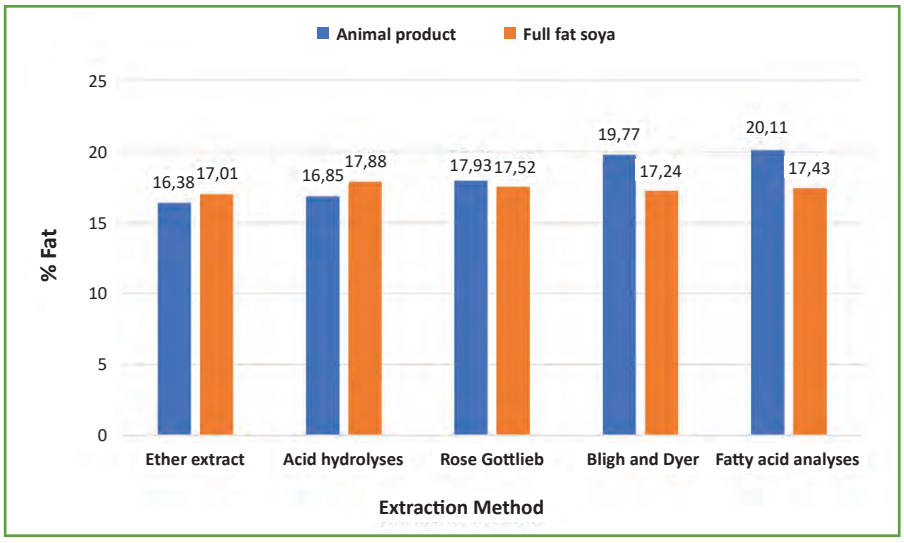
If the lipid extracted material is to be further analysed for fatty acids, care must be taken in solvent choices and methodology to minimise degradation of the lipids. Chloroform, chloroform-methanol, and the less toxic hexane-isopropanol are frequently used for initial extraction. GC-FID methods are usually utilised for detection and quantitation of fatty acids ranging from C4 to C24. The sum of all the fatty acids is used as the total fat.

A comparative study

To evaluate all the methodology mentioned in this article, Labworld conducted a comparative study into an animal product and full-fat soya to evaluate the efficiency of the extraction methods (total fat analyses). For the animal product, a clear advantage was observed in utilising either the Bligh and Dyer method or fatty acid determination. For the full-fat soya, the total fat extracted was not significantly different when applying the different methods (*Figure 1*).

It is clear that the analysis of fat is not as straightforward as simply conducting a crude fat analysis. To determine the total fat in a sample, the correct approach to fat extraction must be followed.❖

Figure 1: Fat analyses and the different extraction methods.



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Life is a DIY project: Chris Schutte

By Izak Hofmeyr, Plaas Media

Chris Schutte, CEO of Astral Foods, was recently honoured with the inaugural AFMA Lifetime Achievement Award for his significant contribution to the agricultural industry, his visionary leadership, and his unwavering dedication.

Chris Schutte and his wife, Reinette, with AFMA chairperson, Anina Hunter. Schutte received the Lifetime Achievement Award during the organisation's annual general meeting.

Schutte received this award at the AFMA annual general meeting held at the Cathedral Peak Hotel in KwaZulu-Natal. Addressing the meeting, his message was that life is a do-it-yourself or DIY project. "You must do it yourself. Along the way, some people support you, but how you face the challenges on your path is entirely up to you.

"The fact that you carry a heavy load in life is not the issue," he said. "Everybody is carrying a heavy load. The key is how you carry it." He went on to say that when one consistently does something right, it becomes a habit. This is true in business, but most definitely also in life. Schutte entertained the delegates with a presentation of famous quotes that have inspired him over the years. However, the quote he will be remembered for is his own, namely that if you are dumb, you have to be clever.

From shed worker to CEO

Schutte matriculated in 1978 from Hoërskool Oudtshoorn by the skin of his teeth. Realising he lacked the credentials for university or college, he joined the South African Air Force (SAAF) in 1979. At the SAAF College he excelled, achieving *cum laude* in all his subjects with an average pass rate of 98%.

After leaving the SAAF in 1984, Schutte, along with his wife, Reinette, moved to the then Transvaal to start a new life by becoming a shed worker on a small poultry farm near Krugersdorp. Six months later, he was promoted to assistant farm manager on the same farm, which was eventually sold to a corporate company, Tiger Oats, now Tiger Brands.

He joined Golden Lay Farms, a division of Tiger Oats at the time, as an assistant farm manager. He progressed through the ranks of Golden Lay, a table egg producer, eventually becoming the sales director. In 2002, he joined Astral Foods as the retail sales manager for Meadow Feeds and was later promoted to national sales manager for the feed division. By 2004, he was appointed as managing director of Astral's feed division and joined the Astral Foods Board in 2006. In 2009, Schutte became the CEO of Astral Foods Limited.

On his journey to becoming CEO of the largest poultry group on the African continent, he obtained a business diploma from Wits Business School and a Master of Business Administration (MBA) and finance diploma from Henley University. He has represented the industry at ministerial and parliamentary levels, and serves on advisory boards for two prominent universities. He also played a significant role in the conceptualisation of *Veeplaas* magazine.

A commendable career

In 2010 he received the AFMA Person of the Year Award and in 2014 was named *Landbouweekblad's* Newsmaker of the Month. He was also inducted into the Hall of Colonels by the Governor of Kentucky in the United States.

During his tenure in 2014, Astral was the top performer on the Johannesburg Stock Exchange for three months. He initiated the Pinnacle Programme in collaboration with North-West University and since then, Astral has supported 35 Master's degrees, 12 MBAs and seven PhDs.

After 44 years, Schutte and his wife are still happily married. He recently announced his retirement from Astral and the couple plan to relocate to George.❖

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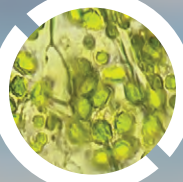

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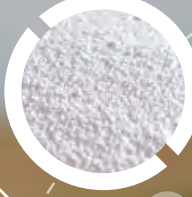

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The importance of laboratory accreditation

By Reagan Bowers, managing director, Chem Nutri Analytical

The *Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act, 2006 (Act 19 of 2006)* recognises the South African National Accreditation System (SANAS) as the only national accreditation body in South Africa for assessing the competence of testing laboratories. This legal framework ensures that laboratories adhere to strict standards to guarantee the reliability of their services.

Accreditation is a rigorous process that provides greater confidence in a laboratory's ability to deliver accurate and reliable results. This process goes beyond basic compliance, offering an extra layer of assurance that a laboratory's testing methods, equipment, and personnel meet high standards.

Accreditation is the formal recognition by an authoritative third party, that a laboratory is competent to perform specific tasks. The main goal of accreditation is to instil confidence in the accuracy, impartiality, and reliability of test results. To maintain this status, accredited laboratories undergo regular re-evaluations by SANAS to ensure continued compliance with strict standards and that operational excellence is upheld.

In addition, laboratories must establish systems to document their processes, ensuring that results are reproducible and traceable. This documentation plays a critical role in demonstrating accountability and providing evidence of the laboratory's ongoing compliance with accreditation standards.

Accredited laboratories must comply with the stringent ISO/IEC 17025 standard, recognised worldwide for laboratory accreditation. This ensures that laboratories not only operate a quality management system but are also technically proficient. Laboratories are accredited for specific tests listed in each lab's schedule of accreditation, which is available on the SANAS website, *www.sanas.co.za*.

Benchmarking performance

ISO/IEC 17025 is the internationally recognised standard defining the requirements for testing laboratories' competence. It serves as a global benchmark. Accredited laboratories are required to participate in proficiency testing programmes accredited under ISO/IEC 17043. Since there are limited accredited proficiency programmes in South Africa, laboratories often participate in international proficiency testing to meet this requirement.

These programmes provide an independent assessment of a laboratory's performance by comparing their test results to those of other laboratories. By participating in these programmes, laboratories can identify areas for improvement and ensure consistently accurate results. This is especially important in sectors where precision is vital, such as healthcare, environmental monitoring, and food safety.

International recognition

Many countries have adopted ISO/IEC 17025 as their standard for accrediting laboratories. This has encouraged laboratories worldwide to adopt internationally accepted testing and measurement practices where applicable. This alignment with global standards fosters collaboration between countries and supports the harmonisation of testing methodologies.

Laboratory accreditation is globally recognised due to the *International Laboratory Accreditation Cooperation Mutual Recognition Arrangement*. This is especially beneficial for organisations involved in global trade, as it boosts credibility and reputation while demonstrating due diligence in ensuring product quality.

For industries involved in international transactions, working with an accredited laboratory ensures that test results are recognised and accepted by foreign regulators and customers. This reduces the risk of product rejections, delays, or additional testing, which can incur significant costs.

Decisions based on credible results

Although accreditation is not mandatory, many laboratories seek it to demonstrate technical competence, ensure continuous improvement, and benchmark themselves on a global scale.

While accreditation is an effective marketing tool and facilitates international trade, its core purpose is to ensure technical competence of personnel; application of validated and appropriate test methods; traceability of measurements to national standards; proper calibration and maintenance of equipment; a suitable testing environment; appropriate handling of test items; and quality assurance of test and calibration data.

Accredited laboratories are often favoured by customers needing reliable and verified test results. In many industries – such as construction, environmental testing, and healthcare – accreditation is mandatory. Given the alarming rise in global food fraud, it might be time for food and feed safety and security to follow suit.

In conclusion

An accredited laboratory demonstrates that its testing is consistent and unbiased. Non-accredited laboratories are not subject to the same independent scrutiny, making it harder to assess their ability to provide impartial and reliable results.

Accredited laboratories typically issue reports that bear the accreditation body's symbol, signalling to clients that the necessary standards have been met. Clients are encouraged to verify the specific tests for which the laboratory is accredited and to understand the associated measurement uncertainties. This transparency allows customers to make informed decisions about their testing service providers and fosters trust in the results.

In the event of disputes or legal claims related to product defects or financial losses, producing accredited results demonstrates due diligence. ❖

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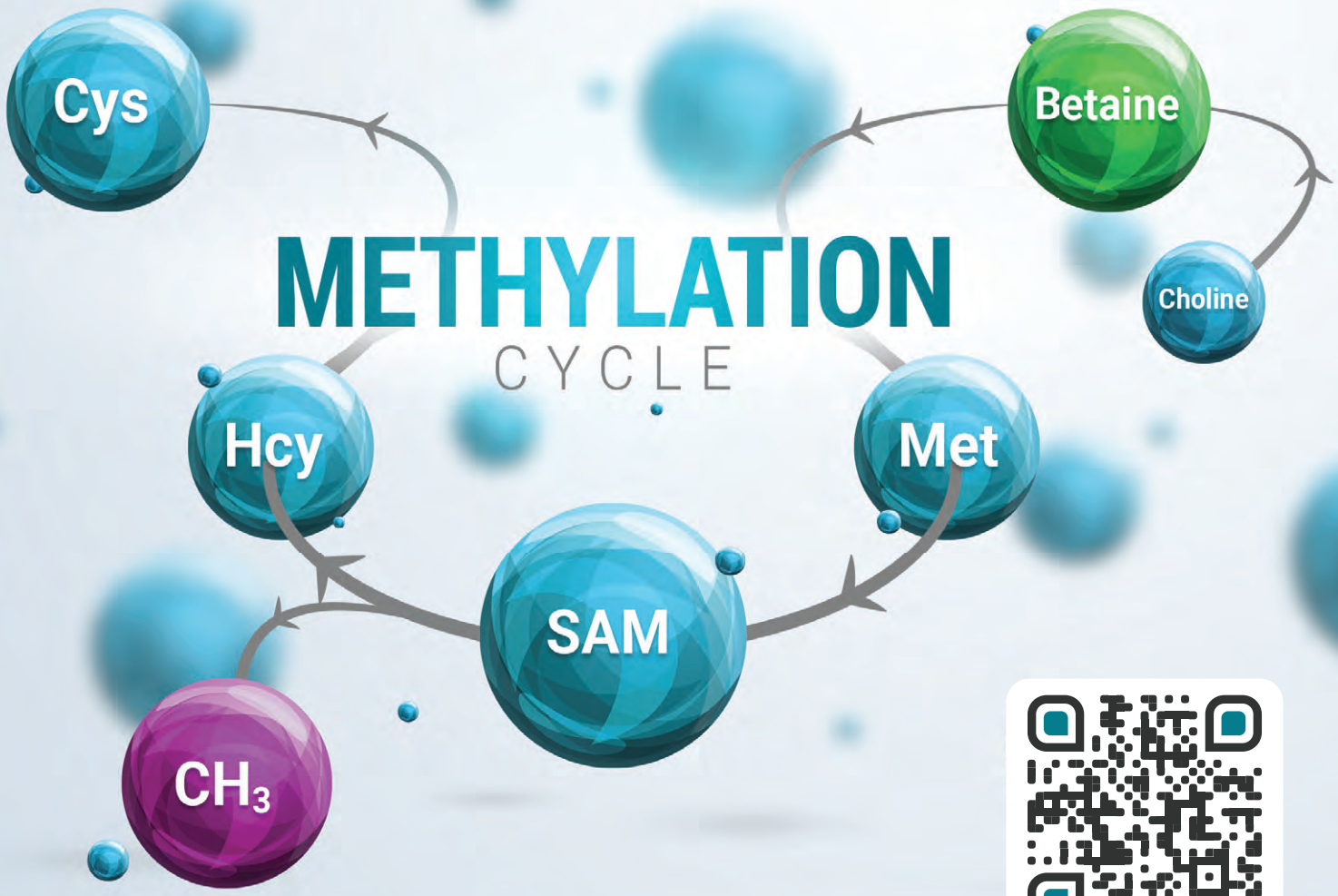

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Shaping the future of poultry through mentorship

By Elmarie Smit, Plaas Media

Chemuniqué's innovation director, Dr Peter Plumstead, was recently honoured at the Poultry Science Informal Nutrition Symposium, an event held as part of the Poultry Science Association Annual Meeting. Recognised for his outstanding contributions to the field of poultry nutrition and his dedication to mentoring the next generation of scientists, Dr Plumstead's recognition highlights his significant influence on both the industry and young professionals entering the field.

His journey into poultry science was not something he had initially planned. Like many students, he began his academic career with little knowledge of the opportunities in poultry research. "In my case, it was meeting Prof Gerrie Smith of the University of Pretoria who introduced me to the poultry industry. I didn't even know such a career existed," he recalls.

Throughout his career, he has made it his mission to provide young scientists with similar opportunities. "All I have done is try to give back to young students in a way my mentors did for me." His commitment to mentorship is a core part of his work at Chemuniqué, where he has been instrumental in establishing a graduate development programme in collaboration with South African universities. This programme provides students with the chance to work closely with industry experts and gain exposure to cutting-edge research.

"The tremendous support Chemuniqué has enjoyed from the industry over the past 25 years has enabled us to successfully collaborate with South African universities in developing our own, internal graduate development programme. Today, I am delighted to celebrate with Peter, who has been instrumental in guiding these young scientists through their post-graduate studies and into their unique, purpose-driven careers," says Terry Wiggill, managing director of Chemuniqué.

The enigmatic career opportunity

"Many students aspire to become producers or veterinarians because these are traditional, recognised careers. But not many consider being a nutritionist. The person who decides what nutrients go into feed can have such a big impact on the health and well-being of animals," Dr Plumstead notes. His career has spanned 30 to 40 countries.

"In South Africa, we produce approximately 21 million broilers every week. Chicken is by far the most consumed protein source in sub-Saharan Africa." Given the scale and significance of poultry production in the region, he believes it is essential to attract young professionals to the field to support its continued growth and success.

Dr Plumstead is currently involved in groundbreaking research on calcium digestibility, a project that could have a significant impact on the future of poultry nutrition. In collaboration with a private research group and the University of the Netherlands, he and his team are leading the way in developing a digestible calcium system for poultry. This research addresses a key challenge in poultry nutrition: while calcium is vital for bone development and gut health, formulating a digestible calcium solution has remained elusive. Dr Plumstead's team is at the forefront of solving this issue, which could have wide-ranging benefits for poultry health and efficiency.

"A successful calcium digestibility system would allow nutritionists to formulate more effective diets for poultry, improving both animal welfare and production efficiency."

Dr Peter Plumstead, innovation director at Chemuniqué.

A competitive advantage

Dr Plumstead is also passionate about ensuring that South Africa's poultry industry remains competitive on a global scale. "If we want to make the South African poultry industry sustainable, we have to stay competitive against imported broilers." By making local poultry producers more efficient from a cost-production standpoint, he hopes to safeguard jobs in the sector and reduce dependence on imported chicken.

Dr Plumstead's contributions to the field of poultry nutrition, his commitment to mentorship, and his groundbreaking research continue to have a lasting impact on the industry. Looking ahead, his focus remains on inspiring the next generation of poultry scientists and ensuring that South Africa's poultry industry remains at the forefront of innovation and sustainability.

For more information, visit *www.chemunique.co.za* or phone 011 789 2414.

Chemuniqué celebrates World Egg Day

By Robyn Joubert, Chemuniqué

Chemuniqué, as a leader in animal feed additives, is committed to promoting the nutritional value and versatility of animal protein products. One of its flagship corporate social investment (CSI) projects is World Egg Day.

World Egg Day was launched in Vienna in 1996, and celebrates the power of the egg on the second Friday of October each year. Since then, egg enthusiasts worldwide have devised new and creative ways to honour this nutrient powerhouse, and the celebration has grown and evolved over time.

Eggs are a staple in countless cuisines across every continent. From a quiche in France to tamago sushi in Japan, eggs play a central role in meals. Eggs are also an environmentally sustainable and inexpensive animal protein, connecting people in the pursuit of a healthier planet. Whether in family breakfasts, community meals, or as part of festive celebrations, eggs foster connection and tradition. World Egg Day is therefore more than a celebration of a household commodity; it is a recognition of the common bonds that connect us all through the universal appeal and benefits of eggs.

Chemuniqué organises workshops for children that include an egg-based arts-and-crafts lesson led by volunteers.

In the lead-up to World Egg Day in 2022, Chemuniqué organised activities at three early childhood development centres in Diepsloot and Cosmo City. These centres are associated with the company's main CSI partner, Hlanganani, a non-profit organisation that aims to establish a network of people, organisations, and businesses that provide expertise in uplifting communities by empowering those caring for orphans, enabling them to become effective members of society and, in turn, empower others.

The workshops are aimed at making the learning experience enjoyable and memorable for young children. This hands-on approach not only fosters a love for healthy eating, but also encourages families to incorporate eggs into their diets.

Chemuniqué celebrates World Egg Day by serving every employee an egg-based meal while they attend presentations by the technical team regarding the role of the company's feed additives in producing top-quality eggs for the market.

The nutritional value of eggs

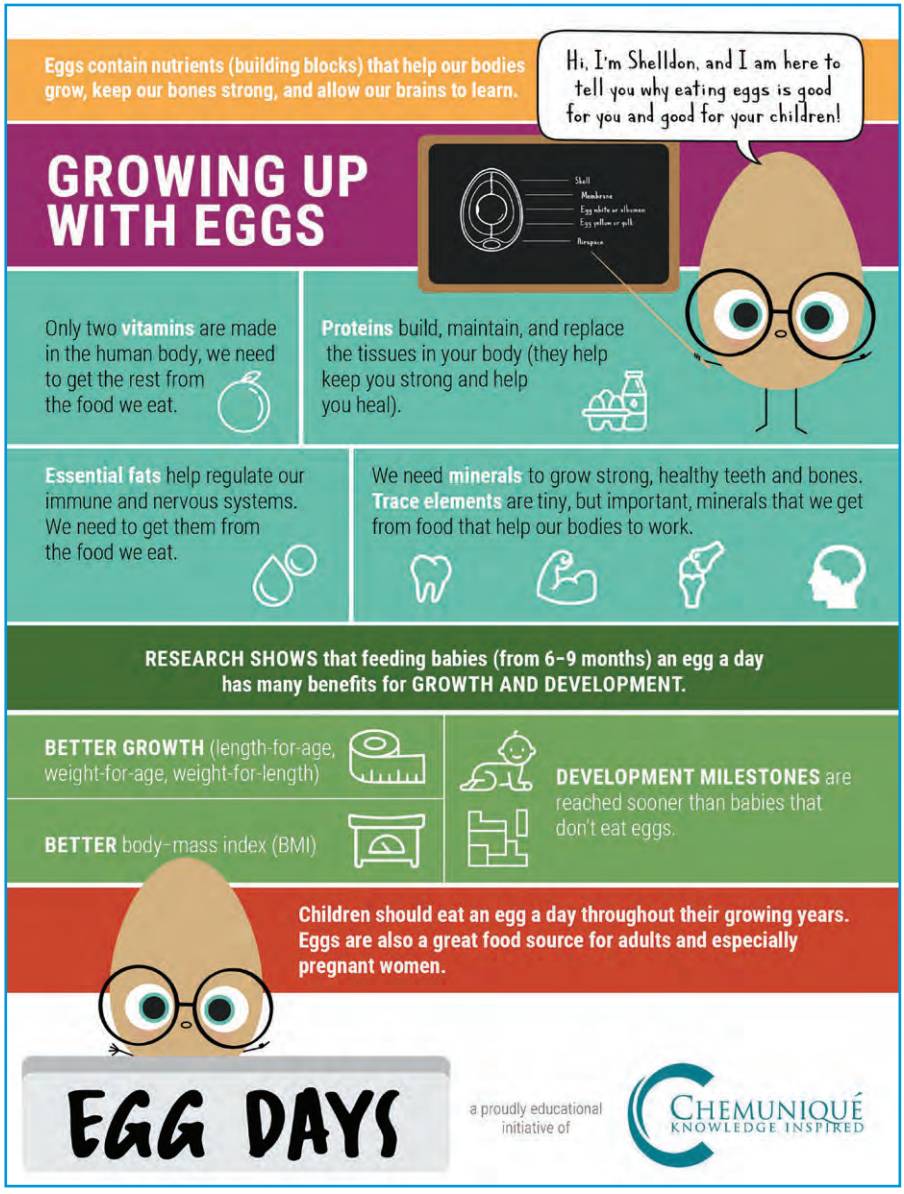
The company's efforts are supported by scientific evidence highlighting the importance of eggs in combatting nutrient deficiencies, particularly in children and pregnant women. Studies have shown that eggs are an excellent source of nutrients, providing essential fats, proteins, vitamins, minerals, and trace elements. Eggs are also a good source of choline, which is vital for cellular maintenance and growth, neurotransmission, brain development, and bone integrity.

Introducing eggs into children's diets at an early age can be very beneficial. A study in Ecuador found that providing infants

aged six to nine months with one medium-sized (50g) egg per day for six months significantly improved anthropometric metrics of growth, including length-for-age, weight-for-age, and weight-for-length. In addition, the prevalence of stunting was reduced by 47% and the prevalence of underweight children was reduced by 74%. This demonstrates that early introduction of eggs as complementary feeding has significant positive effects on the growth and development of children. North-West University's Centre of Excellence: Nutrition is also researching the role of eggs in child nutrition.

These qualities of eggs make them a staple food in many parts of the world, including South Africa. Eggs are versatile and can be cooked in various ways, making them an excellent addition to any meal. One unique feature of eggs is that they do not require refrigeration until cooked – they are therefore ideal for households with limited refrigeration capacity or in emergencies when no refrigeration is available.

Figure 1: An infographic on the nutritional value of eggs.



Research has also shown that consuming an egg a day can offer significant health benefits, including reducing the risk of heart disease and stroke. The cholesterol in eggs does not significantly impact blood cholesterol levels in most people, and the high-quality protein in eggs can help in muscle building and repair.

Educational workshops

Following the success of several pilot projects in 2022, Chemuniqué developed a scripted half-day workshop to educate children in early childhood development centres and schools. In each session, Chemuniqué collaborates with a local egg-producing client to present a cooking demonstration of an egg-based recipe, a puppet show, or other demonstration, and an egg-based arts-and-crafts lesson led by volunteers.

In 2024, Chemuniqué expanded its egg activities to the Ronald McDonald House at the Nelson Mandela Children's Hospital in Parktown, Johannesburg. This house supports seriously ill children and their families, carers, and guardians by providing accommodation for families travelling more than 60km to receive specialist medical care for their sick children.

On Mandela Day this year, Chemuniqué provided breakfast for these parents, knowing that a small act of kindness, such as offering a nourishing meal, can make a significant difference when one is worried about a seriously ill child. Besides offering care and comfort through breakfast, Chemuniqué also engaged with the families regarding the research, as parents are a key demographic to reach with the good news about eggs' nutritional value.

Additionally, World Egg Day is celebrated annually at the company's headquarters in Lanseria, Gauteng. Every employee enjoys an egg-based meal while attending presentations by the technical team regarding the role of the company's feed additives in producing top-quality eggs for the market. This event also provides a great opportunity for employees to visit the company's egg laboratory and observe the ongoing research on egg quality.❖

For more information, visit *www.chemunique.co.za* or phone 011 789 2414.

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2025 AFMA INTERVARSITY WRITER'S CUP COMPETITION

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DEADLINES

ROUND 1	Article submission date: **21 October 2024** Publication date: **January 2025**
ROUND 2	Article submission date: **24 January 2025** Publication date: **April 2025**
ROUND 3	Article submission date: **8 April 2025** Publication date: **July 2025**

Who may enter?

Final year Animal Science students or Postgraduate Nutrition Science students, studying at a South African university.

Article themes

- Feed industry: Legislative environment; Trade environment (economy/pricing/trade)
- Feed science: Additives
- Nutritional science: All species
- Feed processing: Milling/mixing/formulation/packaging

Competition categories

- Own research
- Literature review

Prizes

AFMA INTERVARSITY WRITER'S CUP CHAMPION:

The university represented by the overall winner of the own research category will receive a cash prize of **R10 000** and a floating trophy as the AFMA Intervarsity Writer's Cup Champion.

OWN RESEARCH CATEGORY:

Authors of winning articles published quarterly will each receive a cash prize of **R2 000**. The author of the overall winning article and his/her promoter will each receive a cash prize of **R7 000**.

LITERATURE REVIEW CATEGORY:

Authors of winning articles published quarterly will each receive a cash prize of **R1 000**.

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The highest-scoring articles in each category will be published in the relevant edition of the AFMA Matrix.
The overall winners will be chosen from all the articles that were published in the AFMA Matrix.
Published own research articles will be considered for the AFMA Intervarsity Writer's Cup award.
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Efficacy of six lactic acid bacteria strains as silage inoculants in forages with different dry-matter and water-soluble carbohydrate content

By Horacio Gonda, Ivana Nikodinoska, Kate Le Cocq and Colm Moran

Across the globe and in every type of animal agriculture operation, producers are always looking for ways to improve efficiency. As several studies have shown in recent years, one way to increase the feeding efficiency of livestock is by achieving more successful forage harvests and silage conservation first (Borreani *et al*., 2018; Tabacco e*t al*., 2018). But while demand for high-quality silage is on the rise, forage conservation remains challenging for many (Wilkinson and Muck, 2019).

When striving to produce high-quality forage, two critical factors often have the biggest impact: its dry-matter (DM) and water-soluble carbohydrate (WSC) content. The chemical characteristics of the forage can also play a major role in determining the extent to which nutrients are preserved for animal health during the ensiling process and fermentation.

Similarly, the complex microbial communities present during the different phases of production are critically important. A forage's microbiota is comprised of a diverse range of micro-organisms – both desirable and undesirable. With this in mind, treating the forage with lactic-acid bacteria (LAB) pre-ensiling can shift the dynamics of the microbial community at different stages of the ensiling process, which is crucial for reducing the proliferation of hazardous micro-organisms and the production of undesirable metabolites (Guo *et al*., 2023), as well as reaching preservation characteristic targets for maximised nutritive value.

The LAB that are most commonly used as silage additives are differentiated based on their carbohydrate metabolism and are mainly categorised as either homofermentative/facultative heterofermentative or obligate heterofermentative. In a meta-analysis of 130 peer-reviewed studies published since 1996, homofermentative and facultative heterofermentative LAB inoculants were correlated with improved fermentation quality as a result of a lower pH, a higher lactic acid content, and the reduced production of ammonia-nitrogen and acetic acid (Oliveira *et al*., 2017). It should be noted, however, that the same study determined that the forage type was the most consistent factor affecting the end quality of silage following LAB inoculation.

The impact of additives

To gain insights into how the forage type and additive treatments can affect the quality of the final silage, a study was conducted utilising multiple strains of LAB and forages with varying characteristics.

As previously mentioned, DM and WSC content are key drivers of fermentation within forage and, as a result, have the greatest impact on the efficacy of silage inoculants (Pauly and Wyss, 2019). In this study, six individual homofermentative LAB strains were evaluated for their impact on silage quality when applied to forage samples with various DM and WSC levels.

Fresh forage samples were collected during silo filling at the beginning of the study. These forage samples, which were selected at the Swedish Livestock Research Centre in Uppsala, Sweden, included timothy (*Phleum pratense*), perennial ryegrass (*Lolium perenne*), meadow fescue (*Festuca pratensis*), red clover (*Trifolium pratense*), and white clover (*Trifolium repens*).

Before and after harvesting, the forage was treated to achieve two levels of DM, either high (H) and low (L), as well as high (Hs) and low (Ls) levels of WSC, resulting in the four different forage types used in the study:

- HLs: High DM, low WSC.
- HHs: High DM, high WSC.
- LLs: Low DM, low WSC.
- LHs: Low DM, high WSC.

Other measurements that were taken before and after the additives were applied included the buffering capacity (BC), ash residue, pH, and levels of neutral detergent fibre (NDF), nitrogen (N), ammonium-nitrogen (NH4-N), total nitrogen (TN), nitrite, nitrate, organic acids, and alcohols. The specific chemical compositions of the forage samples prior to ensiling can be found in *Table 1*.

Testing process

Before ensiling, the forage was chopped to a length of approximately 30mm, thoroughly mixed and weighed into equal quantities of 1kg on a fresh basis. Along with a control sample, the following six additive treatments were subsequently applied, all at a rate of 10^6 CFU/g FM:

- *Lacticaseibacillus rhamnosus* IMI 507023, also known as LR.
- *Lactiplantibacillus plantarum* IMI 507026, also known as LP1.
- *Lactiplantibacillus plantarum* IMI 507027, also known as LP2.
- *Lactiplantibacillus plantarum* IMI 507028, also known as LP3.
- *Pediococcus pentosaceus* IMI 507024, also known as PP1.
- *Pediococcus pentosaceus* IMI 507025, also known as PP2.

While these strains of LAB have been utilised and measured for their efficacy in other studies (Franco, Nikodinoska, *et al*., 2022; Gonda *et al*., 2022; Nikodinoska, Gonda, and Moran, 2022a, 2022b; Apajalahti *et al*., 2022; Ferrero *et al*., 2022; Wambecq *et al*., 2022), no other studies before this one have evaluated the efficacy of these strains using forages with different DM and WSC levels in the same experimental design, which helps to more accurately represent the range of ensiling

Table 1: Chemical compositions of forage samples prior to ensiling.

	Forage type			
Parameter	**LLs**	**LHs**	**HLs**	**HHs**
Dry matter (%)	24 (0,63)	27,1 (0,60)	39,8 (1,97)	40,1 (0,89)
WSC (% fresh matter)	2,09 (0,18)	3,57 (0,25)	3,44 (0,38)	5,27 (0,36)
WSC (% DM)	8,7 (0,53)	13,1 (0,71)	8,6 (0,58)	13,1 (0,69)
Crude protein (% DM)	17,9 (0,45)	16,8 (0,28)	17,8 (0,49)	17 (0,36)
Nitrate-N (mg/kg DM)	429 (52)	322 (43)	450 (49)	334 (19)
NDF (% DM)	50 (0,54)	46,3 (0,91)	49,5 (1,09)	45,4 (1,21)
Ash (% DM)	10,6 (0,12)	10,2 (0,14)	10,7 (0,11)	10,1 (0,18)
pH	5,77 (0,03)	5,70 (0,02)	5,76 (0,05)	5,74 (0,03)
Buffer capacity (g Hla/kg DM)	57,9 (0,89)	55,6 (0,55)	58 (0,70)	57,1 (0,69)

Mean characteristics (±SEM) of the forage with different DM (low DM, L; and high DM, H), and WSC content (low WSC, Ls; and high WSC, Hs) before ensiling in lab-scale silos. ***Abbreviations:*** *DM: dry matter; HLs: high dry matter-low water-soluble carbohydrates; HHs: high dry matter-high water-soluble carbohydrates; LLs: low dry matter-low water-soluble carbohydrates; LHs: low dry matter-high water-soluble carbohydrates; NDF: neutral detergent fibre; SEM: standard error of the mean; WSC: water-soluble carbohydrates.*

conditions typically encountered within grassland systems.

Following the application of additives, the treated samples were mixed and packed in glass silos, which were stored at 20°C in a temperature-controlled room.

Examining the results

After 90 days of ensiling, the silage samples were collected and homogenised, and various chemical analyses were subsequently carried out to determine whether the LAB additives had impacted the silage and, if so, to what level. These analyses revealed that silage fermentation improved in treated forages compared to the silage fermentation seen in the control sample.

The results also indicated that the forage type interacted with the treatments. The highest DM content in the silage was observed in the forage samples with a higher DM content, and DM losses in the silage significantly decreased with any treatment addition compared to the control. Additionally, irrespective of the treatment, the WSC content was the highest in the high-DM forage (HHs) compared to the other forage types. These results lend credence to the suggestion that proper forage management is just as important as the use of inoculants.

In terms of the fermentation-related parameters of the study, the analyses revealed that the pH, ammonia, lactic acid, acetic acid and ethanol levels were all significantly affected by both the treatment and the forage type. With regard to forage type, the high-dry-matter forages (HL and HH) showed a higher pH than the low-dry-matter forages (LL and LH), and all of the treatments led to significant reductions in the pH to levels below 4,2. The additive treatments were also shown to increase the production of lactic acid compared to the control sample, which elevated the ratio of lactic acid to acetic acid.

All of the samples treated with additives displayed lower ethanol and ammonia content, ammonia-nitrogen, propionic acid and acetic acid levels, and total nitrogen percentages compared to the control group. Conversely, the impact of the LAB on the aerobic stability of the silage was inconsistent. The principal component analysis of all analytes showed that aerobic stability was most closely correlated with acetic acid and butyric acid concentrations.

What do these results mean?

When considered as a whole, all of the LAB strains utilised in this study successfully improved the preservation of forage materials through improvements to the fermentation quality of the silages, as measured through the pH, acetic acid, propionic acid, ethanol, and lactic acid levels. In addition, significant inhibitions to DM losses were also observed in all of the treated forages compared to the control. It is also worth noting that the inoculants used in the study improved the silage quality regardless of a forage's DM and WSC content.

Among the different treatments, the *L. planatrum* (LP1, LP2 and LP3) and *L. rhamnosus* (LR) strains were more impactful than the *P. pentosaceus* (PP1 and PP2) strains, primarily due to their higher lactic acid content and higher aerobic stability. These observations confirm previous findings related to the efficacy of these six microbial strains as silage additives (EFSA FEEDAP Panel *et al*., 2021a, 2021b, 2021c, 2021d; Franco, Nikodinoska *et al*., 2022; Gonda *et al*., 2022; Nikodinoska, Gonda, and Moran, 2022a, 2022b; Apajalahti *et al*., 2022; Ferrero *et al*., 2022; Wambecq *et al*., 2022).

In future studies, the potential synergistic fermentation-quality effects of combining different *Pediococcus pentosaceus* and *Lactoplantibacillus plantarum* strains would be worth exploring. What is clear now, however, is that, by utilising additive treatments like LAB, producers can more successfully transform their forage into the high-quality silage that nourishes animals more efficiently and effectively.❖

This article was condensed for publication in *AFMA Matrix*. For the full article and references, visit *www.onlinelibrary.wiley.com/doi/10.1111/gfs.12622* or email cmoran@alltech.com.

Proviox®

Cargill®

Managing oxidative stress in a market with rising vitamin E prices

One of the challenges in high producing commercial farms is oxidative stress caused by high production rates or external conditions. This stress can be acute or chronic, resulting in sub-optimal performance and economic losses for producers.

One of the strategies to support the animal is supplementing animal feed with synthetic vitamin E. However, this is a costly solution, especially given the current high market price. A cost-effective way to help animals cope with oxidative stress and maintain performance is partial replacement of vitamin E with **Proviox® 50**.

Role of antioxidants

Reactive oxygen species (oxidants or free radicals) are produced by all organisms during normal cell metabolism. Stress factors that result in the increased production of oxidants include high growth rates, peak periods of milk and egg production, high stocking density, farrowing, calving, weaning, heat stress, mycotoxins, rancid fats, and disease. Antioxidants play a critical role in neutralising oxidants.

Oxidative stress occurs when oxidants are no longer in balance with antioxidants. When they are not neutralised due to this imbalance, oxidants attack and damage cell membranes. This has a negative effect on animal production. Therefore, higher levels of antioxidants are required to maintain a good balance with oxidants during periods of stress.

Proviox® 50 solution

Proviox® 50 is a unique blend of natural polyphenols with high antioxidant properties that supports optimal animal production. It has a sparing effect on vitamin E by neutralising oxidants and by reconstituting oxidised vitamin E. **Proviox® 50** contains three complimentary antioxidant sources: grape and onion extracts, and aromatic substances. Each ingredient is carefully sourced before use in **Proviox® 50** to ensure its stability and powerful antioxidant capacity.

The diversity of ingredients in **Proviox® 50** results in a wide range of benefits demonstrated in over 100 *in vivo* trials. These benefits include vitamin E replacement, immune support, improved product quality, and patented trans-generational effect.

Vitamin E replacement

Research on the partial replacement of vitamin E with **Proviox® 50** was done in poultry, swine, ruminants, and aquatic species. The results showed that partial replacement of vitamin E is possible while maintaining similar production. It will also result in a reduction of the cost per kilogram of feed.

Although **Proviox® 50** could replace the antioxidant function of vitamin E and re-generate vitamin E, a minimum level of this vitamin will be required for its other functions. Maintaining the oxidant/antioxidant balance during times of increased stress with the addition of **Proviox® 50** will be more cost effective than simply increasing vitamin E levels.

Improved immunity

Studies have shown a positive immune response with the use of **Proviox® 50**. The partial replacement of vitamin E with **Proviox® 50** resulted in a better response in some cases. This shows that the partial replacement of vitamin E will result in similar or potentially improved performance of disease-challenged animals.

Improved product quality

Improvements in meat, milk, and egg quality were found in studies where **Proviox® 50** was used on top of normal vitamin E values. Meat quality improved in terms of drip loss, lipid oxidation (TBARS), and meat acceptability by consumers. In broilers a reduction in breast blister was also found. The antioxidant content of cows' milk improved with the in-feed use of **Proviox® 50**. The full benefit of improved product quality is obtained at higher inclusion rates of **Proviox® 50** than levels used for production and depends on the target species.

Trans-generational effect

Proviox® 50 has demonstrated improved performance of offspring in poultry and swine. This trans-generational effect, patented by Cargill, was seen in several *in vivo* trials. The improved oxidative status of broiler breeders resulted in an increase in egg hatchability, as well as an increase in the average daily gain and feed intake of chicks. In swine the benefits of using **Proviox® 50** in sows during gestation included improvements in liveability, litter birth weight, and post weaning weight gain.

Cargill's SMT team can provide Proviox® 50 trial data for each livestock species and information on the use of the product on all systems. Contact Marjorie Potgieter, Technical Lead Poultry SSA at marjorie_potgieter@cargill.com or visit *www.cargill.co.za*.

Is animal feed a vector for the AI and ASF viruses?

By Dr Charles Gilfillan, technical manager health, Kemin sub-Saharan Africa

Highly pathogenic avian influenza (HPAI) first appeared in South Africa in 2017, with the H5N8 strain that caused the loss of 5,4 million domestic poultry. In April 2021, South Africa reported its first outbreak of H5N1 HPAI in domestic poultry, resulting in the loss of an additional 5,5 million birds by the end of 2023. In 2023 alone 8,5 million domestic poultry were lost to H7N6 HPAI.

The swine industry has been plagued in recent years by African swine fever (ASF), a viral haemorrhagic disease of pigs that can have a case fatality rate of 100% in domestic swine. ASF, which originated in and is endemic to Southern and East Africa, has spread to many parts of Asia and Europe resulting in the death of millions of pigs. ASF has been particularly devastating in Asia, killing 60% of China's pigs. ASF outbreaks have occurred across South Africa, affecting small-scale swine producers and occasionally spilling over into commercial swine operations.

A question often raised by feed millers is whether animal feed is a vector for the transmission of AI and ASF viruses.

Avian influenza virus

The primary hosts of avian influenza (AI) viruses are wild waterfowl such as ducks, geese, and swans. Most AI viruses cause little to no disease in birds and are classified as low pathogenic avian influenza (LPAI) viruses. These LPAI viruses mainly replicate in the gastrointestinal tract of birds and spread among waterfowl via the faecal-oral route. Domestic poultry can become infected with LPAI viruses via a similar route.

When LPAI viruses of the H5 and H7 subtypes circulate in poultry populations, they can mutate into HPAI viruses through genetic reassortment. HPAI viruses cause high mortalities in domestic poultry. Controlling sporadic HPAI outbreaks involves identifying all the poultry establishments infected with HPAI and then depopulating all the farms, thus curtailing the spread of the HPAI virus.

The H7N6 HPAI virus, which caused the 2023 H7 HPAI outbreaks, is an example of an LPAI virus that infected domestic poultry from infected waterfowl that converted to H7N6 HPAI after circulation in domestic poultry.

The H5 HPAI viruses involved in the 2017/18 and 2021 to 2023 outbreaks have a different origin from the H7N6 HPAI virus. These H5 HPAI viruses belong to the Goose/Guangdong (Gs/Gd) lineage of H5 HPAI viruses, which first appeared in China in 1996. Unlike sporadic emergent HPAI viruses, the Gs/Gd-lineage of H5 HPAI viruses can persist as HPAI viruses in several avian hosts. They can enter domestic poultry populations as HPAI viruses without having to first enter as an LPAI virus and then switch to an HPAI virus via genetic reassortment.

Spread of H5 HPAI viruses

The ancestor of the Gs/Gd-lineage of H5 HPAI viruses was introduced into poultry as an LPAI H5 through contact with infected wild waterfowl. The LPAI H5 virus then mutated to an HPAI H5 virus via genetic reassortment, gaining the ability to infect domestic geese as a HPAI H5 virus. Wild waterfowl were infected with the HPAI H5 virus via contact with infected domestic waterfowl, which resulted in the virus being spread across the Northern Hemisphere. Eradication of the Gs/Gd-lineage of H5 HPAI viruses is very difficult as these viruses persist as HPAI viruses in wild waterfowl populations.

The 2017 H5N8 and 2021 H5N1 HPAI viruses, which caused outbreaks in South Africa, were introduced into South Africa by Afri-tropical ducks and geese residing in West and Central Africa. These birds were infected with H5 HPAI from migratory waterfowl from Europe. Afri-tropical waterfowl are non-seasonal, intra-African migrants that travel over wide areas in response to rainfall, agricultural practices, and the availability of open water sources. The H5 HPAI viruses spread southward in Africa through resident waterfowl populations, reaching South Africa in 2017 as H5N8 HPAI and in 2021 as H5N1 HPAI.

African swine fever virus

All members of the pig family (Suidae) are susceptible to ASF. Clinical ASF disease is, however, only observed in domestic and feral pigs, as well as the European wild boar. African suids such as warthogs, African bush pigs, and African giant forest hogs, are asymptomatic carriers of ASF, meaning they get infected without showing any clinical signs.

ASF infections are maintained in warthog populations through a warthog-tick cycle, which is the natural cycle of the ASF virus (ASFv). Warthog piglets are infected with ASFv in the first six to eight

weeks of their lives when they are bitten by soft *Ornithodoros moubata* ticks that carry ASFv and live in warthog burrows. In ASF-endemic areas, up to 100% of warthogs have ASFv antibodies in their blood. The virus remains dormant in the lymph nodes of adult warthogs. The soft ticks, in turn, become infected when feeding on infected warthogs.

The epidemiology of ASF in Southern Africa has shifted from a warthog-tick cycle, which from time to time spills over to domestic pigs, to a situation where ASF is now sustained within the domestic pig population. This means the virus is transmitted from infected to susceptible domestic pigs. Small-scale swine farming has become very popular in Southern Africa, as pigs are omnivorous and will eat any food they find. These pigs are often free roaming, allowing them to scavenge. Small-scale swine producers in South Africa often buy pigs at auctions, a practice that has contributed to the spread of ASF across the country. This poses a risk of ASF spilling over into commercial swine farms.

Transmission risk via poultry feed

AI viruses are sensitive to heat, extreme pH values and desiccation. However, the presence of organic material does protect AI viruses from physical and chemical inactivation. For example, H5N1 AI viruses have been shown to remain viable for four days in chicken faeces kept at temperatures between 25 and 32°C in the shade. Research conducted during AI outbreaks in the United States (US) suggests that feed trucks can spread AI viruses between farms. Storing final feed and feed raw materials outside increases the risk of contamination by AI-infected faecal material from wild birds.

Feed collected from farms positive for H5N1 tested positive for viral H5N1 RNA, but no viable H5N1 virus was detected via virus isolation. Similar viral H5N1 RNA degradation, as estimated via polymerase chain reaction (PCR), occurred in feed spiked with LPAI stored at 37°C. Virus isolation from a sample of the spiked feed also did not yield any viable AI virus. AI viruses can survive longer in spiked feed stored at lower temperatures. AI spiked feed that was heat-treated, such as through pelleting, or treated with formaldehyde-containing in-feed antimicrobials tested negative for AI viral RNA via PCR.

Feed can thus be considered a low-risk vector for the spread of AI viruses. Treating poultry feed, especially mash feed, with formaldehyde-containing in-feed antimicrobials provides feed mill clients with assurance that the feed is not contaminated with AI viruses when it leaves the mill. However, producers need to implement biosecurity measures to prevent the final feed from being contaminated with AI after it is delivered to the farm.

These measures include but are not limited to decontamination of feed trucks that enter the farm; preventing wild birds from accessing the poultry houses; and sealing the feed storage areas thus preventing access to wild birds.

Transmission risk via swine feed

Unlike AI viruses, the ASFv can survive for extended periods in the environment.

- ASFv has been shown to survive for up to six months in uncooked pork products.
- ASFv is highly resistant to low temperatures and can survive for extended periods in blood, tissues, and faeces of infected animals.
- Viable ASFv has been isolated from frozen carcasses of European wild boar that died of ASF.
- Feeding recently harvested grains from ASF-infected areas to domestic pigs has been implicated in ASF outbreaks in Europe.

The introduction of the porcine endemic diarrhoea virus (PEDv) in the US, which resulted in the loss of seven million pigs (10% of the annual pig population), was shown to be spread via contaminated feed. This raised awareness of feed as a vector for the spread of porcine viruses. The US PEDv strain was found to have 99,7 to 99,8% nucleotide identity with a Chinese PEDv strain, raising the questions of whether contaminated feed imported from China might have been the source of the outbreak, and whether other porcine viruses, including ASFv, could be introduced into the US via feed imported from Asia or Europe.

A simulated 30-day transoceanic transport model, mimicking the environmental conditions that final feed and feed raw materials will be exposed to on a ship travelling from Poland to the US, showed that ASFv can remain viable in feed raw material and final swine feed. The tested feed raw materials included soya oilcake and soya bean meal. A follow-up study indicated that the viral half-life for ASFv in shipped animal feed was 12,2 days in a transoceanic transport model.

Infection risks

It has thus been demonstrated that ASFv can survive for up to 30 days in plant-based feeds. However, can domestic pigs be infected with ASFv from contaminated feed and liquids? Evidence suggests that pigs in Europe were infected with ASFv after consuming recently harvested grains from ASF-infected areas and that the Danube River has been linked to the spread of ASFv in Romania.

A study by Niederwerder *et al*. (2019) confirmed the efficient transmission of the Georgia strain of ASFv via the oral route in both liquid and feed that did not contain any contaminated pork products. Thus, showing the potential for plant-based feeds to be high-risk vectors for the transmission of ASFv.

Formaldehyde-containing in-feed antimicrobials, used at similar inclusions to reduce *Salmonella* contamination in feed, have been shown to result in a 3,5 to 3,8 log10 TCID50/mℓ reduction in ASFv titres. Therefore, treating swine feed with formaldehyde-containing in-feed antimicrobials could be an effective method to decrease the risk of plant-based swine feeds being a vector for the transmission of ASFv.

Is animal feed a vector for the transmission of AI virus and ASFv? It is highly unlikely for the AI virus, but is a confirmed risk for AFSv.

References are available on request. For more information, contact Dr Charles Gilfillan on 072 859 9537 or email charles.gilfillan@kemin.com.

Sustainable dairy boost with yeast probiotic ActiSaf®Sc 47

Global food demand is set to double by 2050, according to United Nations estimates, as the world population is expected to grow from today's 7,6 billion to 9,8 billion over the next 26 years. To keep pace with such growth, agricultural systems worldwide will need to produce additional food to feed the rising number of people.

While this is a daunting prospect, it also offers opportunities and challenges for the dairy sector to continue providing the global population with healthy, nutritious, and sustainably produced food. Currently, more than 80% of global consumers, approximately six billion people, regularly consume milk and buy other dairy products.

Agro-industry players and dairy producers face the increasing challenge of producing more milk with fewer resources, improving product quality, and reducing production costs. This is despite a background of continuous feed cost inflation and resource scarcity. For more than 30 years, ActiSaf® Sc 47 has been used in dairy cows to address these issues. These include helping to improve animal well-being, fertility, and performance by enhancing rumen health and fibre digestibility to secure higher milk yields and milk solids. Additionally, it ensures cows have improved metabolic balance and protection against acidosis.

Feed production

According to the Food and Agriculture Organization of the United Nations (FAO), the global average cost of feed accounts for approximately 70% of the total costs in milk production.

A study by Nutter *et al*. (2013) on the value chain of liquid milk in the United States found that approximately 72% of greenhouse gas emissions occur before milk leaves the farm, with feed production accounting for a significant proportion of these emissions. The study also estimated that emissions associated with milk production range between 0,8 and 1,2kg of CO_2-equivalent per kilogram of milk, with feed production accounting for 20% of these emissions.

Agro-industry players and dairy producers are increasingly challenged to produce more milk using fewer resources, improving product quality and reducing production costs.

Life cycle assessment (LCA) has been instrumental in evaluating other environmental impacts linked to feed production, such as feed ingredient cultivation, processing, transportation, and utilisation. LCA is a scientific method that evaluates the environmental impact of a

Phileo by Lesaffre's research and development efforts are dedicated to understanding the environmental impact of feed additives, aiming to drive change in the industry.

Supplementing a cow with the yeast probiotic ActiSaf® from transition to mid-lactation can potentially reduce the carbon footprint of 1kg of fat and protein-corrected milk (FPCM) by up to 5%.

product throughout its life cycle, from raw material extraction to end-of-life disposal.

Environmental impact

Phileo by Lesaffre's research and development activities focus on understanding the environmental impact of feed additives to drive change in the industry. To evaluate the environmental impact and performance of ActiSaf®, a comprehensive LCA was conducted, covering the product's journey from production to farm gate. We began by examining the impact of producing 1kg of ActiSaf®, an assessment carried out with the help of an external consultant, EVEA.

The ActiSaf® LCA study, conducted in collaboration with international LCA specialists, Blonk Consultants, followed the Product Environmental Footprint Category Rules approved by the European Commission for dairy and animal feed production, and the FAO's Livestock Environmental Assessment and Performance Partnership guidelines for feed additives (2019).

In accordance with ISO14040 and ISO14044 standards, the LCA study comprised four phases: goal and scope definition, inventory analysis, impact assessment, and interpretation. Additionally, the LCA was also critically reviewed by three experts, ensuring compliance with ISO14040 and 14044.

The final report secured ISO14040/44 compliance, ensuring the transparency and accuracy of the study's findings. This report provided comprehensive information on the environmental impact of using ActiSaf® in dairy farming, demonstrating that supplementing cow diets with ActiSaf® can reduce the carbon footprint of milk production by up to 5%, while also improving cow health and productivity. The study also drew on zootechnical trials carried out by renowned institutions in different regions of Europe.

Reducing dairy's carbon footprint

This peer-reviewed study provides scientific data and a robust analysis of the environmental benefits of using ActiSaf® in dairy farming, highlighting the potential to reduce the carbon footprint of milk production and improve the sustainability of dairy farming.

Primary data gathered for this study featured areas which are responsible for 50% of the European Union's milk output. Different dairy cow diets were covered by the data, ranging from high to medium-production herds and from transition to mid-lactation cows. These studies provided the relevant data required for an LCA on dairy production based on a one-year study including the lactation cycle and dry period.

Figure 1: ActiSaf® reduces the carbon footprint of milk production by up to 5%.

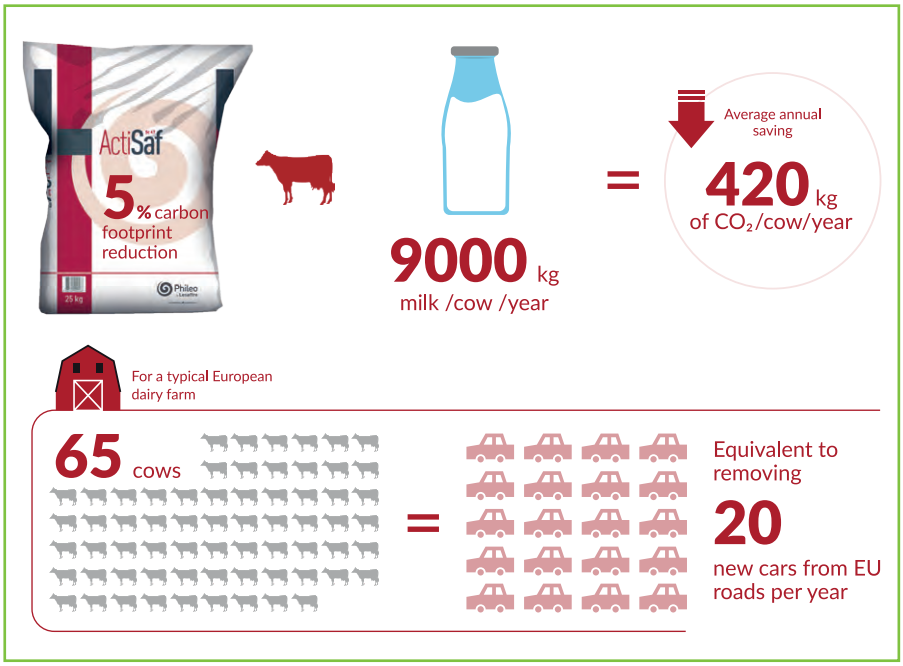

Figure 2: Phileo by Lessafre benefits the three Ps.

One of our main conclusions is that when a producer supplements a cow from transition to mid-lactation with the yeast probiotic ActiSaf®, he/she could expect to reduce the carbon footprint of 1kg of fat and protein corrected (FPCM) milk by up to 5%, alongside additional reductions across several environmental impact categories.

LCA studies offer brand-new added value for industry players and customers. They show the potential for using feed additives within an increasingly sustainable agroindustry. These studies help to support the transition of the dairy industry towards greater sustainability across social, environmental, and economic dimensions, benefitting the all-important three Ps: people, profit, and planet.

Three P benefits

- **People:** Enhances food security by increasing milk yield and quality, serving as a source of animal protein.
- **Profit:** Offers producers a return on investment of 7:1 secured by supplementing with ActiSaf®.
- **Planet:** Positively impacts the environment by reducing up to 5% of CO_2/kg of FPCM.

For more information, contact Francois du Toit on 082 471 5034 or email f.dutoit@phileo.lesaffre.com or visit *www.phileo-lesaffre.com*.

Inflammation: The silent nutrient thief

By Anatha Erasmus, nutritionist, ADM SA, and Dr Jose Luis Cano, customer and technical manager, ADM EMEA

One factor prevalent in animal production and leading to significant losses in productivity, efficiency, and health, is chronic inflammation. Chronic inflammation on farms has increased due to the global trend of intensification in beef, dairy, swine, aquaculture, and poultry production.

The production cycle is a source of chronic inflammation, and combined with intensive management practices this problem becomes widespread, impacting animal production and health.

Chronic inflammation in the gut leads to a loss of integrity in the enterocyte layer, damaging tight junctions and compromising the gut mucosa's ability to maintain isolation from micro-organisms, thereby disrupting balance homeostasis. This loss of function triggers a cycle of inflammation. This includes the disruption of tight cell junctions and the breakdown of the intestinal lining causing damage to villi, increasing the passage of bacteria through the intestinal layers, and leading to a decrease in nutrient absorption.

Feed intake can decrease by up to 15% resulting in reduced weight gain and reproductive performance, and increased maintenance needs due to a poor health status. Up to 30% of the ingested energy is used to manage the process of inflammation, and fewer amino acids are available for production. These nutrients are not fully absorbed due to metabolic deviances.

Functional nutrition

Inflammation can be mitigated by improving management practices such as biosecurity and applying responsible medication programmes. Functional nutrition focusses on products or compounds that affect the problem at hand. Three plant extracts – sanguinarine, magnolol and honokiol – from the magnolia and *Macleaya* plants, are used as a nutritional strategy in fighting inflammation. These extracts are alkaloid and neo-lignan compounds that, when used in combination, can increase the integrity of the gut, ensuring proper nutrient absorption during stressful periods.

Research has proven these compounds to preserve the tight junctions on intestinal cells and limit the amount of pro-inflammatory markers present in the body. This proves the overall reduction in inflammation. More of the energy and amino acids will be re-directed to production performance instead of amplifying the inflammatory process. These biofunctional compounds have a synergistic effect when combined and secure gut integrity for all types of production animals.

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EVONIK
Leading Beyond Chemistry

Metabolisable protein supply for improved transition cow management and reproductive performance

By Ranier van Heerden, business manager, Evonik Africa

The reproduction cycle of a dairy cow entails a succession of interconnected steps: establishing and maintaining ovarian cyclicity, expressing oestrus (mating behaviours), establishing and maintaining pregnancy, parturition (transition), and successful uterine recovery (cervical and uterine involution).

The oestrus cycle lasts approximately 21 days (18 to 24 days) and is initiated with the prepubertal heifer (non-cycling and growing) reaching puberty and first oestrus by 12 to 13 months (*Figure 1*). This depends on different factors including weight, genetics, and management. After fertilisation, the cow is in gestation for 283 to 285 days until parturition. During this period the cow will not cycle (anoestrous or acyclic). The postpartum stage after calving is the period of recovery which typically lasts 40 days or more (NASEM, 2021).

These events include follicular development, ovulation, fertilisation of the oocyte, embryo transport and development, maternal recognition, and implantation (De Vries, 2020). These processes are significantly influenced by the cow's nutritional status.

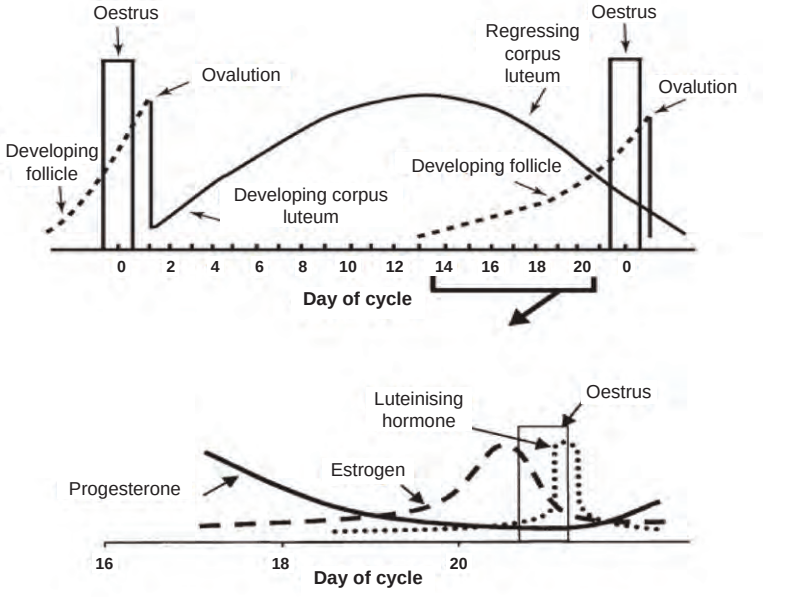
The transition period

During the 21-day transition period a dairy cow goes from a pregnant non-lactating state to a non-pregnant lactating state. This period sees a significant increase in nutrient requirements and a concomitant reduction in dry matter intake (DMI) (Bell *et al*., 1995), leading to a negative nutrient balance (Block *et al*., 2001), especially for metabolisable protein (MP) and energy which further accentuates certain metabolic diseases and disorders (milk fever, ketosis, fatty liver, retained placenta, displaced abomasum, metritis, mastitis, and lameness), in addition to increased culling rates (Roch *et al*., 2013).

During the pre-partum phase, rapid foetal and mammary gland growth and development, colostrum synthesis, and dramatic changes in endocrine status occur. These hormonal changes prepare the cow for an alteration in nutrient requirements and are influenced by her current nutritional status (Ehrhardt *et al*., 2016).

The hormonal responses allow for the increase of nutrient mobilisations and repartitioning, and reduce the cow's basal metabolic rate. This leads to a decline in DMI and increased mobilisation of fat from adipose tissue (lipolysis) and utilisation of glycogen from the liver, which subsequently results in increased blood net esterified fatty acid levels which are associated with inflammation and immune system dysfunction (Garverick *et al*., 2013).

Figure 1: Anatomical and hormonal changes that occur during a typical 21-day oestrus cycle. (Adapted from Deutscher, 1980)



Protein mobilisation

Dairy cows mobilise adipose tissue during this period as well as substantial amounts of body protein (Bell *et al*., 2000) as indicated by plasma concentration of 3-methyl histidine (a marker of protein breakdown) (Van der Drift *et al*., 2012). The magnitude of this protein mobilisation seems to be related to the amount of muscle mass before calving (McCabe and Boerman, 2020).

The transition period entails additional challenges that include ruminal changes (rumen morphology and functionality), reduced immune status (suppression of neutrophils and lymphocytes, metritis and mastitis), reduced oxidative status (increased reactive oxygen metabolite-free radicles and increased mastitis), and reduced DMI (bodyweight, body condition, foetal growth and health status).

The pre-partum diet influences post-partum reproduction as well as cow and calf performance, and is directly influenced by protein and amino acid (AA) supply, primarily due to the major role protein and AA play in enzyme production, oxidation status, foetal growth, immune function, and metabolism (Krog *et al*., 2018). However, decreased reproductive

performance (fertility) may be attributable to greater severity of post-partum negative energy balance (NEB) and negative protein balance (NPB), which frequently result from inadequate transition management or increased rates of diseases and disorders influencing subsequent lactational and reproductive performance (Cardoso *et al*., 2020).

NEB and its related health and performance consequences have been extensively studied, resulting in several dietary recommendations for the transition period and reproduction regarding energy (Mann *et al*., 2015). However, the effects of NPB, or MP supplementation during transition and on reproduction, including calf performance and health, in general, have received less attention.

Balancing diets

Dairy cows require specific post-ruminally absorbed AA, whereas rumen microbes have requirements for various nitrogen-containing compounds (peptides, AA, and ammonia). However, when formulating diets, the aim is to optimise the AA profile of MP reaching the cow's small intestine, especially for the essential amino acid (EAA) methionine (Met) since Met is the most limiting AA for dairy cows (Lean *et al*., 2018).

From a biological perspective, improving cow reproduction and transition period management while improving cow performance is achievable by either decreasing dietary crude protein levels, optimising rumen fermentation and thus microbial protein production, altering the passage of EAA to the small intestine, increasing the efficiency of absorbed AA, and/or modifying the rumen microflora, particularly those involved in peptide degradation and AA deamination.

Recent research demonstrates that when AA is ignored during formulation, diets tend to be more expensive. Balancing for AA is widely accepted because of the positive impacts seen on transition cow health (reducing NEB, NPB and associated effects), early lactation performance, reproduction, subsequent lactations, and calf performance (Cardoso, 2021), especially for Met (Batistel *et al*., 2017).

Supplementing methionine

Since Met is often the most limiting AA for dairy cows, it is important to consider the effects rumen-protected Met (RPM) supplementation (i.e., ethyl-cellulose protected) may have:

- Pre-and post-partum supplementation of RPM increases pre-partum DMI, lactation performance (yield, protein concentration and energy-corrected milk), reduces NEB and NPB pre- and post-partum, and increases cow health status (Batistel *et al*., 2018).
- Methionine is a precursor of importance for protein synthesis, enzyme production, antioxidants and a methyl donor for the synthesis of choline and carnitine, which are involved in lipid metabolism (Chandler and White, 2017).
- Supplementation of RPM during the periparturient period and early lactation has shown improved liver function, inflammation status and oxidation stress by lowering blood fatty acid and β-hydroxybutyrate levels and increasing neutrophil and monocyte function (Batistel *et al*., 2017 and Han *et al*., 2018).
- Blood, milk, and liver biomarkers have indicated that at least part of the effect of RPM supplementation on milk production is due to improved immune status and liver function (Vailati-Riboni *et al*., 2017).
- Balancing diets for EAA with RPM enhanced the activity of skeletal muscle genes related to the transportation of various nutrients, biological processes that generate energy, tissue protein replenishment, and co-ordination of antioxidant responses during the periparturient period (Thanh *et al*., 2023).
- Supplementing with RPM supports embryo viability and implementation through higher lipid content, embryo volume and changes in DNA methylation (Bonilla *et al*., 2010) and lowers pregnancy losses (Toledo *et al*., 2017).
- Adding RPM to the dairy diet increased the rate of utilisation of some AA and improved the protein efficiency of others (Vailati-Riboni *et al*., 2019)
- Methionine supplementation improves calf performance via foetal programming as methyl donor (epigenetics and DNA methylation) and mTOR regulator (cell growth and activity and greater nutrient transport from the maternal to foetal circulation through nutrient transporters) (Krog *et al*., 2018; Ma *et al*., 2019).
- Cows supplemented with RPM during gestation and the transition period yielded calves that were heavier at birth, grew better (average daily gain), and improved hindgut health and function (Elolimy *et al*., 2019; Urie *et al*., 2018).

Balancing suggestions

Establish optimal EAA concentration in MP: Formulate diets based on lactation stage, production level, pregnancy status, and production system. Lower-producing cows (such as those in later lactation) need less protein and AA than high-producing cows and/or cows in early lactation.

Optimise rumen function and microbial protein yield: Since it is widely accepted that microbial protein has a superior AA profile (8,10 and 2,29g/100g AA of lysine [Lys] and Met, respectively [Sok *et al*., 2017]), particularly for Lys and Met. Formulate diets maximising microbial crude protein yield. Monitor histidine levels since microbial protein tends to be low and diets in which grasses and legumes are predominant.

Supply high-quality dietary protein sources: Use protein sources (soya bean and canola meal) that are high in Lys or Met. Utilise a variety of feedstuffs in rations to eliminate imprecise estimates of the nutrient level of a feed that makes up a high proportion of the diet. Cow performance increases, and the proportion of cows' EAA requirements met by microbial protein alone decreases.

Utilise supplemental rumen-protected amino acids: To meet the cows' EAA requirements (Met) and theoretical optimal Lys:Met ratio in MP rumen-protected amino acids can be used successfully. Using only high-quality plant- and/or animal-based protein supplements to meet the cows' EAA requirements seldomly achieves an optimal EAA profile in MP. However, be sure of the product's rumen-bypass rate, bioavailability and metabolisable amino acid supply to be able to accurately do an economic evaluation. ❖

References available on request. Email raniervanheerden@gmail.com for more information or visit *www.mea.evonik.com*.

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Exploring magnesium in ruminant nutrition

By Zané Orffer, Nu3enta

Minerals comprise the inorganic component of the diet and serve different structural, physiological, catalytic, and regulatory functions. Nutritionists distinguish between macrominerals (needed in g/day) and microminerals (needed in mg/day). Magnesium (Mg) is one of the seven essential macrominerals in the diet of animals. It serves various functions including growth, bone formation, maintenance of the ionic balance, enzyme activation, and regulation of ion channel function.

This article explores the functions of Mg in ruminants, how Mg is absorbed and metabolised for these functions, and the factors that influence digestion of Mg, accurate supplementation, and deficiency symptoms.

Functions of magnesium

More than 65% of the total Mg in the body is found in the skeleton bound to calcium (Ca) and phosphorous (P), with the rest being found inside muscle, cells of soft tissues, and extracellular fluids in its ionised form (Mg^{2+}) and serving various crucial functions in the animal, including the preservation of cell membrane integrity. Magnesium performs three different biochemical functions: it is a cofactor in enzymatic reactions, it is a structural component in ribosome assembly, and it stabilises membranes throughout the entire cell. Over 300 enzymes, including phosphohydrolases and phosphotransferases involved in energy metabolism and protein synthesis in the ruminant, are activated by Mg (Wacker, 1980), making it the most common enzyme activator and essential for efficient carbohydrate, protein, and lipid metabolism.

Magnesium is essential for all biosynthetic processes in the body, including glycolysis, the Kreb cycle, cyclic AMP formation, membrane transport mechanisms that are energy-dependent, and the transmission of genetic code. Furthermore, Mg^{2+} absorbed in the lumen is involved in the maintenance of the electric potential over membranes (both nervous and muscle) and impulse transmission in the nervous system (NRC, 2015). Low Mg levels in ruminants have been shown to decrease the rumen's ability to digest cellulose, which decreased appetite and overall nutritional intake, highlighting the importance of Mg supplementation.

Magnesium plays a critical role in the prevention of milk fever, as it is required to produce hormones that play a role in Ca absorption from the gut and Ca mobilisation from the bones. Mg is therefore essential for ruminants, playing critical roles in skeletal health, cellular functions, and metabolic processes, and Mg intake is therefore vital for the overall health and productivity of ruminants.

Magnesium absorption

The rumen is the primary site for Mg absorption (Grace *et al*. 1974; Greene *et al*., 1983) through active and passive pathways, with additional absorption occurring in the lower gastrointestinal tract. Magnesium uptake is primarily passive and driven by the negative potential difference (PD_a) and blocked by high lumenal potassium (K) concentrations at the apical membrane of the rumen mucosa. Therefore, because Mg is passively absorbed, an excess of ions in the diet, such as K, can negatively affect its absorption. At elevated levels of luminal Mg, an active carrier-mediated mechanism that involves an Mg and hydrogen ion exchanger (that is K insensitive) takes over (Martens and Schweigel, 2000).

Another saturable active process that regulates efflux to the bloodstream is found in the basolateral membrane and completes the absorption of Mg (Dua and Care, 1995). In other words, any negative interference in the absorption of Mg may be addressed and prohibited by an adequate supply through supplementation.

True Mg absorption varies based on various factors such as diet, diet composition, Mg source, species, age, and requirements. The pH of the rumen has a significant impact on Mg solubility, with a pH rise generally leading to decreased Mg absorption. According to Dalley *et al*. (1997), when pH is raised *in vitro* from 5 to 7, the solubility of Mg in sheep's rumen drops from about 80 to 20%. Diet composition also plays an important role. For a given pH, the amount of Mg absorption is lower in hay with concentrate diets than in grass.

One of the largest dietary factors affecting Mg absorption is K (Greene *et al*. 1983), where decreased Mg absorption is observed as the result of increased K concentrations (Martens and Schweigel, 2000). Thus, unless Mg intakes are extremely high, and the K-independent route of Mg absorption becomes dominant, dietary K supplements reduce apparent Mg levels. By raising the rumen volume and rate of digesta outflow from the rumen, diets high in K may also lower available Mg (Dalley *et al*., 1997a). Similar effects that are partially explained by the corresponding shift in dietary K are seen when the amount of roughage in the diet is increased (Schonewille *et al*. 2002).

Early research conducted in the Netherlands revealed that high levels of crude protein and fatty acids in spring pastures had inhibitory effects on Mg absorption and often led to hypomagnesia in cows (Martens and Rayssiguier, 1980). Furthermore, high concentrations of nitrogen (N), organic acids (specifically citric acid and trans-aconitate), long chain fatty acids, Ca and P all influence Mg absorption and utilisation negatively, whereas feeding soluble carbohydrates and carboxylic ionophores (such as monensin and lasalocid), on the other hand, increase Mg absorption indirectly through decreased K concentrations (Fontenot *et al*. 1989).

Supplementing sodium (Na) in low Na diets has been reported to increase Mg absorption, due to the evidence that one of the Mg-uptake pathways in the rumen is an active Na-linked process (Martens and Rayssiguier, 1980).

Cattle and sheep exhibit subtle differences in the Mg fluxes across the hindgut mucosa, which adds to the body of evidence indicating that findings for one

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Because modern feeding practices frequently emphasise various dietary components that may restrict or impede effective Mg absorption, optimal supplementation is necessary to ensure that the daily requirements of the animal are met, and deficiency is prohibited.

species are no longer indicative of other species. Sheep's hind intestine typically contains some net Mg (Dalley *et al*., 1997). When Mg absorption in the rumen is reduced by K, there can be a significant compensatory rise in Mg absorption from the small intestine when diets are high in Mg (Dalley *et al*., 1997), but not diets low in Mg. According to Grace and MacRae (1972), forages fed once daily have higher post-ruminal Mg levels than those fed continuously. In contrast, cattle forage-fed experience a net loss of Mg from their hindguts (Bell *et al*., 2008).

Because modern feeding practices frequently emphasise various dietary components that may restrict or impede effective Mg absorption, optimal supplementation is necessary to ensure that the daily requirements of the animal are met, and deficiency is prohibited.

Magnesium deficiency

In young ruminants, decreased milk Mg concentration as well as reduced absorption efficiency of the animal with age can lead to an Mg deficiency in low serum Mg and depleted bone Mg, followed by tetany and ultimately, death. Mg deficiency in calves leads to excitability, anorexia, hyperaemia, convulsions, frothing in the mouth, and soft tissue calcification.

Adult sheep and cattle exhibit a sharp decline in plasma Mg levels, regardless of lactation status (McCoy *et al*., 2001) when fed diets deficient in Mg, with the rate of decline representing the Mg concentration in the diet. In older ruminants, hypomagnesaemia is associated with decreased intake and performance and hypomagnesemic tetany (Mg tetany, lactation tetany, grass staggers) and entails low cerebrospinal fluid and plasma Mg concentrations, which has received increased attention due to high mortalities.

Initial symptoms include restlessness, decreased intake, muscular twitching, and uncoordinated and stiff movement. Severe symptoms include lying down and going into convulsions and can only be treated with subcutaneous or intravenous injection of Mg. This condition is found in various ruminants including total mixed ration and pasture-based dairy cows as well as sheep, and is most prominent in animals grazed on young, succulent pasture.

The condition generally develops within a day or two and is mostly found in its acute form, where blood Mg levels decline so rapidly that the body's mobilisation mechanisms are unable to keep up. The chronic form, on the other hand, shows a slow decline in blood Mg levels (more common in suckling herds) and is often also a precursor for milk fever.

Factors that predispose animals to the disease include grazing on pastures heavily fertilised with K and N, weather conditions such as cold, wet and windy weather as well as rapid grass growth in the spring season, which goes hand in hand with increased pasture K content and therefore intake, higher organic material intake which increases milk yield and subsequently Mg requirements, and the possibility of increased internal parasite loads with the spring pasture.

Magnesium supplementation

Research and practice have demonstrated benefits from supplementing Mg above the projected minimal requirements in both monogastric and ruminant animals. The common practice of adding Mg

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supplements to feedstuffs is to prevent Mg shortage, which is followed by improvements in animal performance (fertility and production), and occasionally the quality of the products. Cereal grains typically contain between 0,11 and 0,17% Mg, but plant protein sources have around twice this amount (Underwood and Suttle, 1999). Species, soil Mg content, growth stage, season, and ambient temperature all affect the Mg concentration in forages (Minson, 1990). Legumes have more Mg than grasses.

> Magnesium is a critical mineral for the health and productivity of ruminants, and is essential for numerous physiological processes such as optimal rumen fermentation and metabolism.

To prevent acute and chronic unfavourable effects associated with Mg deficiency, both short- and long-term measures must be taken to prevent Mg deficit. If there is a sudden need to avoid Mg deficiency, it is recommended to raise the dietary Mg content to adequate levels using compound feeds. Supplemental Mg can be obtained from Mg oxide (MgO) (50 to 52g Mg/100g), Mg carbonate, hydroxide (36 to 38g Mg/100g), phosphate (24 to 33g Mg/100g), chloride (12g Mg/100g) and sulphate (10g Mg/100g), but it is not readily available from magnesite and dolomitic limestone. Along with MgO, which is the most widely utilised form of Mg to prevent milk fever, Mg sulphate ($MgSO_4$) is thought to be a good bioavailable source of Mg.

Magnesium chloride ($MgCl_2$) and sulphate can both help reduce the so-called dietary cation-anion difference (DCAD) and although $MgCl_2$ should be intuitively preferable in terms of bioavailability to both regulate DCAD and avoid milk fever in dairy cows, the concomitant anions of $MgSO_4$ and $MgCl_2$ can decrease that balance when used as supplemental Mg sources (Schonewille, 2013). There are differences in the mineral feed bioavailability as well. For instance, the average Mg bioavailability of MgO is approximately 20 vs 45% when compared to $MgPO_4$. Because it is more palatable and usually includes high Mg levels (50 to 60%) which ensures adequate Mg absorption, MgO is a more common option for Mg supplements than other Mg sources.

Due to its alkaline qualities, MgO is used in the rumen as an antacid when feeding diets heavy in grains (Beede, 2017). The high levels of Mg in MgO do, however, not warrant high bioavailability of the source, this varies depending on solubility, absorbability as well as reactivity (Suttle, 2010).

Bioavailability components

Bioavailability refers to the proportion of ingested nutrients that are absorbed and utilised by the body for various physiological functions. Bioavailability has four components: accessibility, absorbability, retainability, and functionality. The biological availability of commercially available Mg sources varies based on the precursor's origin, the quantity of impurities, the degree of calcination (Wardle, 1983), solubility, and the particle size (Xin *et al*., 1989). The solubility of supplemental Mg sources is one of the elements that determines its bioavailability (Khiaosa-ard *et al*., 2023).

Another factor that has a significant effect on Mg bioavailability is particle size, with smaller particles being more bioavailable (Jesse *et al*., 1981; Schonewille *et al*., 1992). Absorption can be significantly boosted by using finely ground MgO due to its increased solubility. The coefficient of absorption will be 50% based on MgO particles with 99% of the material having a diameter of less than 250µm.

A study by Ravenswaay *et al* (1989) found MgO from brine with a larger particle distribution was less available than that from seawater or calcined magnesite with a smaller particle distribution. When formulating dairy diets, the availability of Mg in magnesite and dolomitic limestone should be considered and the solubility and absorption capacity of $MgSO_4$ and $MgCl_2$ are significantly higher than that of dolomitic limestone and magnesite.

The Agricultural Research Council (1980) determined that the coefficient of absorption for Mg from natural feedstuffs should be 16%, one standard deviation below the mean, as overestimating the efficiency of absorption of Mg can be harmful. Research conducted on cattle has found that the percentage of Mg absorbed from MgO ranges from 28 to 49% (Moore *et al*., 1971; Storry and Rook, 1963). However, in research including animals on pasture that were suspected of having hypomagnesemia, the percentage of Mg absorbed from MgO ranged from 5 to 10%.

Working with sheep, Ammerman *et al*. (1972) found that genuine physiologic efficiency of absorption was 51% while perceived absorption of Mg from MgO was 52%. Additionally, they discovered that the actual biological absorption efficiency of $MgSO_4$ was 57,6%, while the commercial magnesite (Mg carbonate) had no biological absorption efficiency. The biological absorbance of reagent grade Mg carbonate was 43,7%.

Conclusion

Magnesium is a critical mineral for the health and productivity of ruminants, and is essential for numerous physiological processes such as optimal rumen fermentation and metabolism. Furthermore, Mg plays a role in nerve function and the absorption and metabolism of Ca. To prevent hypomagnesaemia clinical disorders such as milk fever and grass tetany and to maintain the metabolic activity of the enzymes that need Mg as a cofactor, ruminants must be fed supplements containing Mg.

Antagonism in absorption with K is crucial to keep in mind when ensuring that the Mg requirements of an animal are met, as ruminants consume an excess of their daily requirement of K. These conditions include grazing herds on lush green spring pastures, high roughage diets and the inclusion of K-rich feed ingredients such as molasses and poultry by-products in the diet. It is therefore important to ensure adequate Mg supply in these cases to prevent Mg deficiency.

Supplementing diets with Mg can enhance Mg levels both temporarily and permanently. However, the bioavailability of Mg from various sources can differ significantly, making the choice of an appropriate supplement crucial.❖

For more information and references, email the author at zane@nu3enta.co.za.

Hydroxy-seleno-methionine: Ensuring performance under heat stress

By Michele de Marco, global scientific and technical manager, and Mickael Briens, micronutrient expert, Adisseo

Antioxidants, especially selenium (Se), play a pivotal role in helping animals cope with heat stress, which causes significant economic losses in the global livestock industry. Introducing nutritional solutions can mitigate these effects.

Micro-nutrient supplements are essential during heat stress conditions, as they are involved in biological systems. They can reduce the adverse effects of oxidative stress, which tend to increase when animals experience hyperthermia. Selenium plays a crucial role in antioxidant nutritional solutions. Selenium imbalances in livestock can alter growth, reproduction, and health. Selenium deficiency also produces an imbalance of redox homeostasis and, ultimately, oxidative stress.

When animals experience heat stress, they adopt several strategies to dissipate excess heat. They significantly increase their water consumption and decrease their feed intake, which reduces their nutrient/micronutrient uptake. Additionally, they dissipate energy through various metabolic adaptations, such as increasing their heart rate and panting. These changes negatively impact their performance regarding average daily gain, feed efficiency, liveability, and milk production.

Metabolic changes induce an overproduction of free radicals at the cellular level. Free radicals include reactive oxygen species (ROS), which are known to seriously damage biological molecules such as lipids, proteins, and DNA. Cells boost their antioxidant activities to protect themselves and their structures from free radicals.

Benefits of antioxidants

Research indicates that supplementing diets with antioxidants under heat stress conditions can help animals prevent or mitigate adverse effects. Selenium is an indispensable component of the antioxidant system, playing a role in every level of antioxidant defence. For instance, Se can be used for synthesising glutathione peroxidase (GSH-Px), a key antioxidant that protects the body from free radical damage. Increased levels of GSH-Px have been observed in animals experiencing heat stress. Selenium has been shown to increase serum GSH-Px activity significantly, and the elevated activity of the GSH-Px activity in the blood persisted after heat stress.

Research demonstrated that the response of the heat shock protein (HSP70) to heat stress varied depending on the Se source: It increased in the selenite-fed group, and decreased in the organic-Se-fed group, indicating that the animals in this group coped with heat stress more effectively.

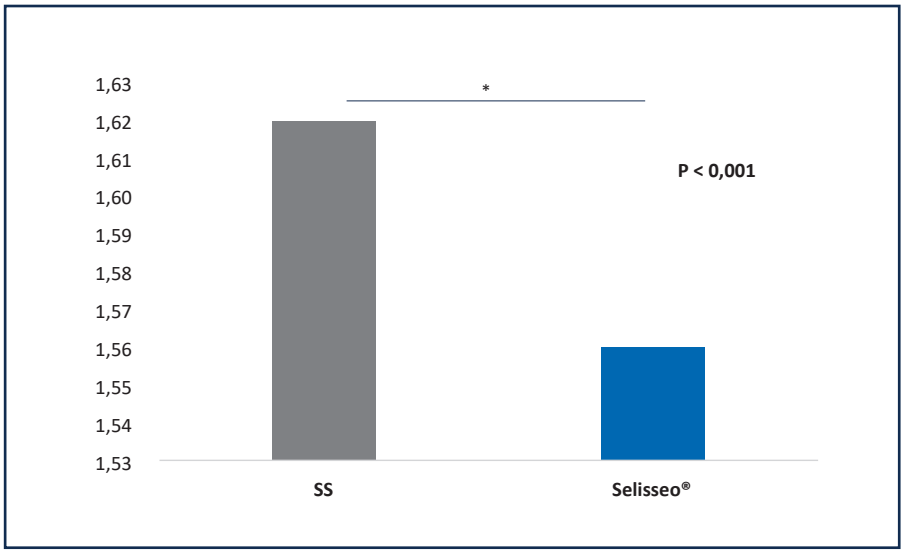
Heat-stressed broilers

In collaboration with the INRA (URA, France), researchers evaluated the effect of supplementing pure organic Se hydroxy-selenomethionine (OH-SeMet 0,2ppm Se, Selisseo) or sodium selenite (SS 0,2ppm Se) on the growth performance of Cobb 500 broilers exposed to heat stress.

The experimental period was five weeks. Half of the birds were kept in a thermoneutral environment for the entire period, while the other half were kept in a thermoneutral environment for the first two weeks and then at 32°C for the last three weeks of the trial. Heat stress induced a drop in growth performance for both selenium treatments. However, the OH-SeMet-fed broilers were 52g heavier at day 35, and their feed conversion ratio was one point better than the SS-fed broilers.

This study suggests that OH-SeMet can better support and ensure broilers' performance than mineral Se during heat stress. Another experiment was designed in collaboration with the University of Ghent, Belgium, in which a cyclic heat stress model was used to study the effects of dietary supplementation of OH-SeMet

Figure 1: Effect of different Se sources on the feed efficiency of broilers under cyclic heat stress. The feed conversion rate was measured from days 25 to 39.



on Ross 308 broilers. In the finisher phase (days 25 to 39), the temperature increased from 22 to 34°C (50 to 60% humidity) for six hours daily. The broilers were reared for 39 days and fed a diet with either a 0,3ppm Se feed from SS or a 0,3ppm Se feed from OH-SeMet.

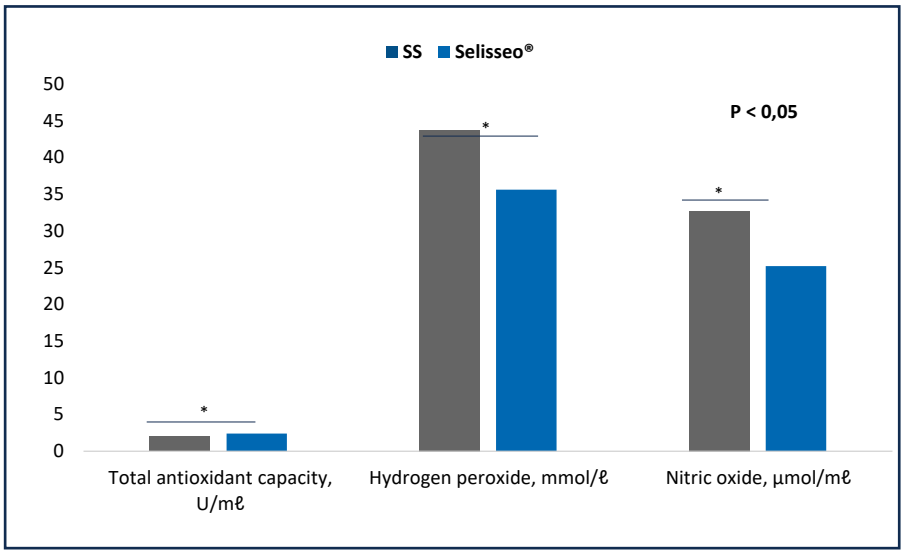
Under cyclic heat stress, the OH-SeMet-fed group showed a significant improvement in feed conversion ratio compared to the SS-fed group (1,56 vs 1,62, respectively), as shown in *Figure 1*. Mortality in the finisher period, which increased substantially under cyclic heat stress, was -4,2 points lower for the OH-SeMet-fed birds than the birds fed SS. Moreover, the Se levels in plasma were significantly higher in the OH-SeMet group than in the SS group, thus confirming the higher bioavailability of the organic form. Broilers fed OH-SeMet exhibited lower plasma heat shock protein 70 (HSP70) levels, indicating reduced cell oxidative damage.

Heat-stressed dairy cows

A recent study at the Chinese Academy of Agricultural Sciences compared the effects of OH-SeMet and SS in dairy cows. Eight cows were fed diets either containing SS or OH-SeMet at 0,3ppm. The animals were subjected to heat stress for nine days (32 to 36°C and 40% relative humidity).

The obtained results confirmed the higher bio-efficacy of OH-SeMet than SS, showing significant positive modulation of several oxidative stress biomarkers, including improved total antioxidant capacity and decreased plasma hydrogen peroxide (H_2O_2) levels (*Figure 2*). Additionally, milk production remained higher in the OH-SeMet-fed cows. These findings further demonstrate that OH-SeMet helps animals cope with heat stress and maintain their performance.

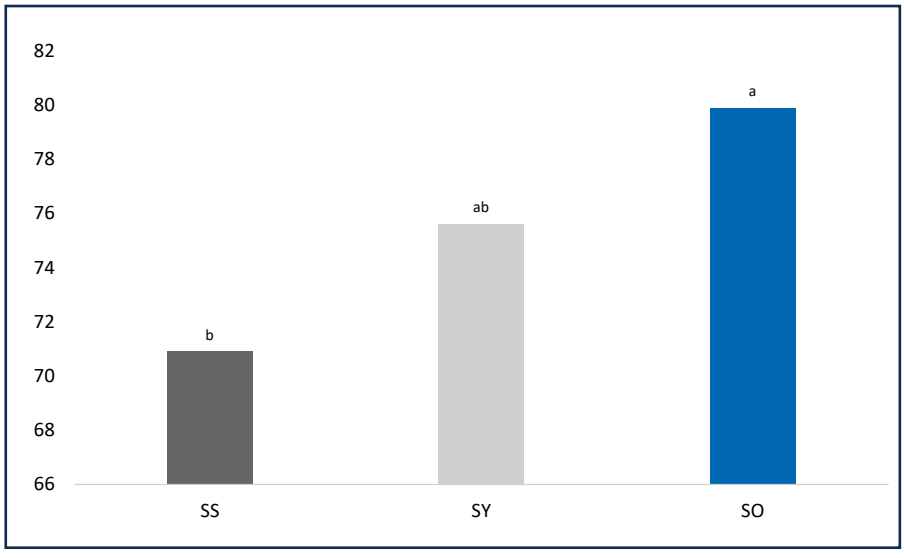
Figure 2: Effect of Se source T-AOC and oxidative stress biomarkers in dairy cows under heat stress.



Heat-stressed laying hens

In collaboration with Ankara University, Türkiye, a trial was performed to assess the effect of different sources of Se (SS, selenised yeast [SY], OH-SeMet) on the antioxidant status and performance of ageing laying hens (Lohmann Brown Classic, 63 weeks of age) raised under heat stress (average 33°C and 74% relative humidity). OH-SeMet supplementation supported egg production, improving +9% ($p = 0,05$) and +4,5% laying rate compared to SS and SY (*Figure 3*). These results can be explained by positive modulation of the antioxidant system, as reflected by lower blood and liver malondialdehyde (MDA) levels ($p < 0,05$). It was also observed that OH-SeMet positively affected the incidence of cracked, broken and dirty eggs.

Figure 3: Effect of Se sources on egg production of laying hens from 63 to 90 weeks of age.



The Se insurance policy

Maintaining the antioxidant balance by ensuring adequate production of selenoproteins is crucial for animal performance under heat stress. Feeding animals with a pure form of organic Se, such as OH-SeMet, enhances Se deposition in the tissues, thus creating Se tissue reserves that act as a 'Se insurance policy'. This policy enables animals to produce sufficient antioxidant enzymes during heat stress, even when feed intake is reduced. The organic Se effectively supports growth and productive performance with reduced mortality rates in broilers, even under challenging conditions.❖

For more information, send an email to Marthie Nickols at Marthien@vitam.co.za.

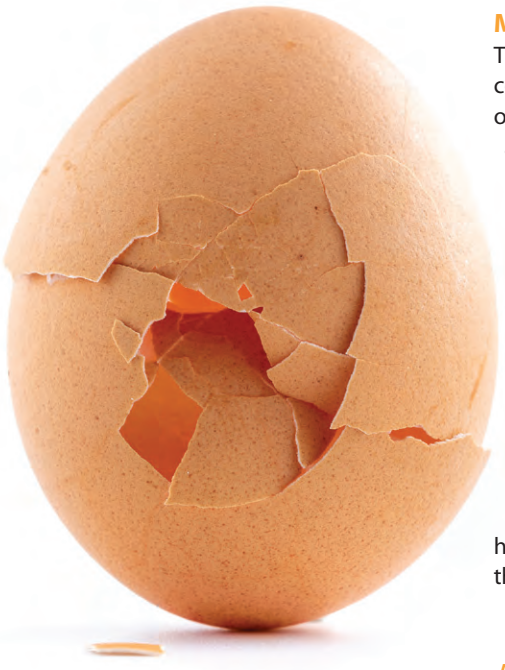
Improving eggshell and egg quality with probiotics

By Dr Charles Gilfillan, technical manager health, Kemin sub-Saharan Africa

For breeder birds the egg is the perfect package for protecting the developing embryo, and providing the perfect environment and nutrients for the developing embryo. The eggshell protects the developing embryo from mechanical damage, regulates gas exchange between the developing embryo and the environment, protects the embryo from contamination with bacteria and other pathogens, and provides nutrients in the form of calcium for the embryo.

In commercial layers the eggshell protects an important human food item, the yolk and egg white, from mechanical damage and contamination, ensuring that a healthy and nutritious food reaches the consumer. Maintaining eggshell quality is thus important for producers of breeder and commercial layer birds.

It is estimated that between 6 and 10% of eggs produced worldwide are lost due to eggshell damage, leading to significant economic loss for the egg industry. An important factor affecting eggshell quality is the age of the hens. The size of the egg produced increases as the hen ages. The increase in size is, however, not accompanied by an increase in the amount of calcium carbonate deposited in the shell. This results in the thinning of eggshells, increasing the risk of eggshell damage as hens age. The decrease in eggshell quality as breeder hens age can also negatively affect the hatchability of their eggs.



Intestinal calcium absorption has been shown to decrease as the hens age, resulting in the decrease in eggshell quality. Research in improving eggshell quality has concentrated on improving calcium metabolism. Intestinal calcium availability at the time of eggshell development has been identified as more crucial for eggshell development and eggshell quality than the quantity of calcium retained by the bird. Improving calcium absorption from the intestine is thus more effective at improving eggshell quality than increasing the calcium levels in the feed.

Increasing calcium levels in the feed has, in contrast, been shown to be detrimental to the hen as increasing the calcium level in the feed negatively affects the absorption of the other minerals and trace elements that are important for bone matrix development.

Microbiota and calcium metabolism

The intestinal microflora is a complex community of hundreds of diverse micro-organisms. The intestinal microflora plays an important role in the maintenance of intestinal health by assisting in the maintenance of intestinal integrity/barrier, modulation of intestinal immunity, nutrient digestion, and intestinal function. A breakdown in intestinal integrity will facilitate the intestinal growth of pathogenic bacteria and the translocation of pathogenic bacteria across the intestine, resulting in systemic inflammation and septicaemia.

The intestinal microflora changes as the hens age. This can have a negative effect on the intestinal mucosa and intestinal barrier, increasing the risk of intestinal overgrowth of bacteria and intestinal inflammation. These changes will negatively affect intestinal function including calcium metabolism and absorption, thus negatively affecting eggshell quality.

Probiotics and eggshell quality

Probiotics are live bacteria that, when fed to animals and birds in sufficient quantities, can have health benefits for the host. Probiotics influence the health of the intestine via several mechanisms, including modulating the host immune system and stimulating the production of short-chain fatty acids that supply energy for improved intestinal integrity and barrier function. Certain probiotics produce antimicrobial metabolites that inhibit intestinal pathogens, thus reducing the intestinal colonisation of pathogenic bacteria. The addition of the probiotic *Bacillus subtilis PB6* to the diet of layer birds has been shown to improve intestinal integrity, intestinal health, and intestinal absorption of nutrients including calcium.

The supplementation of the feed for commercial with the probiotic *Bacillus subtilis PB6* has been shown to significantly improve egg production in laying hens from 64 to 73 weeks of age (70 vs 74% [p=0,001]). The significant improvement in egg production was accompanied by a significant increase in eggshell thickness (0,33 vs 0,36mm [p=0,041]) and weight resulting in a significant reduction in cracked eggs and thus significantly reducing the production of unmarketable eggs (8,4 vs 3,5% [p<0,001]).

The improvement in eggshell quality did not affect bone mineralisation in these hens. In contrast, the tibias of the hens fed the probiotic *Bacillus subtilis PB6* showed a significant increase in density (1,18g/cm^3 vs 1,25g/cm^3 [p=0,006]) showing improved bone calcification in these hens. This indicates improved intestinal absorption of calcium from the hens' feed in response to *Bacillus subtilis PB6* supplementation.

A similar improvement in eggshell thickness (0,35 vs 0,36mm [p=0,007]) and eggshell strength (45,12 N vs 47,63 N [p=0,025]), accompanied by significant improvement in yolk colour (7,83 points vs 9,01 points (p=0,001)) and Haugh units (70,45 vs 72,95 [p=0,043]) was seen in eggs from laying hens between 18 to 42 weeks of age that were fed diets supplemented with *Bacillus subtills PB6*.

Supplementing the diet of laying hens from 25 to 37 weeks of age with a multi-strain probiotic containing *Bacillus subtilis PB6*, *Bacillus subtilis FXA* and *Bacillus licheniformis G3* also resulted in significant improvement in egg-breaking strength (4,25 vs 4,75kg [p=<0,05]), shell colour (26,07 vs 28,83% [p<0,05]), eggshell thickness (0,32 vs 0,37mm [p<0,05]), albumin height (8,1 vs 8,62mm [p<0,05]) and Haugh units (95,73 vs 99,08 [p<0,05]).

These improvements in eggshell quality were also associated with significant improvements in tibia density (1,37g/cm^3 vs 1,59g/cm^3 [p < 0,05]) indicating improvement in intestinal calcium absorption. Thus, probiotics cannot only be used to maintain the profitable production of marketable eggs by older hens over 64 weeks of age, but can also improve the quality of the eggs produced by younger hens (18 to 42 weeks).

Diets for breeder hens

The improvement in egg quality seen in commercial layer birds fed *Bacillus subtilis PB6* probiotics will also be of benefit in breeder hens. The eggshell protects the developing embryo, thus improvement in eggshell quality seen with the supplementation of probiotics should also improve the hatchability of eggs from breeders, especially in breeders over 57 weeks of age.

The addition of *Bacillus subtilis PB6* to the diet of broiler breeder hens (Ross 308) significantly increased eggshell thickness (0,33 vs 0,39mm at 61 weeks [p<0,05]) and egg quality, resulting in a significant increase in the hatchability of the eggs (70,45 vs 73,8% at 59 weeks [p<0,05]) and thus the production of day old chicks in 57 to 63 weeks old broiler breeder hens.

A similar significant improvement was seen in eggshell thickness (0,347 vs 0,367mm [p=<0,05]) and eggshell strength (25,1 N vs 25,2 N [p<0,05]) in eggs produced by layer breeder hens from 55 to 70 weeks of age fed diets supplemented with *Bacillus subtilis PB6*. The production of dirty eggs was also lowered by 3% in the layer breeder hens fed *Bacillus subtilis PB6* compared to the non-supplemented group of hens.

This illustrates the benefit of using probiotics in layer birds, both commercial layers and breeders, to improve eggshell and egg quality. This improvement seen in eggshell and egg quality will significantly lower the production of unmarketable eggs, especially in older hens, which will be of significant economic benefit to the layer industry. The improvement in the quality of eggs laid by poultry breeders supplemented with probiotics, resulting in increased hatchability and production of day-old chicks, will also be of economic benefit to the poultry breeder industry, both in broiler and layer breeder producers.

References are available on request. For more information, contact Dr Charles Gilfillan on 072 859 9537 or email charles.gilfillan@kemin.com.

2024 AFMA Golf Day:
More than just a round of golf

By Deidré Louw, Plaas Media

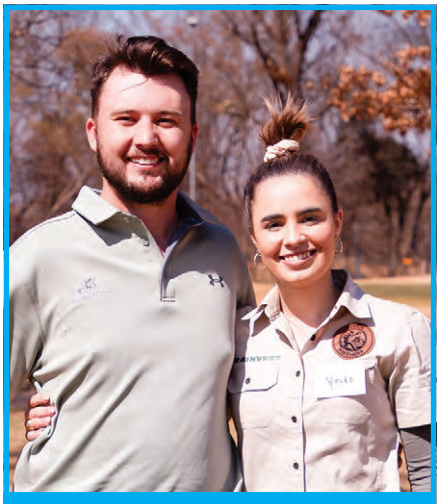
The annual Animal Feed Manufacturers Association (AFMA) Golf Day was yet again a great success. The event, held on 7 August this year at the Centurion Golf Club, saw various industry role-players come together to support AFMA, network, and simply enjoy each other's company.

After a great and enjoyable day in the field, top honours went to:

- **First place:** The Free State Oil team of Johan Scholtz, Sas Kasselman, Philip Labuschagne, and CJ de Villiers.
- **Second place:** Zac Jansen, JP Thudichum, Ryan Hoskings, and Brahm Burger representing Bester Feed & Grain.
- **Third place:** The second Free State Oil team consisting of Mario van den Heever, Viljoen Jordaan, Bradley Jackson, and Jandré Potgieter.

A word of thanks to this year's amazing sponsors which included: 4Mix International, Adisseo, AFGRI Animal Feeds, Agri SA Commodities, Allied Nutrition, Automill, Bester Feed & Grain, BiTek Industries, Brisen Commodities, Bühler, Cargill, Chemuniqué, De Heus, Eagles Rock Animal Feeds, Epol, Evonik, Farmwise Grains, Free State Oil, Huvepharma, Idwala Lime, Kemin Industries, Manuchar, Nutri Feeds, Nutroteq, R-Biopharm, SA Lime & Gypsum, SOILL, Super Agri Science, Trouw Nutrition, and Vitam International.❖

Stephanie Holmes and Leandrie van Niekerk of Nutroteq.



Grainvest's Rian Olckers and Yocke Vermaak.

The Chemuniqué team, from the left, was Natasha Snyman, Louma Mostert, Stenelle van Marle, and Robyn Joubert.

André Kilian and Iwan Smit of Epol.

Samantha Smith-Williams, Beverly Thompson, Mikyla Prinsloo, and Lamaurize Visagie of SOILL.

Evonik's Zenani Shozi, Felicia Dube, Theresa Struwig, and Dr Alain Useni.

Jané Liebenberg and Nicol le Roux of Cargill.

The Eagles Rock Animal Feeds team: Rudolf van Niekerk, Lizelle Gee, and Luc Schimper.

Alec Audie and Ricky Rathjen of Bühler.

Trouw Nutrition's team, from the left, Martmarie Brand, Chris Cilliers, Theunis de Bruyn, Louhandri Breitenbach, Tatenda Guta, and Shaé De Kock.

Keigan Martins, Jannas van Heerden, and Enrico Knoetze of Farmwise Grains.

Huvepharma's Megan Hilton and Kaitlyn Croukamp.

Theuns Stoffberg and Bruce Weir of BiTEK Industries.

Courtney Macphail and Ashley Southern of 4Mix International.

For more information on next year's golf day, email Bee Oelofsen at events@afma.co.za.

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