Corona – Must We Fear Transmission from Livestock to Humans?

SARS-CoV-2 is causing one of the worst global challenges in the 21st century right now. The virus is a member of the family of coronaviridae and belongs to the RNA-viruses. It is assumed that the virus was transmitted by wild animals on a wet market in China. If the virus came from wild animals, is it possible that it can also be transmitted to our farm animals and vice versa? There is considerable confusion in the market. In India, e.g., sales of poultry meat broke down by 80% since January, due to rumors that one could catch the virus from eating chicken.

Corona – nothing new in agriculture!

For people working in the agricultural sector, coronaviruses are not unknown. Cattle producers often fight against diarrhea in newborn calves and against winter dysentery in young adult cattle. Pig farmers know Porcine Epidemic Diarrhoea (PED) and Transmissible Gastroenteritis (TGE) very well. Poultry farmers vaccinate their animals against infectious bronchitis (IB). Are these diseases all caused by the same viruses? No! Different members of the coronavirus family are responsible.

Most of the coronaviruses are species – and tissue – specific

To infect animals or humans, the spike-proteins forming the crown – the "corona" – of the coronavirus must bind to receptor molecules on the target cells of the host's tissues. The binding is highly specific, just like a lock and its specific key go together, or how an antibody binds to a particular pathogen. SARS-CoV-2, for example, needs a particular cell membrane protein (angiotensin-converting enzyme 2 – ACE2) to enter human cells; TGE viruses, on the other hand, depend on the porcine aminopeptidase N (ANPEP). The cells of pigs have other receptor molecules than the cells of poultry. The cells of the gastrointestinal tract are different from the cells of the respiratory tract (Russ, 2020).

Table: examples for the different coronaviruses in livestock and humans (adapted from Ackermann, 2016)

Virus	Disease	Species	Genus*
TGEV PEDV FCoV-I	Transmissible gastroenteritis Porcine epidemic diarrhea Feline infectious peritonitis (FIP)	Pigs Pigs Cats	α
BCoV HEV MERS-CoV SARS-CoV SARS-CoV-2	Diarrhea in newborn calves; winter dysentery Vomiting and wasting disease Middle East respiratory syndrome Severe acute respiratory syndrome COVID-19	Cattle Pigs Humans Humans Humans	β
IBV TCV	Infectious bronchitis Blue comb disease	Poultry Poultry	γ
PDCoV	Porcine delta coronavirus	Pigs	δ

*for the allocation to the genus, one crucial factor is the viral protein nsp 1.

Corona in Pigs

For pigs, five coronaviruses are relevant. The porcine epizootic diarrhea virus (PEDV) and the transmissible gastroenteritis virus (TGEV) belong to the α genus. They show a high affinity to the epithelial cells of the gastrointestinal tract. The porcine respiratory coronavirus (PRCV) is also a representative of the α genus, but does not show any affinity to the gastrointestinal epithelial cells. It causes respiratory diseases. The other viruses are the hemagglutinating encephalomyelitis virus responsible for the vomiting and wasting disease and belonging to the β-genus, and the porcine delta coronavirus (PDCoV), causing diarrhea (Stiebnitz, 2017).

Corona in Poultry

Infectious bronchitis caused by a coronavirus belonging to the γ genus is one of the major economically critical respiratory diseases in poultry. As it also affects the kidney and the reproductive tract, the consequences are kidney damage, decreased egg production, and bad egg quality. A further significant problem of IB in poultry is the rapid spread. Within 48 hours, a whole flock can be infected and remains a virus reservoir, even after recovery. Usually, the infection is horizontal, from hen to hen, not from hen to the chick. However, infection via contaminated eggs shell in the hatcheries is also possible (MacLachlan and Dubovi, 2016).

Corona in cattle

The symptoms associated with bovine coronaviruses are calf diarrhea, winter dysentery (hemorrhagic diarrhea) in adult cattle, and respiratory infections in animals of various ages (MacLachlan and Dubovi, 2016). The bovine coronavirus belongs to the ß genus. The bovine coronavirus is not as host-specific as

many other coronaviruses. It can infect dogs, turkeys, and other wild ruminants such as waterbucks, giraffes, or white-tailed deers.

Can SARS-CoV-2 also be exchanged between humans and livestock?

SARS-CoV-2, like the MERS-CoV (Middle East Respiratory Syndrome) and the SARS-CoV (2002/03), belongs to the ß genus of coronaviruses. All three can infect animals and humans, which can be seen from the way they spread: SARS-CoV originated from bats, MERS-CoV was transmitted by camels, and for SARS-CoV-2, bats (Zhou et al., 2020) but also pangolins (Zhang, 2020) are assumed to be the source. But not livestock animals.

There is one known case of a SARS-CoV infected pig, which was discovered in China in the context of research on the SARS epidemy in 2002 (Chen, 2005). Scientists from the Chinese Academy of Sciences in Beijing examined six animal species living in close contact with humans and found this one pig infected by SARS-CoV of human origin. As the only person having contact with the pig was tested negative for the coronavirus several times, it was concluded that the infection likely came from virus-contaminated feed. The pigs in rural areas in China are often fed the leftovers from restaurants.

For now: keep calm

Today, there is no scientific indication that livestock can contract SARS-CoV-2 from humans or vice versa. In Germany, the Friedrich Löffler Institute (2020), a leading research institute on epizootic diseases, is conducting extensive studies at the moment to better understand the sensitivity of animals towards SARS-CoV-2. Reliable results are expected earliest at the end of April. Until then, let's keep calm, and behave responsibly to weather these unsettling times.

By Inge Heinzl, Editor EW Nutrition

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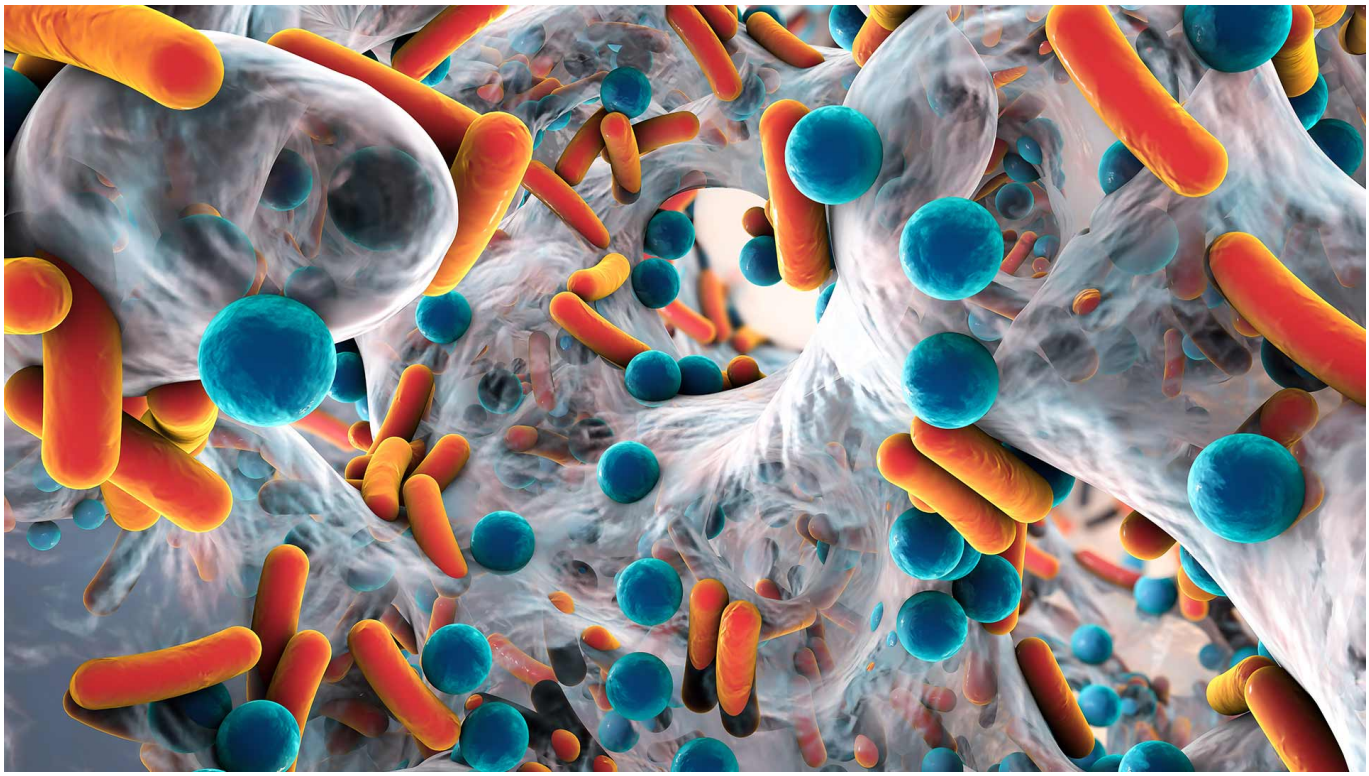
Antibiotic reduction: The increased importance of high-level biosecurity



Biosecurity is the foundation for all disease prevention programs (Dewulf, et al., 2018), and one of the most important points in antibiotic reduction scenarios. It includes the combination of all measures taken to reduce the risk of introduction and spread of diseases. It is based on the prevention of and protection against infectious agents by understating the disease transmission processes.

The application of consistently high standards of biosecurity can substantially contribute to the reduction of antimicrobial resistance, not only by preventing the introduction of resistance genes into the farm but also by lowering the need to use antimicrobials (Davies & Wales, 2019).

Lower use of antimicrobials with higher biosecurity

Several studies and assessments relate that high farm biosecurity status and/or improvements in biosecurity lead to reduced antimicrobial use (Laanen, et al., 2013, Gelaude, et al., 2014, Postma, et al., 2016, Collineau, et al., 2017 and Collineau, et al., 2017a). Laanen, Postma, and Collineau studied the profile of swine farmers in different European countries, finding a relation between the high level of internal biosecurity, efficient control of infectious diseases, and reduced need for antimicrobials.

Reports on reduction on antibiotic use due to farm interventions are also available. Gelaude, et al. (2014), evaluated data from several Belgian broiler farms, finding a reduction of antimicrobial use by almost 30% within a year when biosecurity and other farm issues were improved. Collineau et al. (2017) studied pig farms in Belgium, France, Germany, and Sweden, in which the use of antibiotics was reduced on average by 47% across all farms. The researches observed that farms with the most strict biosecurity protocols, higher compliance, and who also took a multidisciplinary approach (making other changes, e.g. in management and nutrition), achieved a greater reduction of antibiotic use.

Biosecurity interventions pay off

Of course, the interventions necessary to achieve an increased level of biosecurity carry some costs. However, the interventions have proven to also improve productivity. Especially if taken with other measures such as improved management of newborn animals and nutritional improvements. The same studies which report that biosecurity improvements decrease antibiotics use also report an improvement in animal performance. In the case of broilers, Laanen (2013) found a reduction of 0.5 percentual points in mortality and one point in FCR; and Collineau (2017) reported a reduction in mortality in pigs during both the pre-weaning and fattening period of 0.7 and 0.9 percentual points, respectively.

Execution

Although biosecurity improvements and other interventions necessary for antibiotic reduction programs are well known, continuous compliance of these interventions is often low and difficult. The implementation, application, and execution of any biosecurity program involve adopting a set of attitudes and behaviors to reduce the risk of entrance and spread of disease in all activities involving animal production or animal care. Measures should not be constraints but part of a process aimed to improve health of animals and people, and a piece of the multidisciplinary approach to reduce antibiotics and improve performance.

Designing effective biosecurity programs: consider five principles

When designing or evaluating biosecurity programs, we can identify five principles that need to be applied (Dewulf, et al., 2018). These principles set the ground for considering and evaluating biosecurity interventions:

1. Separation: Know your enemy, but don’t

keep it close

It is vital to have a good definition of the perimeter of the farm, a separation between high and low-risk animals, and dirty and clean internal areas on the farm. This avoids not only the entrance but the spread of disease, as possible sources of infection (e.g. animals being introduced in the herd and wild birds) cannot reach the sensitive population.

2. Reduction: Weaken your enemy, so it doesn't spread

The goal of the biosecurity measures is to keep infection pressure beneath the level which allows the natural immunity of the animals to cope with the infections (Dewulf, et al., 2018). Lowering the pressure of infection e.g. by an effective cleaning and disinfection program, by the reduction of the stocking density, and by changing footwear when entering a production house.

3. Focus: Hunt the elephant in the room, shoo the butterflies

In each production unit, some pathogens can be identified as of high economic importance due to their harm and frequency. For each of these, it is even more important, to understand the likely routes of introduction into a farm and how it can spread within it. Taking into consideration that not all disease transmission routes are equally significant, the design of the biosecurity program should focus first on high-risk pathogens and transmission routes, and only subsequently on the ones lower-risk (Dewulf, et al., 2018).

4. Repetition: When the danger is frequent, the probability of injury is increased

In addition to the probability of pathogen transmission via the different transmission routes, the frequency of occurrence of the transmission route is also highly significant when evaluating a risk (Alarcon, et al., 2013). When designing biosecurity programs, risky actions such as veterinary visits, if repeated regularly must be considered with a higher risk.

5. Scaling: In the multitude, it is easy to disguise

The risks related to disease introduction and spread are much more important in big farms (Dorea, et al., 2010); more animals may be infected and maintain the infection cycle, also large flocks/herds increase the infection pressure and increase the risk by contact with external elements such as feed, visitors, etc.

Can we still improve our biosecurity?

Almost 100% of poultry and swine operations already have a nominal biosecurity program, but not in all cases is it fully effective. BioCheck UGent, a standardized biosecurity questionnaire applied in swine and broiler farms worldwide, shows an average of 65% and 68% in conformity, respectively, from more than 3000 farms between both species (UGent, 2020). Therefore, opportunities to improve can be found in farms globally, and they pay off.

To find these opportunities, consider three situations you need to know:

1. **Know your menace:** Identify and prioritize the disease agents of greatest concern for your production system by applying the principles of **focus** and **repetition**. Consider the size of the facility when evaluating risks applying the **scaling**
2. **Know your place:** Conduct an assessment of the facility. A starting point is to define the *status quo*. For that, operation-existing questionnaires or audits can be used. However, the "new eyes principle" should be applied and an external questionnaire such as BioCheck UGent (biocheck.ugent.be) is recommended. The questionnaire will help you identify gaps in your **biosecurity plan** as well as **processes** that may be allowing pathogens to enter or move from one location to another, and measures that can be implemented applying the principles of **separation** and **reduction.**
3. **Know your processes:** Implement processes and procedures that apply the biosecurity principles and help to eliminate, prevent, or minimize the potential of disease. A deep evaluation of the daily farm processes will aid in risk mitigation, considering, among others, movement of personnel, equipment, and visitors, the entrance of pets, pests and vermin, dealing with deliveries and handling of mortality and used litter.

Compliance – The weak link in biosecurity programs

Achieving systematic compliance of biosecurity protocols on a farm is a complex, interactive, and continuous process influenced by several factors (Delabbio, 2006) and an ongoing challenge for animal production facilities (Dewulf, et al., 2018). Thus, it is clear that the biosecurity plan can only be effective if everyone on the operation follows it constantly, i.e. if everyone performs in **compliance**.

Compliance can be defined as the extent to which a person's behavior coincides with the established rules. Thus, compliance with biosecurity practices should become part of the culture of the facility. Poor compliance in relation with biosecurity can be connected to:

- Lack of knowledge or understanding of the biosecurity protocols (Alarcon, et al., 2013; Cui & Liu, 2016; Delpont, et al., 2020)
- Lack of consequences for non-compliance (Racicot, et al., 2012a)
- A company culture of inconsistent or low application of biosecurity protocols (Dorea, et al., 2010)

In general terms, compliance with biosecurity procedures has been found to be incomplete in different studies (Delpont, et al., 2020; Dorea, et al., 2010; Gelaude, et al., 2014; Limbergen, et al., 2017). In one study (Racicot, et al., 2011) used hidden cameras, to asses biosecurity compliance in Quebec, Canada and found 44 different biosecurity fails made by 114 individuals (farm workers and visitors) in the participating poultry farms, over the course of 4 weeks; in average four mistakes were made per visit. The most frequent mistakes were ignoring the delimitation between dirty and clean areas, not changing boots, and not washing hands at the entrance of the barns; these three mistakes were committed in more than 60% of the occasions, regardless of being farm employees or visitors. These are frequent breaches not only of those farms in Quebec but found frequently in many animal production units around the world and have a high probability of causing the entrance and spread of pathogens.

How to create a high biosecurity culture: start now!

Creating, applying, and maintaining a biosecurity culture is the most effective way to make sure that compliance of the biosecurity program and procedures is high on the farm. Decreasing, therefore, the probability of entrance and spread of pathogens, reducing the use of antimicrobials, and maintaining animal health. Some actions are recommended in order to achieve a high biosecurity culture:

1. Name an accountable person

Every operation should have a biosecurity coordinator who is accountable for developing, implementing, and maintaining the biosecurity program.

This important position should be appointed having in mind that certain personality traits may facilitate performance and execution of the labor (Delabbio, 2006; Racicot, et al., 2012; Laanen, et al., 2014; Delpont, et al., 2020) such as responsibility, orientation to action, and being able to handle complexity. Additionally, expertise – years working in the industry y- and orientation to learn are strategic (Racicot, et al., 2012).

2. Set the environment

When the farm layout is not facilitating biosecurity, compliance is low (Delabbio, 2006), thus the workspace should facilitate biosecurity workflows and at the same time make them hard to ignore (Racicot, et al., 2011).

3. Allow participation

It is important to mention that not only the management and the biosecurity coordinator are responsible for designing and improving biosecurity procedures. Biosecurity practices must be owned by all the farm workers and should be the social norm.

The annual or biannual revision of biosecurity measures should be done together with the farm staff. This not only serves the purpose of assessing compliance but also allows the personnel to suggest measures addressing existing -often overlooked– gaps, and to be frank about procedures that are not followed and the reasons for it. At the same time, participation increases accountability and responsibility for the biosecurity program.

4. Train for learning

Don’t take knowledge for granted. Even when a person has experience in farm work and has been working in the industry for several years, their understanding and comprehension around biosecurity may have gaps.

People are more likely to do something when they see evidence of the activity’s benefit. Therefore, if workers are told about the effectiveness of the practices, showing the benefits of biosecurity and analyzing the consequences of non-compliance, they are most likely to follow the procedures (Dewulf, et al., 2018). Knowledge of disease threats and symptoms also improves on-farm biosecurity (Dorea, et al., 2010), thus workers should recognize the first symptoms of disease in animals and act upon them.

Discussion of ‘What if…?’ scenarios to gain an understanding of the key aspects of farm biosecurity should be held on a regular basis. Workers should see examples of the benefits of compliance – and risks of noncompliance – as part of their training.

5. Lead by example

A high biosecurity culture requires everyone to comply regardless of status.

Personnel practice of biosecurity procedures is not only affected by the availability of resources and training, but also by the position that management takes on biosecurity and the feedback provided. The management and owners must transmit a message of commitment to the farm personnel, owning and following biosecurity practices, procedures and protocols, giving positive and negative feedback on the personnel’s compliance, supplying information on farm performance and relating it with biosecurity compliance and ensuring adequate resources for the practice of biosecurity (Delabbio, 2006).

When necessary, management also should enforce personnel compliance by disciplinary measures, firings, and creating awareness about the consequences of disease incidence. Nevertheless, the recognition of workers' contribution to animal health performance also has a positive impact on biosecurity compliance (Dorea, et al., 2010).

The bottom line

Biosecurity is necessary for disease prevention in any animal production system. Actions and interventions that prevent the entrance and spread of disease in a production unit have a pay-off as they often lead to performance improvements and lower antimicrobial use. Maintaining a successful production unit requires a multidisciplinary approach in which biosecurity compliance needs to be taken seriously and also actions to improve in other areas such as management, health, and nutrition.

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How producers keep the egg supply chain going amid COVID-19

The Covid-19 pandemic has increased consumer demand for eggs. This article discusses how the egg supply chain, from layer farms to supermarkets, works amid disruptions caused by Covid-19.

China lockdown sends ripples across international animal production

For animal production, just as for many other sectors that trade globally, China is a central node within our industry's complex supply chains. As China is starting to lift its restrictions again, what can we say about the knock-on effects of China's lock-down on animal production to date? And what happens now that these measures are replicated in other markets?

Soaring Chinese demand for chicken and pork imports

Wuhan, the capital of Hubei province in China, is home to more than 11 million inhabitants and to the Huanan Seafood Wholesale Market, where the first human infection with SARS-CoV-2 likely took place. From January 23, 2020, onwards, Chinese authorities effectively put all of Wuhan under quarantine: Places and trains could no longer leave the city, buses, subways, and ferries were suspended. Lock-down measures were extended to much of Hubei province and beyond.

According to analysts and Chinese state media, poultry production was seriously affected: Transport restrictions prevented feed such as soybean meal from being delivered to poultry farms, forcing farmers to cull millions of young birds. Hence, the first noticeable ripple effects on international animal production were felt in terms of Chinese import demand. In February, the Financial Times reported that China lifted the ban on importing live chickens from the US to tackle the worsening protein shortage.

This protein shortage is, of course, a longer-term issue due to African Swine Fever's decimation of the Chinese hog population by 40% that has sent pork prices skyrocketing in the past year and fueled inflation. According to Nikkei Asian Review, the added pressure of COVID-19-related domestic transport disruption on pork prices has led to a boost in Chinese demand for imported meat. The U.S. Meat Export Federation reported that US pork exports to China in January 2020 were almost ten times higher than the year before, reaching 74,350 metric tons. However, pork exporters were and still are having trouble getting their pork into China because of the lockdown measures' paralyzing effect on sea freight.

Prices hikes for vitamins and amino acids

By the same token, Chinese manufacturers were and still are having trouble getting their products out of China, or even more fundamentally, producing them in the first place. Much of the world's supply of feed ingredients such as B vitamins, vitamin D3, threonine, and lysine is produced in China. The ripple effect of China's lockdown on global animal production supply chains has thus been keenly felt in terms of the availability and pricing of multiple vitamins and amino acids.

Delayed January exports are starting to trickle in, but disruptions in shipping links are expected to continue for some time yet – and supply chain bottlenecks translate into price hikes. Analysts report vitamin and amino acid price hikes of varying magnitude relative to pre-pandemic levels, and markets appear to be getting more volatile rather than more stable. Among others, Nan-Dirk Mulder, Senior Global Specialist for Animal Protein at Rabobank, therefore, expects animal health and feed additive prices to continue to rise in 2020.

China restrictions ease, but everyone else under lockdown

If we look at China in isolation and assume that its lifting of restrictions will steadily continue, there is reason to be cautiously optimistic. Martijn de Cocq, Lead Analyst at FeedInfo News Service, reports that Chinese production of premix, compound feed, and amino acids and vitamins is back to 80-90% of 2019 levels. Against a backdrop of backlogs, low stock levels, and shortages of certain raw materials, manufacturers are playing catch-up now to meet both domestic and export demand, putting pressure on spot prices for various feed additives and also on seaport capacity.

Chinese economic recovery also bodes well for animal product import demand. Despite the delays and disruptions to supply chains and trade flows caused by COVID-19, Iowa State University researchers Wendong Zhang and Tao Xiong, for instance, anticipate American exports of poultry, pork, and beef products to China to grow from $3 billion to $5 billion in 2020.

However, even if China bounces back quickly, eschews further rounds of lockdown measures, and returns to producing and shipping its usual volumes of feed additives (albeit at temporarily higher prices) – in terms of global animal production, we also have to ask ourselves what happens in the target markets for Chinese exports.

Deciding factors: transport and labor

Specifically, we have to consider domestic transport logistics, e.g., how raw materials are getting from ports to feed manufacturing facilities how end products are getting to farms. The undisrupted functioning of the feed supply chain is indispensable for animal production. Hence, many countries have already explicitly classified feed as an essential good that needs to be exempt from transport restrictions imposed to stem the spread of Sars-Cov-2. The EU Commission, for instance, has adopted a directive on "green lanes" to facilitate cross-border freight transports, including that of feedstuffs. The other hot-button cross-border topic, which eventually will affect animal feed as well, is, of course, seasonal labor, which is urgently required for spring planting in both Europe and North America.

The big dark cloud hovering over every sector within animal production is the question of what would happen if they are severely affected by staff shortages due to coronavirus infections. We simply don't know. All lockdown measures put in place right now, at a considerable social and economic cost, are about preventing a scenario where large parts of the population are simultaneously ill. However, at the level of, say, a feed mill or a farm, even just a few infections among staff, could require them to suspend operations, with unthinkable consequences for animal welfare and food security.

In the absence of a crystal ball, we have to accept a certain baseline of unnerving uncertainty about future developments and focus on the positives: Globally, feed manufacturing is going strong, and animal producers are busier than ever to play their role in maintaining reliable food supply chains during these extraordinary times.

How COVID-19 is affecting animal producers – and what to focus on right now

As the novel coronavirus pandemic continues to spread and large parts of the world are under lock-down, meat, dairy, and egg producers are working hard to maintain production in the face of many uncertainties. Let's take stock of three major challenges for animal production businesses – and consider three elements of the multi-pronged "solution" our industry is creating to this unprecedented situation.

Demand patterns are volatile

Stock-piling and panic buys in light of quarantine and social distancing measures have driven up consumer demand for non-perishable, shelf-stable, and frozen food. Accordingly, sales of products such as eggs, long-life milk, and fresh chicken have strongly picked up, while demand for restaurant cuts is waning. Animal producers are trying hard to increase retail processing to meet consumer needs, yet future demand slumps are looming: eventually, consumers will purchase less while they use up their provisions.

Moreover, the economic knock-on effects of this pandemic might include higher unemployment and long-term pressure on the hospitality industry. Dan Sumner, an agricultural economist at the University of California, also expects longer-term reduced export demand from areas strongly affected by the virus.

Inputs: feed additive price hikes and labor shortages

Measures to contain COVID-19 have led to multiple production and transport disruptions in China, where much of the global supply of ingredients such as vitamins, threonine, and lysine, as well as fertilizers, originates. According to Nan-Dirk Mulder, Senior Global Specialist for Animal Protein at Rabobank, these developments will drive up animal health and feed additive prices in 2020.

Animal producers are also concerned about the pandemic's impact on labor availability. Staff shortages due to sickness, quarantine, childcare issues, and movement restrictions for seasonal labor could have severe consequences, from productivity losses to major animal welfare challenges. The National Pork Producers Council in the US, for example, warns that "the specter of market-ready hogs with nowhere to go is a nightmare for every pork producer in the nation."

Misinformation can create hazards

The media landscape, in particular social media, is rife with misinformation about COVID-19. There is no scientific evidence that farm animals can contract, transmit, or spread the SARS-CoV-2 virus, but fake news along these lines may have a detrimental impact on animal production.

In India, rumors were spread that the novel coronavirus can be transmitted through the consumption of chicken. This has led to a 70% drop in the wholesale price of chicken, as reported by Minister of State Sanjeev Kumar Balyan, putting tremendous pressure on the local poultry industry. Knock-on effects are already felt by feed companies, equipment providers, corn, and soybean growers – but also fish, meat, and egg producers as the rumors have morphed into a general suspicion towards animal protein.

Biosecurity and planning matter more than ever

Many of the prevention and control measures against SARS-Cov-2, such as tight hygiene standards and limiting visitors to facilities, are familiar to animal producers. Biosecurity is of paramount importance to prevent the spread of diseases, not least devastating pests such as Highly Pathogenic Avian Influenza and African Swine Fever. Now is the moment to reinforce biosecurity protocols, on farms and in processing plants, to keep both workers and animals safe.

Experts at the Friedrich Löffler Institute, a German swine producer interest group, have also stressed that producers need to develop feasible contingency plans in case key staff members need to self-isolate. Businesses are also exploring how automation can help safeguard production in case of labor disruptions; agricultural drone manufacturers are reporting significant increases in sales already.

Feed additives to safeguard performance

Nick Major, president of the European Feed Manufacturers' Federation (FEFAC), has urged the European Commission to recognize "feed as essential goods in the EU COVID-19 guidelines, which is crucial to (…) prevent supply chain disruptions and shortages of essential nutrients to the EU farm animal population."

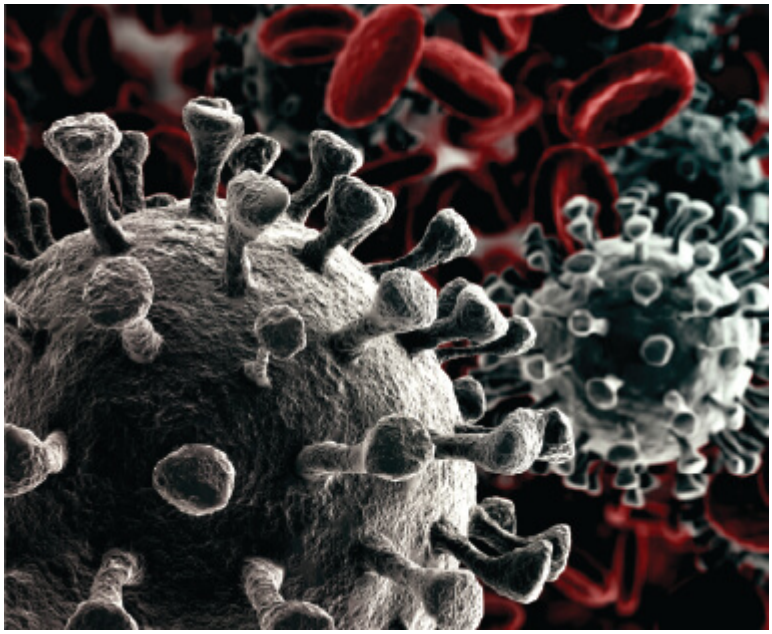
As border controls, transport restrictions, and port closures upend the normal flow of raw feed materials, quality concerns with regard to the origin and storage conditions, e.g. mycotoxin contamination, are becoming topical. Especially given the added issue of how to guarantee appropriate care for their animals during labor shortages, producers need to, therefore, prioritize their feed additive portfolio. Intelligent feed additive solutions have been proven to support animal performance in challenging situations, boosting gut health and immune functions.

Collaborate and communicate

Now is the moment to remind people that meat, dairy, and egg production is part of a society's critical agricultural infrastructure. Industry associations and advocacy groups are working hard to prevent the spread of misinformation and to ensure that politicians and regulators do not gloss over the needs of producers and farm animals. These include access to feed supplies and practicable labor arrangements, but also guaranteed allocations of protective equipment, without which safe operations are not possible.

This crisis highlights what should be obvious: animal producers are in the business of "what really matters," providing safe and nutritious food for everyone. This is a time to rally – if anyone knows how to deal with uncertainty, volatility, and rapidly changing circumstances, it is animal production.

COVID-19: What we are doing and what you can do



Dear friends,

Over the past few weeks, we have all found ourselves facing a situation never before seen on this scale. How are we, at EW Nutrition, dealing with it? In a few words: with responsibility to customers, partners, and employees. To find out what we are doing as a company, but also to find out how COVID-19 might spread and what YOU can do to limit risks to yourselves and others, read more here.

What we are doing as a company

Recognizing the challenge posed by COVID-19 in our times, we at EW Nutrition remain on high alert, focused primarily on delivering solutions to our customers and security to our partners and employees.

No Coronavirus cases or known contact with such exist at present among our international teams, yet the EW Nutrition management is acting responsibly on three levels:

- Coordinating operations to ensure on-time and on-standard delivery to our customers
- Postponing/canceling all events that involve any relatively large group of customers and/or employees, regardless of the costs to the company, in order to ensure the health and safety of everyone involved (three events have been canceled/postponed so far: in Turkey, Germany, and Mexico)
- Coordinating with employees to ensure maximum levels of hygiene are observed, as well as best practices of social distancing and self-isolation in order to “flatten the curve”. Where necessary and possible, remote work has been encouraged.

Moreover, to stay ahead of any potential disruptions and to keep on top of the news, the management team at EW Nutrition meets every morning for updates and sends out periodical communications to all concerned.

With the measures it has adopted and the positive code of conduct we are modeling, EW Nutrition is acting preemptively and responsibly to address any present and future challenges that the COVID-19 pandemic may raise. We are confident of our company’s capacity to provide stability and value to our customers, partners, and employees.

How does the virus spread?

New research from the University of Austin, Texas, shows that more than 10% of the cases are transmitted by people without any observable symptoms – what is knows as “asymptomatic transmission”. This type of transmission makes containment more difficult, warranting “extensive control measures including

isolation, quarantine, school closures, travel restrictions and cancellation of mass gatherings."

Since this is a new virus, it is impossible to say with 100% certainty how it is spread. However, it is almost certain that one of the transmission pathways is through the cough or sneeze droplets from infected persons, even when these infected persons do not show very clear signs of the disease.

It is also possible that contact with objects on which such droplets reside may be a secondary pathway of transmission. So far, it is not known for certain how long COVID-19 can survive outside the body, but a related virus (MERS-CoV) was known to survive for up to 60 minutes in the air. Bear in mind, therefore, that objects in public spaces and confined spaces such as restrooms and elevators might also be sources of infection.

What can you do to reduce risks?

Social distancing

Keep a distance of at least a meter from other people: not just those who sneeze, cough or in any way appear to be ill, but generally from people you know have spent any time outside or with other people. This way you minimize the risk of being hit by droplets of saliva from people who may be already infected or carry the virus.

It is a radical practice, yet it is proven to be very effective. This is the solution that many countries that were hit by the SARS epidemic, for instance, adopted to curb the virus's explosive growth.

Wash your hands

Soap and water or an alcohol-based hand sanitizer are the best way to keep viruses away. Wash your hands thoroughly not just every two hours, but literally as often as you can, and especially after contact with other people or objects in public places.

Avoid public places

This includes bars, restaurants, theaters or any other places that may not already be closed. Since it is not yet clear how long coronavirus survives in the air or on objects, even places that may appear safe could potentially still harbor active viruses.

Assist the elderly – cautiously

The elderly and those with preexisting conditions are known to be at higher risk than the rest of the population. If you are an active member of the population outside these groups, it is important to minimize contact with those at risk. However, do assist them by ordering or delivering their shopping for them, or in any way that minimizes their exposure to potential sources of infection.

Avoid touching your face

Your mouth, nose, and eyes are easy pathways for the virus to transfer from your hands to inside your body. Even between sessions of hand-washing, it is important to remember not to touch your face. You may be unaware of certain gestures, either when touching objects or when touching your face, so this is a type of learned behavior that we all need to pay attention to.

Do not rush to the ER

If you do feel unwell, it is important to not rush out to a clinic or hospital. Please call the emergency services and follow their instructions. Rushing out in case of infection can be detrimental to your health and the health of other people you will be exposing. Bear in mind that, in most cases, the symptoms of COVID-19 are mild (fever and coughing being the most common) and there is no cause to panic.

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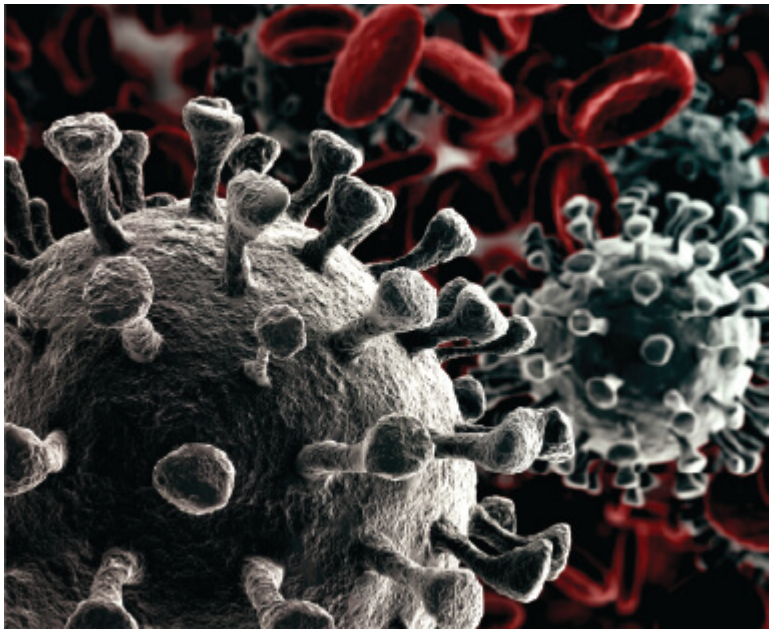
8 ways COVID-19 might impact your business



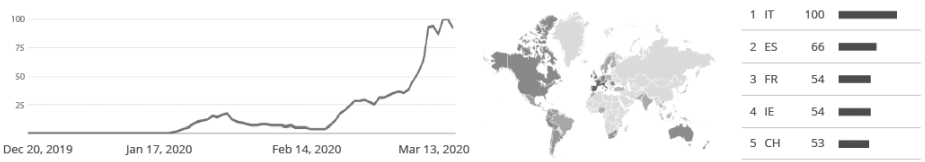
*by **Ilinca Anghelescu**, EW Nutrition*

By now there is no doubt the economic impact of COVID-19 will be massive. The question is, how exactly will the pandemic impact your business – and what can you do to mitigate or prevent what's coming?

Since January, the international community has been aware of the seriousness and ease of contagion of COVID-19. Despite that, internet searches for "coronavirus" only exploded over the past couple of weeks. Worldwide, as a population, we were more interested in Harry Styles, home loan rates and Gal Gadot than in the impending crisis.

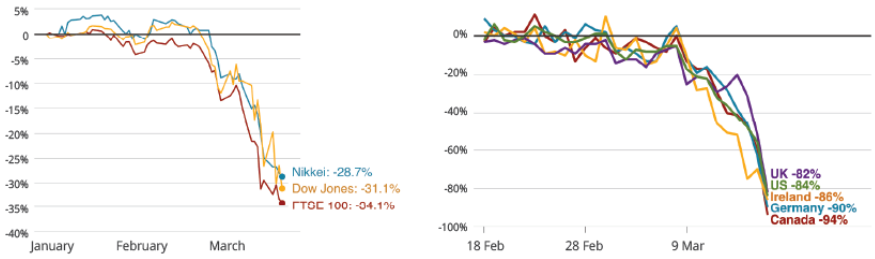
In other words, we individually, as well as markets, were slow to understand and accept the long-term implications of the pandemic.

Google searches for "Coronavirus" since December and which countries did it most



Now that the seriousness of the pandemic has hit home, there are known losses in some industries: airlines worldwide are expected to lose $29BN, with some smaller players being forced out of business by reduced demand. Other low-margin industries, like restaurants or the travel industry, are likewise already sustaining major losses.

Figure 1 – Visualization of COVID-19 impact on markets / Restaurant reservations



And while we are seeing the world slowly understanding and adapting to a new reality, you, like everyone else, have to prepare for the impact of COVID-19 on your business. *Quick note:* though it may appear so at first, not all the ways the pandemic affects businesses are negative!

Labor shortage

As workers are affected by the pandemic, many will either choose to stay home or will be forced to. In some countries, self-isolation measures are elective. In other regions that are more severely affected, the government may require workers in non-essential industries to not break isolation measures. This may affect your company at all levels, from processing feed or feeding animals to delivering goods across quarantined regions.

What you can do:
– Identify proximity workers you can rely on
– Preemptively create crisis scenarios for a reduced workforce
– Create a waiting list of short-term labor resources

Supply shortages

Lockdowns in China, Italy or Spain already provide examples of what happens when regions go into full isolation. Consider how massive shortages in the antibiotic supply from China or shipment delays across the world, for instance, are already affecting the animal production industry.

What you can do:
– Overstock now
– Contact alternative suppliers to create an improved supply chain
– Check expiration dates for your existing supply and consume early dates first
– Choose alternatives for products with an uncertain supply chain

Demand shortages

Depending on the industry and the market, you may be faced with reduced demand. Simply consider the fact that reduced demand for restaurants will lower, in turn, demand for supplies for the restaurant: less meat, butter, milk consumed in restaurants is less meat ordered.

What you can do:
– Prepare for basic production only
– Prepare to stock raw materials long-term if possible
– Discuss with suppliers to cut or minimize deliveries

Government policies

The Food and Drug Administration, the United States' highest authority in food and medicine safety, announced it would suspend inspections of foreign food manufacturers. The impact of this decision could be felt in the quality of foreign feed or raw materials quality. Other governments are already – or might soon be – limiting imports, restricting non-essential activities, offering financial packages for at-risk businesses,

What you can do:
– Review government policy updates on a daily basis and tailor production and operations to ensure compliance
– Give early feedback to government measures
– Apply early for relief measures, even if not severely impacted yet

Lower biosecurity standards

Even now, biosecurity is implemented more in theory than in practice. Routinely there are small infringements – and we can expect their numbers to grow massively in times of crisis. People are less likely to go through the motions if personnel is reduced, supervision is less strict, and the financial pressure of the pandemic is high. This will trigger severe risks for the animal and feed production industries, as well as for product packaging. Workers who hide symptoms to be able to sustain wages; workers attempting to speed up work because of reduced personnel; reduced or looser inspections and monitoring – all these

could perpetrate risks to your operations and to the population at large.

What you can do:
– Tighten biosecurity measures and controls
– Supplement lower government monitoring with additional on-location measures
– If you operate with a reduced workforce, periodically check how downscaling affects biosecurity implementation

Immediate economic downturn

At this point, almost all industries have a global component: your raw materials may be imported; the ingredients in the antibiotics or vaccines you use may come from anywhere around the world; your packaging may be produced in China; your software solutions may come from the Indian subcontinent; your quality controls may be managed by a consultancy from a distant European country – and so on. However much we may try to avoid it, there may be immediate repercussions on your business. Either because your goods may be inaccessible for part of the world, because of lower demand on the consumer side, or because of diminished production capacities, you may feel the impact of the pandemic sooner rather than later.

What you can do:
– Cut costs for non-essentials
– If you are in feed production, consider stocking on toxin binders, search for alternative suppliers, and assess your supply levels
– If you are in livestock production, employ solutions for animal health and welfare to lower disease risk
– Apply for government bailout early
– Assess your export strategy and prepare to zoom in on domestic
– Assess long-term payroll capacities during diminished business demand

Changing consumption trends

It turns out that, after all, the impact could be positive for some industries. The meat industry seems to be doing relatively well, despite the challenges. While in China, severely affected by ASF on the animal side and now by COVID-19 on the human side, meat production was dramatically affected, in other regions demand for – and supply of – animal protein is stable. Consider the new opportunities for frozen or prepackaged food products: as less fresh meat is consumed in restaurants or bought because of infrequent store visits, consumption of these meat products and by-products is not expected to go down – in fact, it may well increase.

The market might, however, first have to be taught to embrace these prepackaged or frozen products.

What you can do:
– Prepare for less fresh meat demand by upping prepackaged meat production
– Teach your end-users about the benefits of frozen products, from meat to egg whites, for instance

Negative impact for others, positive impact for you

While the negative effects are real, there are ways you can balance the COVID-19 impact by taking advantage of some of the positives. Consider that, to give just one example, the energy market is likely going to take a hit. This, in turn, may lead to lower fuel costs for farmers.

Reduced travel means more savings for your company, and while working from home (WFH) may lead in some cases to somewhat reduced productivity, taking an early stand and instructing your team on how to structure WFH days will help preserve productivity while cutting down on energy, fuel and other travel costs, cleaning, in-office equipment depreciation, and other such expenses.

What you can do:
– Check your balance sheets regularly
– Transfer savings from quick benefits into investments into long-term strategy
– Most importantly – never panic!

Ongoing research into treating COVID-19 already shows great promise. While we do not yet know how long these unusual circumstances will last, you can make provisions for the near future and think long-term of how to protect your businesses from this pandemic or any future such challenges.

Poultry health and welfare: Phytomolecules for poultry diets

The large majority of poultry specialists in Europe consider phytomolecules as one of the key elements in diets for broilers, broiler breeders, and layers when birds are raised without antibiotics. A quick glance at the market will reveal more commercial products than can possibly be imagined. There are three basic elements you should bear in mind when making your choice:

1. **Most phytomolecules are volatile**. As such, unprotected products will soon evaporate if left exposed to the open air – as it happens, for instance, with feed prepared in commercial farms. Microencapsulation is therefore essential.
2. **There are countless phytomolecules.** Consequently, finding the right mix for the task required is essential, as not all mixtures will get you the desired result. When designing a phytomolecule mix, the manufacturer must have the necessary knowledge and experience to achieve the desired result.
3. **Phytomolecules are powerful.** This is to say that you cannot just keep adding higher quantities to achieve a better result. Finding the exact inclusion rates for the right purpose is a difficult balancing exercise.

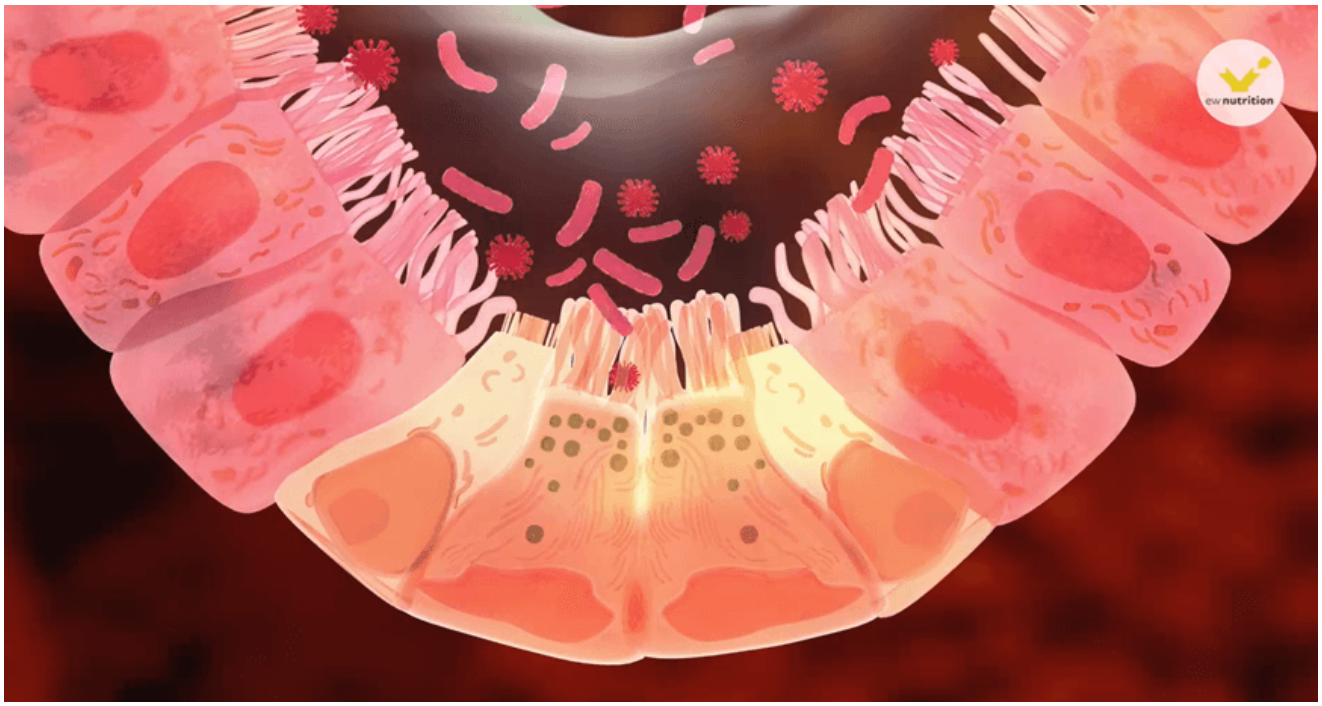
In fact, the right protection, the right mix and the right inclusion rates must be combined to ensure that the animals do not refuse the feed (worst case scenario) or just fail to benefit from the inclusion of phytomolecules.

Among the feed additives, phytomolecules (or secondary plant compounds) stand out as a class of active ingredients that may help to improve gut health and thereby reduce the use of antibiotics. Synthesized by plants as a defense mechanism against pathogens, phytomolecules promote the digestion of feed ingredients (Zhai et al. 2018), prevent loss of gut integrity during enteric challenges (Liu et al. 2018), and have antimicrobial properties that hinder the growth of potential pathogens (Chowdhury, 2018). Phytomolecules can prevent the overgrowth of opportunistic pathogens, thereby reducing the frequency of occurrence of diseases such as necrotic enteritis and dysbacteriosis and thus improve performance data such as daily weight gain and feed efficiency.

Beyond the phytomolecules' proven effects, what works best in supporting the health and welfare of your

animals is, in fact, a holistic program (such as those offered by EW Nutrition) that consists of an effective combination of innovative products and consultancy services in the fields of gut health, nutrition, AMR monitoring, and biosecurity management.

**This article is available in Dutch.*



New distribution partnership with Russian key player in poultry feed additives

VITOMEK

Moscow – September 18, 2019 – VITOMEK and EW Nutrition are pleased to announce that they have signed a distribution partnership agreement, combining the accumulated knowledge, experience, and effective solutions in the field of animal nutrition at VitOmek with a portfolio of comprehensive programs, innovative products, and services from EW Nutrition.

Dmitry Chudakov, General Director, VitOmek: “The partnership agreement with EW Nutrition has become an important event for us and another milestone on the road to success. We are pleased that our new partner is a company with many years of experience in the animal nutrition industry. We are confident that our scientific and technical potential, in conjunction with the valuable experience of the partner, will bring rich benefits in the form of joint development, creation of unique products and services, and the implementation of even more ambitious projects. Our philosophy: “Focus on high results. Give shape to courageous ideas in the final product. ”

VitOmek is one of the largest Russian producers of agricultural feed and feed additives, offering comprehensive, effective solutions for agricultural holdings and small enterprises in the poultry and livestock sector. The company’s range of services includes technological, veterinary and engineering support of farms, audit and consulting on microclimate and animal welfare.

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Pavel Vladimirovich Bogatkin, General Director, EW Nutrition Russia: “We are very pleased to cooperate with VitOmek. Years of experience in the market, as well as great resources and coverage, making them an excellent ally in our common efforts. In addition to a similar market development philosophy, we see for ourselves a similar mission: mitigating the effects of antimicrobial resistance by providing comprehensive solutions in the field of animal feeding, toxin risk management, and young animal nutrition. Achieving these goals ultimately helps to increase the effectiveness of human healthcare. ”

EW Nutrition researches, develops, manufactures, markets, and services its products and programs around the world. Headquartered in Germany, EW Nutrition’s manufacturing facilities are located on 4 continents. Innovation is carried out by our own research laboratories in Germany, with development centers in 5 major animal nutrition markets. EW Nutrition is active worldwide, with its own staff in 27 countries. Our slogan, “Functional Innovations Backed by Science,” is being implemented through technical support at the local, regional, and global level.

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This press release is available in Russian here.

EW Nutrition Opens New Production Plant in China

Press Release

EW Nutrition Opens New Production Plant in China

On 29 October, German-based company EW Nutrition will officially open its new production plant in China. The new plant is the next step in the successful development of EWN Biotechnology Shanghai.

By offering holistic, science-backed solutions, EW Nutrition supports the Chinese industry in its effort to reduce antibiotic use. “With this latest investment,” says Craige Allen, General Manager, EWN Biotechnology Shanghai, “we are offering a twofold benefit to our Chinese customers: bringing our high-value products closer to the end-user, while implementing our policy of supporting antibiotic-free production in China.”

The new facility in Haimen will produce the three leading product lines in the company’s portfolio. They represent EW Nutrition’s answer to gut and respiratory health issues, as well as toxin risk management. “We are pleased to bring our programs closer to our customers, further increasing service levels,” says Michael Gerrits, Managing Director, EW Nutrition. “But we are even more pleased and honored to bring here our mission of mitigating the impact of antimicrobial resistance by providing comprehensive animal nutrition solutions.”

The virtual opening will take place at the Melia Hotel in Shanghai, to be followed by a one and a half-day symposium on “Reducing Antibiotic Use and Mitigating the AMR Risk – 2020 Vision”. Speakers include Prof. Chen Junshi, Prof. Jia Yanxiong, Prof. Suwit Chotinun, as well as other prestigious national and international guests.

About EW Nutrition

EWN Biotechnology Ltd. is the Chinese arm of EW Nutrition, an international animal nutrition company that offers integrators, feed producers, and self-mixing farmers comprehensive animal nutrition solutions for antibiotic reduction, young animal nutrition, toxin risk management and more.

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