EW Nutrition acquires BIOSTABIL product line from dsm-firmenich

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

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

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

The financial details of the sale remain confidential.

Organic acids can play a crucial

role in zinc oxide replacement

Dr. Inge Heinzl, Editor EW Nutrition &
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The use of high levels of Zinc Oxide (ZnO) in the EU before 2022 was one of the most common methods to prevent postweaning diarrhea (PWD) in pig production. Pharmacologically high levels of ZnO (2000-3000 ppm) increase growth and reduce the incidence of enteric bacterial diseases such as post-weaning diarrhea (PWD)(Carlson et al., 1999; Hill et al., 2000; Hill et al., 2001; Poulsen & Larsen, 1995; De Mille et al., 2019).

However, ZnO showed adverse effects, such as the accumulation of heavy metal in the environment, the risk for antimicrobial resistance (AMR), and problems of mineral toxicity and adverse growth effects when feeding it longer than 28 days (Jensen et al., 2018; Cavaco et al., 2011; Vahjen, 2015; Romeo et al., 2014; Burrough et al., 2019). To replace ZnO in pig production, let us first look at its positive effects to know what we must compensate for.

ZnO has a multifactorial mode of action

ZnO shows several beneficial characteristics that positively influence gut health, the immune system, digestion, and, therefore, also overall health and growth performance.

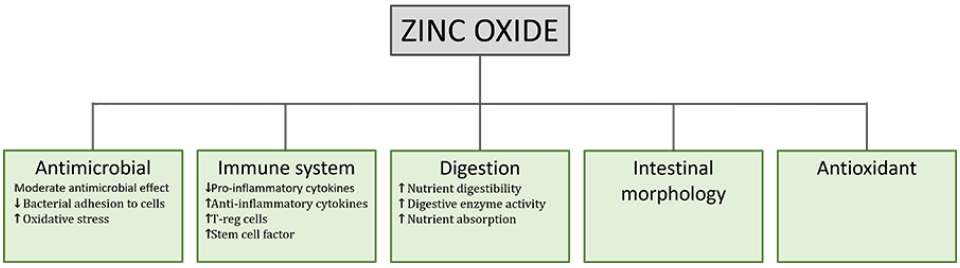

Figure 1. Beneficial effects and ZnO mode of action in postweaning piglets

1. ZnO acts as an antimicrobial

Concerning the antimicrobial effects of ZnO, different possible modes of action are discussed:

- ZnO in high dosages generates reactive oxygen species (ROS) that can damage the bacterial cell walls (Pasquet et al., 2014)
- The death of the bacterial cell due to direct contact of the metallic Zn to the cell (Shearier et al., 2016)
- Intrinsic antimicrobial properties of the ZnO^{2+} ions after dissociation. The uptake of zinc into cells is regulated by homeostasis. A concentration of the ZnO^{2+} ions higher than the optimal level of 10^{-7} to 10^{-5} M (depending on the microbial strain) allows the invasion of Zn^{2+} ions into the cell, and the zinc starts to be cytotoxic (Sugarman, 1983; Borovanský et al., 1989).

ZnO shows activity against, e.g., *Staphylococcus aureus, Pseudomonas aeruginosa, E. coli, Streptococcus pyogenes*, and other enterobacteria *(*Ann et al., 2014; Vahjen et al., 2016). However, Roselli et al. (2003) did not see a viability-decreasing effect of ZnO on ETEC.

2. ZnO modulates the immune system

Besides fighting pathogenic organisms as described in the previous chapter and supporting the immune system, ZnO is an essential trace element and has a vital role in the immune system. ZnO improves the innate immune response, increasing phagocytosis and oxidative bursts from macrophages and neutrophils. It also ameliorates the adaptative immune response by increasing the number of T lymphocytes (T cells) in general and regulatory T lymphocytes (T-regs) in particular. These cells control the immune response and inflammation (Kloubert et al., 2018). Macrophage capacity for phagocytosis (Ercan and Bor, 1991) and to kill parasites (Wirth et al., 1989), and also the killing activity of natural killer cells depends on Zn (Rolles et al., 2018). By reducing bacterial adhesion and blocking bacterial invasion, ZnO disburdens the immune system (Roselli et al., 2003).

ZnO reduces the expression of several proinflammatory cytokines induced by ETEC (Roselli et al., 2003). Several studies have also shown a modulation effect on intestinal inflammation, decreasing levels of IFN-γ, TNF-α, IL-1ß and IL-6, all pro-inflammatory, in piglets supplemented with ZnO (Zhu et al., 2017; Grilli et al., 2015).

3. ZnO improves digestion and promotes growth

Besides protecting young piglets against diarrhea, the goal is to make them grow optimally. For this target, an efficient digestion and a high absorption of nutrients is essential. Stimulating diverse pancreatic enzymes such as amylase, carboxypeptidase A, trypsin, chymotrypsin, and lipase increases digestibility (Hedemann et al., 2006; Pieper et al., 2015). However, Pieper et al. (2015) also showed that a long-term supply of very high dietary zinc triggers oxidative stress in the pancreas of piglets.

By stimulating the secretion of ghrelin at the stomach level and thereby promoting the release of insulin-like growth factor (IGF-1) and cholecystokinin (CCK), ZnO enhances muscle protein synthesis, cell

proliferation, and feed intake (Yin et al., 2009; MacDonald et al., 2000)).

The result of improved digestion is increased body weight and average daily gain, which can be seen, e.g., in a study by Zhu et al. (2017).

4. ZnO protects the intestinal morphology

ZnO prevents the decrease of the trans-endothelial electrical resistance (TEER), usually occurring in the case of inflammation, by downregulating TNF-α and IFN-γ. TNF-α, as well as IFN-γ, increase the permeability of the epithelial tight junctions and, therefore, the intestinal barrier (Al-Sadi et al., 2009).

The enterotrophic and anti-apoptotic effect of ZnO is reflected by a higher number of proliferating and PCNA-positive cells and an increased mucosa surface in the ileum (higher villi, higher villi/crypt ratio)(Grilli et al., 2015). Zhu et al. (2017) also saw an increase in villus height in the duodenum and ileum and a decrease in crypt depth in the duodenum due to the application of 3000 mg of ZnO/kg. Additionally, they could notice a significant ($P<0.05$) upregulation of the mRNA expression of the zonula occludens-1 and occluding in the mucosa of the jejunum of weaned piglets.

In a trial conducted by Roselli et al. (2003), the supplementation of 0.2 mmol/L ZnO prevented the disruption of the membrane integrity when human Caco-2 enterocytes were challenged with ETEC.

5. ZnO acts antioxidant

The antioxidant effect of ZnO was shown in a study conducted by Zhu et al., 2017. They could demonstrate that the concentration of malondialdehyde (MDA), a marker for lipid peroxidation, decreased on day 14 or 28, and the total concentration of superoxide dismutase (SOD), comprising enzymes that transform harmful superoxide anions into hydrogen peroxide, increased on day 14 ($P<0.05$). Additionally, Zn is an essential ion for the catalytic action of these enzymes.

Which positive effects of ZnO can be covered by organic acids (OAs)?

1. OAs act antimicrobial

OAs, on the one hand, lower the pH in the gastrointestinal tract. Some pathogenic bacteria are susceptible to low pH. At a $pH<5$, the proliferation of, e.g., Salmonella, E. coli, and Clostridium is minimized. The good thing is that some beneficial bacteria, such as lactobacilli or bifidobacteria, survive as they are acid-tolerant. The lactobacilli, on their side, can produce hydrogen peroxide, which inhibits, e.g., Staphylococcus aureus or Pseudomonas spp. (Juven and Pierson, 1996).

Besides this more indirect mode of action, a more direct one is also possible: Owing to their lipophilic character, the undissociated form of OAs can pass the bacterial membrane (Partanen and Mroz, 1999). The lower the external pH, the more undissociated acid is available for invading the microbial cells. Inside the cell, the pH is higher than outside, and the OA dissociates. The release of hydrogen ions leads to a decrease in the internal pH of the cell and to a depressed cell metabolism. To get back to “normal conditions”, the cell expels protons. However, this is an energy-consuming process; longer exposure to OAs leads to cell death. The anion remaining in the cell, when removing the protons, disturbs the cell’s metabolic processes and participates in killing the bacterium.

These theoretical effects could be shown in a practical trial by Ahmed et al. (2014). He fed citric acid (0.5 %) and a blend of acidifiers composed of formic, propionic, lactic, and phosphoric acid + SiO_2 (0.4 %) and saw a reduction in fecal counts of Salmonella and E. coli for both groups.

2. OAs modulate the immune system

The immune system is essential in the pig's life, especially around weaning. Organic acids have been shown to support or stimulate the immune system. Citric acid (0.5%), as well as the blend of acidifiers mentioned before (Ahmed et al., 2014), significantly increased the level of serum IgG. IgG is part of the humoral immune system. They mark foreign substances to be eliminated by other defense systems.

Ren et al. (2019) could demonstrate a decrease in plasma tumor necrosis factor-α that regulates the activity of diverse immune cells. He also found lower interferon-γ and interleukin (Il)-1ß values in the OA group than in the control group after the challenge with ETEC. This trial shows that inflammatory response can be mitigated through the addition of organic acids.

3. OAs improve digestion and promote growth

In piglets, the acidity in the stomach is responsible for the activation and stimulation of certain enzymes. Additionally, it keeps the feed in the stomach for a longer time. Both effects lead to better digestion of the feed.

In the stomach, the conversion of pepsinogen to pepsin, which is responsible for protein digestion, is catalyzed under acid conditions (Sanny et al., 1975)group. Pepsin works optimally at two pH levels: pH 2 and pH 3.5 (Taylor, 1959). With increasing pH, the activity decreases; at pH 6, it stops. Therefore, a high pH can lead to poor digestion and undigested protein arriving in the intestine.

These final products of pepsin protein digestion are needed in the lower parts of the GIT to stimulate the secretion of pancreatic proteolytic enzymes. If they do not arrive, the enzymes are not activated, and the inadequate protein digestion continues. Additionally, gastric acid is the primary stimulant for bicarbonate secretion in the pancreas, neutralizing gastric acid and providing an optimal pH environment for the digestive enzymes working in the duodenum.

As already mentioned, the pH in the stomach influences the transport of digesta. The amount of digesta being transferred from the stomach to the small intestine is related to the acidity of the chyme leaving the stomach and arriving in the small intestine. Emptying of the stomach can only take place when the duodenal chyme can be neutralized by pancreatic or other secretions (Pohl et al., 2008); so, acid-sensitive receptors provide feedback regulation and a higher pH in the stomach leads to a faster transport of the digesta and a worse feed digestion.

4. OAs protect the intestinal morphology

Maintaining an intact gut mucosa with a high surface area is crucial for optimal nutrient absorption. Research suggests organic acids play a significant role in improving mucosal health:

Butyric acid promotes epithelial cell proliferation, as demonstrated in an *in vitro* pig hindgut mucosa study (Sakata et al., 1995). Fumaric acid, serving as an energy source, may locally enhance small intestinal mucosal growth, aiding in post-weaning epithelial cells' recovery and increasing absorptive surface and digestive capacity (Blank et al., 1999). Sodium butyrate supplementation at low doses influences gastric morphology and function, thickening the stomach mucosa and enhancing mucosal maturation and differentiation (Mazzoni et al., 2008).

Studies show that organic acids affect gut morphology, with a mixture of short-chain and mid-chain fatty acids leading to longer villi (Ferrara et al., 2016) and Na-butyrate supplementation increasing crypt depth and villi length in the distal jejunum and ileum (Kotunia et al., 2004). However, the villi length and mucosa thickness in the duodenum were reduced. Dietary sodium butyrate has been linked to increased microvilli length and cecal crypt depth in pigs (Gálfi and Bokori, 1990).

5. OAs show antioxidant activity

The last characteristic, the antioxidant effect, cannot be provided at the same level as with ZnO; however, Zhang et al. (2019) attest to OAs a certain antioxidant activity. Oxalic, citric, acetic, malic, and succinic acids, which were extracted from Camellia oleifera, also showed good antioxidant activity in a trial conducted by Zhang et al. (2020).

Organic acids are an excellent tool to compensate for the ban on ZnO

The article shows that organic acids have similar positive effects as zinc oxide. They act antimicrobial, modulate the immune system, maintain the gut morphology, fight pathogenic microbes, and also act – slightly – antioxidant. Additionally, they have a significant advantage: they are not harmful to the environment. Organic acids used in the proper pH range and combination are good tools for replacing zinc oxide.

References on request

INFOGRAPHIC – Target measurements for water quality

Water is a main nutrient and carrier for vaccines, medicine – including antibiotics, but also for pathogens

Chemistry

pH and pKa

Acidity and dissociation index
Target: pH 3,5-3,8 Important for acids application (E.g. organic acids, etc), and ORP

Hardness

Content of Ca, sometimes plus Mg
Target: better TDS Important for acid binding capacity (ABC, buffer capacity)

Oxidation Reduction Potential (ORP)

Target: 650 mV>700 mV » reduces water intake Important for biocides application (E.g. chlorination)

Total Dissolved Solids (TDS)

Sum of dissolved salts, minerals, metals, carbonates, organics Target: 2000 ppm>3000 ppm » laxation Important for buffer capacity and ORP

Microbiology

Yeast

Target: < 5000 cfu/gr

Enterobacterias

Target: < 100 cfu/gr

Moulds

Target: < 100 cfu/gr

Optimizing DOC quality, part 1: The breeder perspective

Conference report

In the Poultry Academy held by EW Nutrition in the fall of last year, **Judy Robberts**, Technical Service Manager, Aviagen, explained that the success of a breeder flock depends on producing good quality hatching eggs with high hatchability and delivering first quality chicks. With this in mind, we have to ask two essential questions: What impact does the breeder farm have on chick quality? And What are the most overlooked areas for breeders?

Nest box hygiene

Nest box hygiene is key to good quality hatching eggs. Shortly after egg deposition, the eggshell is moist, and the cuticle is not yet an effective protection. In addition, during this period the egg is cooling down from the hen's body temperature (41°C) to house temperature. Due to this process of cooling down, the content of the egg contracts and a vacuum is created in the egg. In compensation, air enters and forms the air cell. Together with this air, bacteria can easily penetrate the egg. For this reason, it is very important that only hatching eggs are used which have been laid in a clean nest.

Maintaining a hygienic nest environment with routine cleaning of the nest mat or frequently replacing the bedding material will reduce the risk of bacterial contamination.

Clean nests and nesting equipment are essential to avoiding contamination.

Egg collection and pick-up schedule

Collect nest eggs a minimum of 4 times a day, more frequently in hot weather, as eggs cannot cool down sufficiently in the house to interrupt embryonic development. Adjust the exact timing so that no more than 30% (any more will increase the incidence of cracked eggs) of the eggs fall in any one collection. When determining collection times, it is important to remember:

- The majority of eggs will be laid in the morning, and collection intervals should be managed accordingly.
- Eggs left in the nest or on belts longer than recommended will have an increased incidence of being cracked or soiled.
- Transition points on belts need to be smooth so eggs don't pile up and bump into each other.
- Never leave eggs overnight in the nests or belts.
- Eggs left in conventional nests are subject to toe pecks or soiling from other hens.
- Floor eggs (eggs that were laid outside of the breeder flock's next boxes) should be collected more often than nest eggs.

It is not advisable to collect eggs in cardboard egg trays/flats, as the fiber material absorbs egg heat, and it takes longer for them to cool down. Because the fiber trays are porous, they can also harbor unwanted organisms/bacteria/fungi and attract vermin.

Ideally hatching eggs should weigh a minimum of 50 g from a flock at least 22 weeks of age. Smaller eggs from younger flocks may be used, however, chick size and early livability will not be optimum. Remember that a chick will yield approximately 68% of the egg size. Therefore, a small egg will produce a small chick.

Egg cleanliness

Always wash hands after collecting floor eggs and before each collection of nest eggs. Floor eggs should not be placed in the nest box – even if they appear clean. Washing floor and dirty eggs removes the eggs protective coating. Always remember, a washed egg is still a dirty egg, but a clean egg is one that was never dirty.

Eggs should be treated with chemical-based antimicrobials, as scraping, rubbing, or washing the eggshell will damage the cuticle and remove the physical and antimicrobial barrier. Since the eggshell permeability increases after 24 hours and makes the eggs more susceptible to bacterial invasion, eggs should be sanitized as soon as possible. The most popular method is fogging as it is safe, the fog reaches all the eggs and the eggs do not get wet.

Floor eggs are not hatching eggs

The hatchery cannot fix mistakes from the breeder farm. Therefore, it is NOT recommended to set floor eggs – eggs that were laid outside of the breeder flock's next boxes. Floor eggs have a higher bacterial load than nest eggs and consequently lower hatchability. They are also potential 'bangers, or exploders' and can cross-contaminate other eggs, especially in the same incubator.

Selection of floor eggs must be done at the farm, so that a dirty egg never enters the hatchery. Where strictly necessary, set floor or dirty eggs only if the disadvantages of setting these eggs are fully understood and accepted by the hatchery. If floor eggs are used for hatching, they should be clearly marked and stored separately from the nest eggs so that the hatchery can manage the contamination risk appropriately.

Floor eggs have a significantly higher risk of microbial contamination that will reduce hatch and chick quality.

Egg hygiene – bacterial contamination

Egg condition	Total Bacteria (cm^2)
Newly laid	300
Cooled clean egg	3,000
"Clean" floor egg	30,000
Dirty egg	300,000

Monitor the number of floor eggs and adjust management practices to minimize them. Floor eggs are a problem that should be tackled at the breeder level, with good breeder management and suitable housing equipment. If levels of floor eggs exceed 2-3% across the life of the flock, there is a problem. Floor eggs will be much higher at the start of production, but by peak production should be down to 1-2%.

Cracked eggs

Eggs with cracks are more likely to become infected and have low hatchability and poor chick quality.

Influence of eggshell crack types on hatchability and chick quality

Treatment	Egg weight at transfer (g)	Weight loss (%)	Fertility (%)	Hatchability (%)	Chick weight (g)	Chick uniformity (%)
Normal	62.0[a]	11.4[c]	97.8[a]	83.9[a]	48.9[a]	82.6
Star cracks	55.6[b]	20.7[b]	89.4[b]	49.4[b]	48.2[a]	70.3
Hairline cracks	53.1[c]	24.0[a]	83.3[c]	30.0[c]	45.6[b]	70.2

Khabisi *et al*., 2011 [a-c] Means within a column without a common superscript differ significantly ($p \leq 0.05$)

Do not set cracked eggs. Record the number of eggs with cracks, and if the frequency is unsatisfactory, investigate and eliminate possible causes.

On-farm egg storage rooms

Don’t forget that storage starts from the time of laying, not the time of receival at the hatchery.

Eggs need to be cooled below 24°C (threshold temperature or physiological zero) as soon as possible to stop cellular growth of the embryo, until the egg is set at the hatchery. This minimizes embryo mortality, maximizes hatchability and helps to ensure chick quality. Eggs should be stored within 4 hours after collection.

On breeder farms, eggs are usually stored until being transported to the hatchery. The storage duration depends on the egg room capacity, supply of hatching eggs, hatchery capacity, and demand for day-old chicks. Don’t forget that storage starts from the time of laying, not the time of receival at the hatchery.

If the farm has an environmentally controlled egg storage room, eggs can be collected by the hatchery at least twice a week. If the farm has no dedicated egg storage room, eggs must be transported to the hatchery daily. Uncontrolled fluctuations in egg storage temperatures will cause stop-start growth of the germinal disc, which will reduce hatchability.

The temperature of the farm egg storage room should higher than the egg transport truck and the egg transport truck temperature should be higher than the hatchery egg storage room. This consistent decrease in temperature is to prevent condensation (also referred to as sweating) on the eggs. Condensation on the eggshell impairs the natural mechanisms of defense and provide an ideal environment for bacteria grow, penetrate the shell, and contaminate the egg. Condensation on eggs is more common in hot and humid climates common throughout Asia.

Egg storage rooms are important, yet they are frequently overlooked. Areas to consider include:

- Consistent temperature 24/7 (insulation will minimize variation),
- Temperature alarm system – set for a maximum temperature of 21°C and a minimum of 16-18 °C,
- Temperature and humidity sensor placement – don’t place in a direct line of temperature or

humidity sources as this will lead to false readings,
- Do not place sensors against walls,
- Sensor accuracy (loggers are recommended),
- Fans to evenly distribute air,
- Do not place eggs directly against the wall or on the floor in the storage room to maximize air circulation and to ensure uniform conditions, and
- Avoid direct air flow onto eggs from fans, room coolers and/or humidifiers, as this can increase moisture loss and cause temperature variation throughout the room.

The farm is the starting point to ensure chick quality. Attention to detail and hygiene throughout the whole process is critical. Through monitoring and auditing, areas with deficiencies can be identified and corrected to continue producing high quality hatching eggs.

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Egg storage rooms are important, yet they are frequently overlooked. Areas to consider include:

- Consistent temperature 24/7 (insulation will minimize variation),
- Temperature alarm system – set for a maximum temperature of 21°C and a minimum of 16-18 °C,
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The farm is the starting point to ensure chick quality. Attention to detail and hygiene throughout the whole process is critical. Through monitoring and auditing, areas with deficiencies can be identified and corrected to continue producing high quality hatching eggs.

Optimizing DOC quality, part 2: The hatchery perspective

Conference report

At EW Nutrition's Poultry Academy in the fall of last year, **Judy Robberts**, Technical Service Manager, Aviagen discussed the impact of the hatchery on chick quality. The transportation and storage of hatching eggs, preventative maintenance, and day-old chick transport all play an essential role. If mismanaged, these areas can negate the benefits of money spent and improvements made at the breeder farm or even in the hatchery itself.

Egg transport from breeder farm to hatchery

The transportation of hatching eggs from the breeder farm to the hatchery is critical: clean and disinfect the truck prior to use, to prevent pathogen spread, and only use a truck that is dedicated to transport hatching eggs. Always transport eggs small end down to avoid loose air cells.

The temperature of the farm egg storage room should higher than the egg transport truck. This decrease

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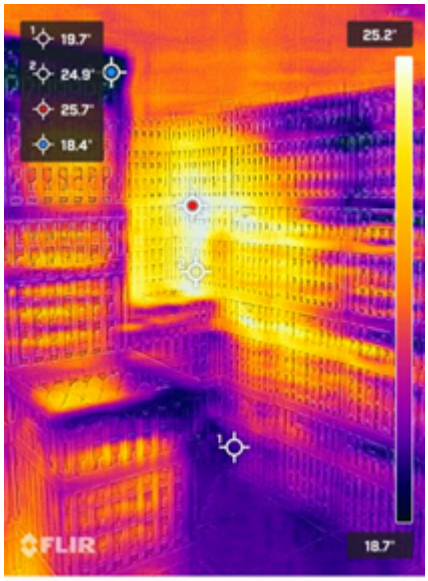
Avoid sudden temperature changes. Use temperature loggers during transport to record any temperature fluctuations. Take internal egg temperatures at different locations within each batch received at the hatchery, to check temperature conditions during transport. The relative humidity of the truck should be set at 65-70%.

Egg storage at the hatchery

Don’t forget that storage starts from the time of laying, not the time of receival at the hatchery. Egg storage rooms are important, yet they are frequently overlooked. Areas to consider include:

- Consistent temperature 24/7 (insulation and fans will minimize variation),
- Avoid condensation,
- Do not place eggs directly against the wall or on the floor in the storage room, to maximize air circulation and to ensure uniform conditions,
- Alarm systems – set for a maximum temperature of 21°C and a minimum of 16-18°C,
- Sensor accuracy (loggers are recommended), and
- Sensor placement – don’t place in a direct line of temperature or humidity sources as this will lead to false readings. Similarly, allow for air circulation, do not place sensors against walls.

Temperature and storage time



“The holding temperature should be based on storage time,” advised Ms Robberts. Eggs which are set within 4 days of lay don’t need to be kept at a temperature below 20°C; in this case 21–22°C is regarded as optimal. This relatively high temperature promotes the thinning of the albumen, which improves the gas exchange during early incubation. On the other hand, it is low enough to maintain the vitality of the embryo. Best hatches result from eggs 3–7 days of age. Storage for longer than 7 days will require cooler temperatures to help reduce the loss of hatch due to embryo cell death and decline in internal egg quality. If the storage period is less than 7 days a storage temperature of 16-18°C is advised and if the storage period is longer, a temperature of 10-12°C is mostly recommended. The eggs of young breeder flocks are

better suited for prolonged storage periods than eggs of older breeder flocks, as albumen quality in eggs of younger breeder flocks is higher.

Differences in temperature will result in the eggs reaching incubation temperature at different times and, therefore, hatching at different times, increasing the hatch window.

Relative humidity

The egg storage room should have a relative humidity of 70-80% to prevent egg dehydration and to maintain internal egg quality. The humidity should be a fine mist, so the eggs do not get wet. Humidifiers should be maintained and cleaned regularly. Dirty humidifiers can be a significant source of bacteria and lead to egg contamination. Follow the same guidelines for trolley placement, spacing, and air circulation in the hatching storage room as the farm egg storage room. Likewise, the same recommendations apply for thermometer monitoring and placement.

Don’t forget the maintenance

Maintenance is often reactive, not preventative – things are only fixed when they break down. This can compromise hatchability and chick quality. A few things to consider when setting up a maintenance plan are:

- Have a dedicated person responsible for maintenance reporting to the hatchery manager,
- Produce a list of all the equipment to be maintained including frequencies,
- Keep records on all performed maintenance,
- Maintenance includes calibration of equipment,
- Keep track of spare parts on hand, and
- Include the building structure and ancillary equipment in the program.

Day-old chick transport

Transport cannot improve the quality of the day-old chick, but it can certainly harm the chick’s welfare, growth, development and performance.

If chicks are transported outside their thermoneutral zone (32-35°C) they will start using up the nutrients from the yolk sac at a much faster rate to maintain their core temperature (40-41°C) . A core temperature above 41°C post-hatch will lead to panting resulting to water loss with the risk of dehydration and below 39.5°C will lead to reduced activity and low feed consumption. Adjust the number of chicks per box if optimal temperature inside the chick boxes cannot be achieved due to limitations in transport equipment.

Optimizing transport conditions for day-old chicks from hatchery to farm for is beneficial for subsequent performance.

Conclusion

The modern hatchery is a major investment, so it just makes sense to pay attention to detail to maintain hatching egg quality and produce high-quality chicks. Factors such as egg storage conditions, play a significant role in achieving maximum hatchability. Through monitoring and auditing, areas with deficiencies can be identified and corrected to continue producing high quality hatching eggs. The transport of day–old chicks from should ensure that the birds arrive at the farm in the same condition in which they left the hatchery.

Getting broilers off to a good start: House preparation

Conference report

At the recent EW Nutrition Poultry Academy, **Judy Robberts**, Technical Service Manager, Aviagen discussed the management of broilers for growth & production efficiency. She noted that the first 7 days is the most critical period in the life of a broiler chicken. “In this period chicks are the most efficient at converting feed to weight, however, its digestive and immune systems are still immature, so you want to get your chicks off to the best possible start,” she said.

“Seven-day weights are a key KPI of the success of brooder management – chicks should weigh at least 4 times their initial body weight. Also, each 1 gram of bodyweight at 7-days of age is equivalent to 10 grams at 35-days.The goal of management during the first week is to ensure that chicks consume enough feed and water because chick weight at 7 days of age is strongly correlated to final body weight at slaughter,” noted Ms. Roberts.

To ensure chicks got off to the best start, her presentation included 6 essential factors for house preparation and brooder set-up for the successful placement of chicks:

Planning

Planning should start well before chicks arrive on farm. The expected delivery date, time and number of chicks should be established with the supplier well in advance of chick placement. It is impossible to do the best possible chick placement if you do not know what you are going to receive, at least several days in advance. For example, the age and vaccination status of the donor flock. This will ensure that the appropriate brooding set-up is in place and that the chicks can be unloaded and placed as quickly as possible.

Chick placements should be planned so that chicks from different aged donor flocks can be brooded separately. Chicks from young donor flocks will achieve target body weights more easily if kept separate until the time of grading at 28 days of age.

Also, is the capacity of the equipment, such as feeders, drinkers, water pressure etc., capable of meeting the needs of the number of chicks to be placed? Do you have necessary supplies, such as chick paper, on hand?

Equipment test

- After cleaning and disinfection is completed, check that all water, feed, heat, ventilation, and lighting equipment is fully functioning and properly, adjusted for the needs of day-old chicks before the chicks arrive. Heaters should be checked and serviced before starting pre-heating.

Litter and pre-heating

Chicks do not have the ability to regulate body temperature for the first 5 days and are not able to fully control their body temperature until about 14 days of age. They quickly become chilled if placed on cold litter, which hinders their search for feed and water. In case of floor rearing, bring in the litter after preheating the floor for at least 24 hours (commencing from when the floor is dry and depending on heater type and capacity, season and building insulation) before chicks arrive to allow the litter to reach 28-30°C. Floor temperature is more important than air temperature because chicks are in contact with litter via bare feet. If the floor is cold, chicks lose body heat to the floor through their feet and through their body when they sit down. Measure temperatures throughout the brooding area with a digital on the litter surface and approximately 2 cm above the litter, as this is where the chicks will be placed.

Litter should be evenly spread, and at least 5cm deep to provide adequate insulation from cold house floors. Air temperature will rise rapidly after the heat is turned on, but it takes much longer to thoroughly warm the mass of litter on the floor. Litter should have good moisture absorption and water holding capacity. Uneven litter can restrict access to feed and water and may lead to a loss in uniformity.

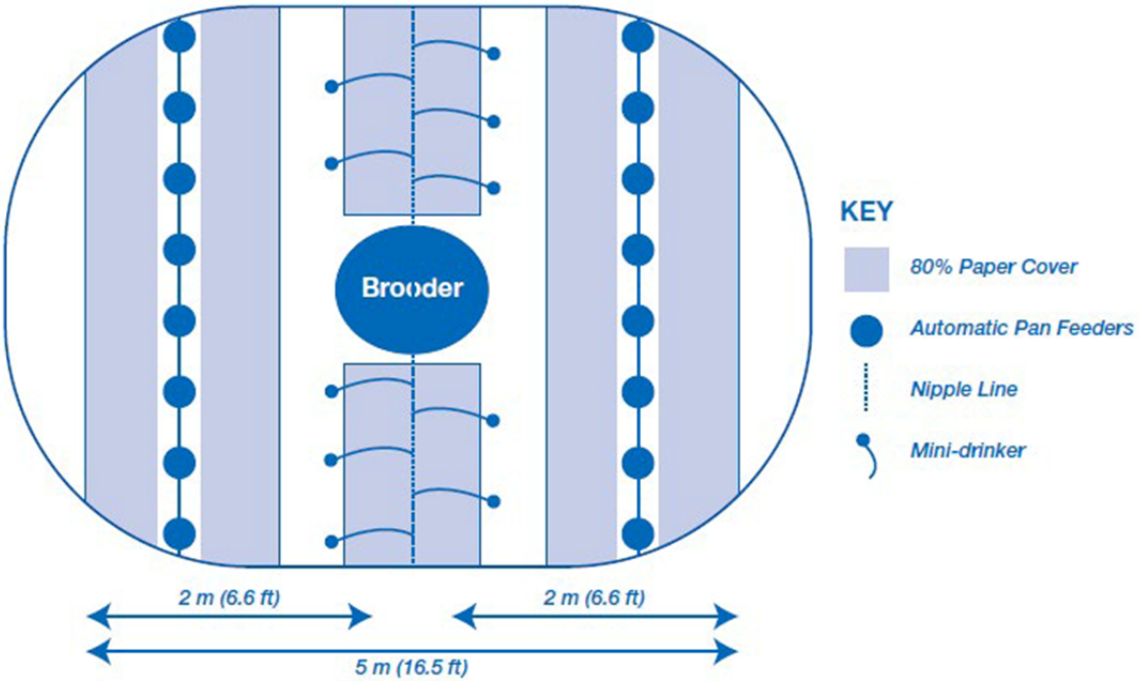
Preheating can ensure that the litter is properly dried prior to placement to reduce bacterial growth and ammonia production.

Brooding area set-up

Allow an initial chick stocking density of 40-50 chicks/m^2, do not give excess of floor space. The size of the brooding area will also be determined by the output of the heat source.

Light intensity should be30-40 lux, uniform and continuous for the first 48 hours to ensure chicks find food and water.

The use of a brooder guard is recommended for the first 5-7 days to confine chicks to near the heat source. The guard should be about 50 cm high. If made of solid material, such as cardboard, it can also protect the chicks from drafts. Brooders should be 2 m away from brooder edge.



Example of spot brooder layout

Temporary guards to confine chicks

Minimum ventilation set-up

Ventilation distributes heat evenly throughout the house and maintains optimum air quality in the brooding area. Minimum ventilation should begin with house preheating 24-48 hours prior to placement to remove waste gases and excess moisture.

Target that 24 hours before chicks arrive to achieve 28-30°C air and floor temperature, and relative

humidity should be 60-70% when chicks enter the house to prevent dehydration. Humidity exceeding 70% limits the amount of evaporation, causing wet litter and excessive litter caking.

Young birds are very susceptible to drafts, so air speed in the brooding area (at chick level) should be less than 0.15m/second.

- Allow enough air exchange with a minimum ventilation rate at placement of 0.09m^3/hour. Use a 5 minute fan cycle (with a thermostat override) – 30-45 seconds on.
- Make sure temperature and humidity sensors are placed correctly. For spot brooding, 2 meters away from the edge of each brooder, and for whole-house brooding at the center and two additional sensors at the end wall of the house. Sensors should not in contact with birds and out of direct lines with heating system.

Feed and water supply

Starter feed should be ordered to ensure delivery 1-2 days before chick placement.

Once the chicks arrive, they need to begin drinking and eating as soon as possible. Poor quality crumble or pellets will result in reduced feed intake and poor performance. Feed distribution should minimize the physical deterioration in crumble and pellets. The amount of fine particles (<1 mm) in sieved crumbles or mini-pellet should be below 10%.

Turn on the mechanical feeding system and ensure all pans or chain feeders are filled. Automatic pan feeders should be buried into the litter, so chicks can easily access them.

Spread a thin layer of starter feed onto chick paper to cover at least 80% of the paper area and fill any feeder trays 1-2 hours prior to chick arrival to prevent feed and water from becoming too hot. At least 20-30% of the total feed offered should be placed on paper. Paper should be positioned alongside the automated feed and drinking systems to aid in the transition from temporary to automated systems. Replenish feed on paper in small amounts given frequently. At placement, chicks should be placed directly onto paper, so that feed is immediately found.

If using paper, the feed area should cover at least 80% of the brooding area (avoid drinkers and feeders)

Papered Feed Area

Never place supplemental feed or water directly under or near brooders. Ensure that supplementary feed never runs empty and always remains fresh.

Water is the most immediate need when chicks arrive at the house because they can easily dehydrate during hatching, processing, and transport to the farm. Chicks must have unlimited access to clean and fresh water (18-21°C). Cold water will chill the chicks.

- Flush drinkers 2-3 times to remove any remaining disinfectant. Remove dust and litter from cups. Adjust drinker line height to bird's eye level. Ensure the placement of supplementary drinkers and feeders allows easy access for chicks and workers.

At placement, lower nipple drinkers to the chick's eye level with sufficient water pressure to produce a droplet of water suspended from the nipple without dripping

Droplet Drinking

Ms. Robberts concluded that “if house preparation is done properly then chicks are ready for a good start.” If there is any delay, it is always better that the chicks waits inside the truck (if its environmentally controlled) rather than getting cold waiting in the house. Chicks cannot become cold or heat stressed!”

Low Crude Protein Diets in Poultry: Understanding the

Consequences

Conference report

The concept of feeding poultry, specifically broilers and layers, with reduced crude protein (CP) diets is gaining traction among nutritionists. The economic implications of balancing amino acids currently dictate dietary CP levels. At the recent EW Nutrition Poultry Academy in Jakarta, Indonesia, Dr. Steve Leeson, Professor Emeritus at the University of Guelph, Canada, raised a crucial question: “What does ‘low CP’ really mean?” He states that it typically means a reduction of maximum 2-3% relative to current CP levels.

Low CP diets generally involve a decrease in soybean meal, compensated by higher grain content. This change increases dietary starch and decreases dietary lipid levels. To meet nutritional needs, these diets also include higher amounts of crystalline (synthetic) amino acids.

Dr. Leeson outlined the advantages and disadvantages of low CP diets. **Positives** include improved gut health due to reduced proteolytic bacteria, less environmental pollution, lower water intake (improving litter quality), improved sustainability indices, increased dietary net energy, and better performance during heat stress. **Negatives** encompass issues like lower pellet quality, altered dietary electrolyte balance, higher diet costs, reduced growth rate and feed efficiency, and increased abdominal fat deposition. There are also questions about the presumed complete utilization of crystalline amino acids, which can be as high as 25kg/MT in these diets.

Challenges with Low CP Diets

- **Protein vs. Amino Acids**: Diets are typically formulated based on digestible amino acid content, though minimum CP levels remain common, to avoid reduced performance: Dr. Leeson noted that broiler diets with less than 19% CP in starter and 15% in finisher phases, and layer diets below 13% CP, often fail to deliver adequate performance, regardless of digestibly amino acid supply.
- **Utilization of Free Amino Acids**: The crystalline amino acids are immediately absorbable in the small intestine, contrasting with protein-bound amino acids that are absorbed as di- and tri-peptides. Amino acids absorption dynamics and endogenous loss of amino acids are affected by (high) levels of crystalline amino acids.
- **Non-Essential Amino Acids**: The impact of reduced CP on animal performance might be related to the lower levels of presumed non-essential amino acids, e.g. glycine and serine. This is an area for further exploration.
- **Energy Level Considerations**: Dr. Leeson suggests maintaining specific ratios of digestible lysine to apparent metabolizable energy in broilers at different growth stages. The heat increment of CP is an essential factor, as it reduces net energy efficiency, possibly requiring an adjustment in amino acid to metabolizable energy ratios as poultry diets are not based on net energy values.
- **Gut Health**: Lower CP levels can reduce the flow of undigested protein into the hindgut, reducing the risk of necrotic enteritis, and the production of harmful metabolites, like biogenic amines.
- **Role of Proteases**: Protease use can lead to a further 2-4% reduction in dietary CP, with the response depending on the inherent protein digestibility of the diets.
- **Impacts on Pellet Quality**: Due to the binding properties of protein, each 1% reduction in CP typically results in a 2% decrease in pellet durability (index).
- **Electrolyte Balance**: Reduced CP can significantly lower dietary electrolyte balance, which has to be considered in feed formulation. Amongst the nutrients contributing to DEB value, Sodium and Potassium appear to be the most influential minerals to consider.

Conclusion

Dr. Leeson anticipates that low CP diets will become increasingly relevant. They have the potential to reduce environmental pollution and dependence on soybean meal, despite current challenges in reducing feed costs.

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EW Nutrition’s Poultry Academy, featuring Dr. Leeson, took place in Jakarta and Manila in early September 2023. With nearly 50 years of industry experience, Dr. Leeson has made significant contributions to poultry nutrition and management, evidenced by his numerous awards and over 400 published papers.

Respiratory disease – one of the

biggest problems in horses

By Judith Schmidt, Product Manager On-Farm Solutions

The respiratory tract in horses is prone to various problems, ranging from allergic reactions and inflammation to severe infections. Respiratory diseases are a constant topic of suffering and irritation in horse breeding and keeping. According to a study published in 2005, respiratory diseases account for about 40 % of all equine internal diseases recorded worldwide (Thein 2005). Through early diagnosis, appropriate treatment, and preventive measures, horse owners can help maintain the respiratory health of their horses and promote their well-being and performance.

The horse’s lung – a high-performance organ

The respiratory tract of our horses is a high-performance system with a large surface, allowing the exchange between the inside of the body and the environment. The lungs enable the gas exchange, i.e., the transfer of oxygen from the air into the horse’s bloodstream and the discharge of CO_2. A functioning gas exchange is crucial for the horse to supply its muscles with sufficient oxygen and perform.

Even when resting, a 600-kg horse breathes about 50 to 80 liters of air per minute into its lungs. With increasing load, this value can rise to 2.000 liters per minute at maximum load. If a horse is healthy, it breathes calmly and slowly and takes eight to sixteen deep breaths per minute.

A special mucous membrane covering the entire respiratory tract protects the lungs from harmful influences. When irritated by pathogens or foreign bodies, this mucous membrane generates higher amounts of mucous and transports it toward the mouth cavity with the help of the finest cilia. In this way, most harmful particles are usually trapped quickly, reliably, and, above all, effectively and, if necessary,

coughed up before they can even reach the alveoli and cause damage there.

The most common respiratory diseases in horses

Chronic obstructive bronchitis

Chronic obstructive bronchitis is better known as COB or equine asthma. COB is more common in horses regularly kept in dusty or poorly ventilated environments, such as cramped stables or pastures with high mold levels. Inhalation of dust particles and allergens can cause respiratory tract inflammation, leading to coughing, increased mucus expectoration, and breathing difficulties. The clinical picture of COB can vary greatly. From occasional poor performance in show horses to chronic coughing with purulent nasal discharge or significant weight loss.

Tracheitis

Another common respiratory disease in horses is tracheitis, often caused by bacterial or viral infections. Young and older horses and those with a weakened immune system are particularly susceptible to tracheitis. Besides infections, factors such as dust, smoke, or chemicals can also irritate the mucous membrane of the trachea and trigger inflammation.

Hay fever

Hay fever, also known as allergic respiratory disease or rhinitis, is a common condition affecting horses. Known to humans, it is an allergic reaction to certain pollen, molds, or other environmental allergens that are present in the air. Common signs include sneezing, a runny nose, and itchy eyes. However, some horses may also suffer from coughing or respiratory symptoms. Hay fever in horses can occur seasonally, depending on the pollen emerging, and the symptoms may be more severe during spring, summer, or autumn.

Asthma

Asthma in horses, also known as equine asthma or heaves, is a chronic respiratory disease similar to asthma in humans in many ways. The main cause of this disease is hypersensitivity of the respiratory tract to dust, allergens, or mold spores in the horses' environment.

How to differentiate between respiratory distress and harmless rattling?

Horse owners know it – the four-legged friends have an impressive range of breathing sounds. But which are harmless, such as the exited trumpeting through the nostrils during a fright, and which could be respiratory disease symptoms?

Diagnosing respiratory problems in horses can be challenging because symptoms are often non-specific signs and similar to several diseases.

Snorting: When horses snort, it is a sign of relaxation. There is usually no cause for concern—quite the opposite.
Snorting at a gallop: Many horses snort rhythmically at a gallop, which is also considered harmless. Snorting is particularly common in thoroughbreds.
Coughing during, e.g., trotting: Occurs so frequently that it is often perceived as usual. But it is not. Coughing is always an alarm signal and can indicate an allergy, asthma, or a viral or bacterial infection.
Whistling when inhaling: In this case, to be on the safe side, a veterinarian should be consulted.

What are the consequences of respiratory disease?

Respiratory disease in horses can have significant economic consequences. If a horse suffers from chronic obstructive bronchitis or another respiratory illness, this can lead to various problems:

- Veterinary costs increase: Diagnosing and treating respiratory diseases often require veterinary visits, medication, and possibly further examinations such as x-rays or endoscopy.
- Performance decreases: A horse with respiratory problems may have severely limited performance. It may have difficulty breathing, negatively affecting its athletic performance, equestrian work, or other activities.
- Downtime: During the treatment or recovery, horses may have to take a break or be taken out of training, resulting in loss of income, especially if the horse was intended for competition or show.
- Decrease in value: A horse with chronic respiratory problems may lose its value as a sport or breeding horse. The demand for that horse and, therefore, the selling price might decrease.

Early diagnosis and treatment are crucial for containing the economic impact. However, the best strategy is to minimize the risk of respiratory disease by appropriate preventive measures.

Prevention

Preventing cough in horses is considerably important to reduce the incidence and severity of respiratory disease. Several measures can be taken to achieve this goal:

1. A clean horse stable is crucial: Dust is a common trigger of respiratory symptoms in horses. Removing dust, dirt, and mold spores regularly from the stable and horse boxes can help improve air quality and reduce respiratory stress.
2. Allow horses to breathe fresh air with efficient pasture management: When possible, horses should have access to fresh pastures. The natural outdoor environment helps horses breathe cleaner air and inhale fewer harmful particles.
3. Hay feeding should not increase exposure to allergens: The exposure to allergens can be reduced by choosing high-quality, low-dust hay. Moist soaking of the hay before feeding can also help reduce dust levels.
4. Ventilation ensures air exchange: Appropriate ventilation in the stable is essential to avoid stagnant air and dust accumulation. The use of fans or natural ventilation systems can improve air circulation.
5. Feed management: High-quality feed free of molds and allergens can reduce the risk of respiratory problems. It is vital to adjust feed rations to the individual needs of each horse.
6. Supplements support hygiene measures: Supplements can play a positive role in preventing respiratory problems in horses if used selectively and with expert advice.
    - Immune system support: Supplements such as vitamins, minerals, and antioxidants can strengthen the immune system. A healthy immune system helps the horse to better defend itself against infections and inflammation of the respiratory tract.
    - Certain supplements contain ingredients with anti-inflammatory properties, such as omega-3 fatty acids or herbal extracts. They can help alleviate inflammation in the respiratory tract and thus reduce the risk of respiratory problems.
    - Supporting respiratory health: Some supplements on the market have been specially designed to support respiratory function. They help regulate mucus production, improve respiratory protection, and facilitate the expectoration of mucus.
    - Strengthening lung capacity: Certain ingredients in supplements can support the horse’s lung capacity and promote better oxygen uptake, which is essential for performance and respiratory health.

Conclusion

Respiratory health is essential for horses. So, you should consult the vet in case of noticeable breathing sounds, coughing, fever, or a drop in performance. Respiratory diseases tend to become chronic and long-term problems if they are not treated appropriately. Fresh air and species-appropriate husbandry, feeding dust- and mold-free feed are the first steps to support the normal function of your horse’s respiratory tract. A holistic approach to equine health, including proper stable and feed hygiene, sufficient exercise, and good air quality in the stable is crucial. Appropriate feed supplements can be an excellent tool to round this approach off.

References:

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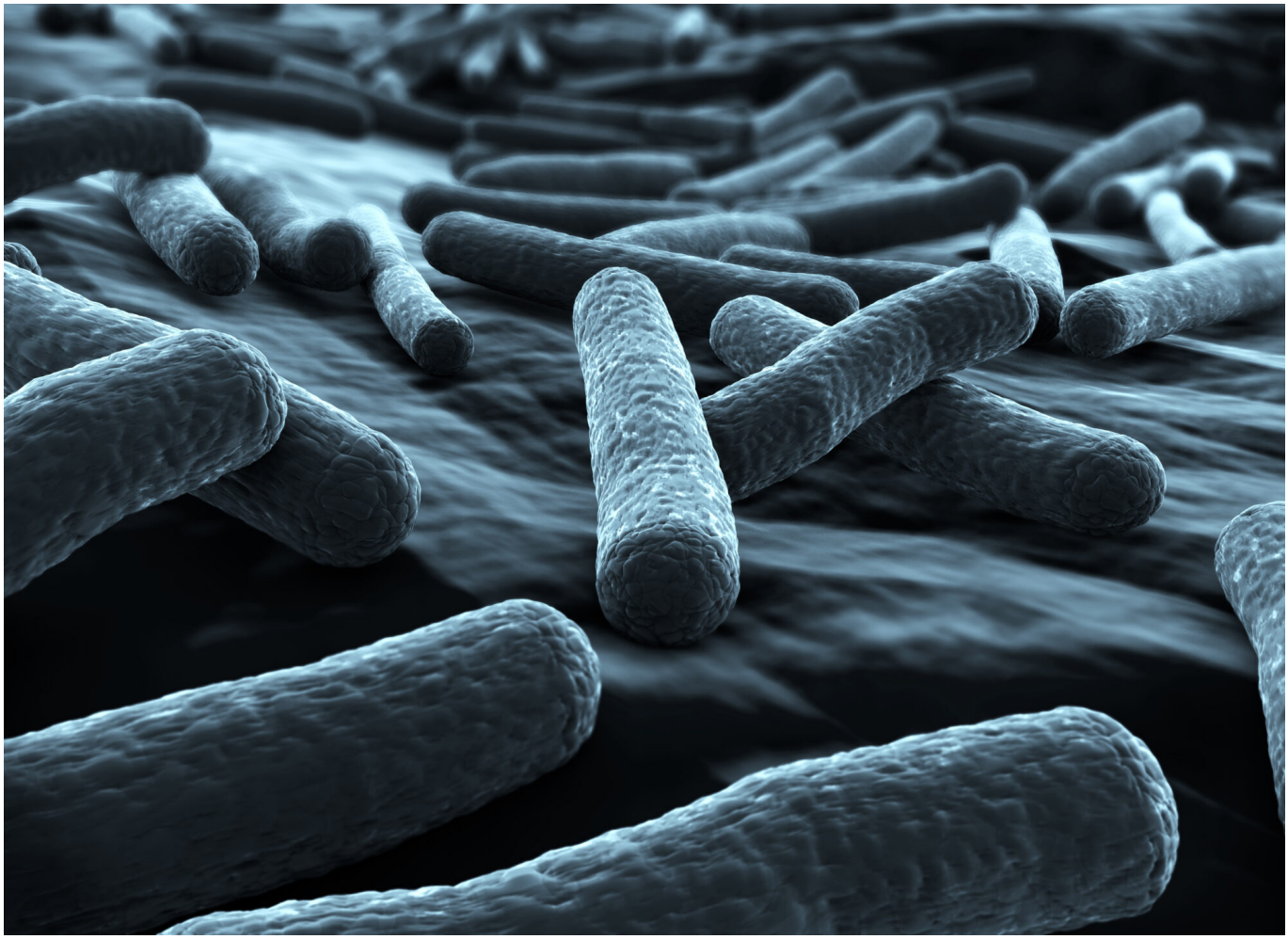
Endotoxins in 250 words



Dr Inge Heinzl, EW Nutrition

Endotoxins are… toxic, of course. The part “endo” in their name means that they are part of the bacterial cell, or, to specify it, they are part of the outer membrane of Gram-negative bacteria such as *E. coli*, *Salmonella*, *Shigella*, *Klebsiella*, and *Pseudomonas*.

When do they occur?

Always. Endotoxins are released with the lysis of bacteria, e.g., at the end of their life cycle, due to the effective immune defense of the host or treatments. The other possibility is bacterial growth as the membrane gets restructured and the endotoxins (or lipopolysaccharides -LPS-) are liberated.

What is the problem?

The “normal” occurrence (animals and humans always have Gram-negative bacteria in their gut) does not matter, because gut cells do not have receptors to recognize them as a danger in their apical side. However, when the barrier function is compromised, they pass into the bloodstream.

The liver still detoxifies small amounts. The problem comes with higher amounts of endotoxins in the bloodstream. Then, they provoke a strong immune reaction, feed intake drops, and nutritional resources are shifted from growth and production to immunity. These performance drops affect the profitability of the farmer.

What can be done?

Use broad-spectrum toxin binders that

- contain clay minerals showing high affinity and selectivity against endotoxins
- contain yeast cell walls, which, in addition to their binding capacity, support the immune response through macrophage activation and are involved in modulating microflora and bacterial load from the intestine
- provide adequate liver protection.