Salmonella control through the Feed to Food chain

KEMIN®

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We aim to support you in producing *Salmonella* free poultry products and thereby contribute to the 'One Health' concept. With our knowledge, expertise and a complete solution offering, we are flexible and adapt ourselves to your specific situation or challenge. We have tailored our solutions around these key resources, to offer a combination of synergistic ingredients, optimal application, monitoring and data collection with big data analytics. When integrating our solutions into your business, we aspire to create a powerful combination, with optimal results, based on data-driven decisions.

At Kemin, it is our priority to partner with you, to help you control *Salmonella* spp with a comprehensive approach with solutions that have demonstrated success worldwide.

Salmonella spp transmission threatens Food Safety and One Health

Contamination of foodstuffs by harmful bacteria can lead to serious foodborne illnesses and can be life threatening. Salmonellosis is an important foodborne illness caused by various serovars of non-host adapted paratyphoid *Salmonella,* leading to morbidity, mortality and economic loss. The most common *Salmonella* serovars associated with poultry meat and egg products are *Salmonella* enterica Enteritidis and Typhimurium, but other serovars such as Hadar, Infantis, Virchow or Kentucky are becoming a growing concern. The most frequent serovars reported in human salmonellosis in the EU are Enteritidis, Typhimurium, Infantis and Derby. All of which are reported in feed, animals and humans.

Our role is to support you in producing *Salmonella* free poultry products and thereby contribute to the One Health concept by limiting transmission of zoonotic agents from feed to birds and then to humans. To achieve this goal, we offer you an integrated feed to farm approach with the help of the Sal CURB® and FormaXOL™ solutions.

The challenge of controlling *Salmonella* spp

There are several reasons why poultry flocks are particularly prone to carrying *Salmonella* spp.

Firstly, feed ingredients and compound feed can be contaminated with *Salmonella* during handling, processing, storage and transport, or by other factors coming from the environment. Oil seed meals and fish derived proteins are the major risk feed materials for introducing *Salmonella* contamination into EU feed mills and industrial compound feed.

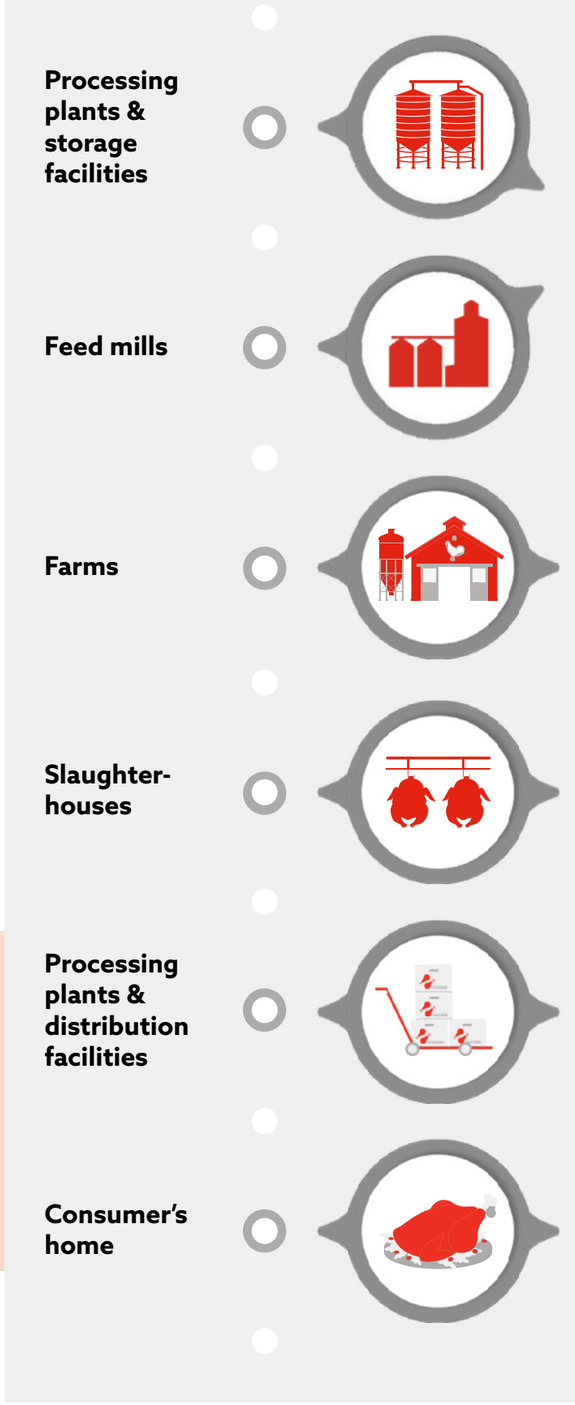
Animals can become infected via contaminated feed, drinking water, and the environment. There is increased susceptibility to *Salmonella* infection in young animals and in those under digestive stress, production stress or suffering from disease. Animals may also become directly infected from other *Salmonella*-infected animals. Occasionally animals can show clinical disease but the major outcome is asymptomatic carriage.

Transmission of *Salmonella* from animal feed to animals consuming the feed, and to food products derived from the animals has been shown by EFSA.

Secondly, birds have developed a tolerance towards intestinal infections from this bacterium. Unlike many other animals, the inflammatory reactions activated by the birds' immune system after exposure to *Salmonella* spp. rapidly temper before the pathogen is eliminated.

This can lead to persistent asymptomatic infection of the intestinal tract, which allows *Salmonella* spp. to survive and proliferate in the intestine without being detected in birds. As a consequence, birds are not able to weed out *Salmonella* spp. on their own and need support to be able to do so.

All these factors favour contamination, carriage, and shedding, which are leading causes of horizontal and vertical transmission of *Salmonella* spp. within farms and along the feed to food value chain.



Four Essential Interventions

1. Controlling environmental contamination

Control environmental contamination of the feed chain by reducing microbial contamination within the environment.

Sal CURB cyclic application solutions

2. Pathogen control in feedstuffs

Control microbial contamination level by pathogen reduction or by inhibiting the pathogen growth.

Sal CURB application solutions with liquids.

3. Pathogen control in animal populations

Reduce the flock prevalence of *Salmonella* and other pathogenic microorganism.

FomaXOL delivers its active ingredients in the intestinal tract to target sites where undesired enterobacteria such as *Salmonella* spp. reside.

4. Prevention of carcass contamination

Reducing carcass contamination at the slaughterhouse level is possible by reducing *Salmonella* prevalence in poultry flocks.

FormaXOL supports this goal by reducing on farm *Salmonella* farm prevalence and by reducing intestinal contamination and shedding.

Kemin's feed to farm solutions to control *Salmonella* spp

At Kemin, it is our priority to partner with you, to help you control *Salmonella* spp with a comprehensive approach with solutions that have demonstrated success worldwide:

Sal CURB®

An antimicrobial with a unique and synergistic combination of powerful compounds

The application of Sal CURB to kill bacterial pathogens in animal feeds is a well-established practice worldwide. Sal CURB involves interventions in oilseed extraction and rendering plants, feed mills, storage facilities, farms, transport vehicles, and/or equipment.

Treatment of feed ingredients and compound feed with Sal CURB is effective in controlling contamination from *Salmonella* spp. and other pathogenic organisms. Sal CURB reduces the counts of *Salmonella* and prevents re-contamination, providing a long-lasting protection from microbial growth. Consequently, it will reduce the number of human cases of salmonellosis.

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Efficacy of Sal CURB under field and lab conditions:

In two technical documents, we looked at the efficacy of Sal CURB Ba under field and lab conditions.

In the field conditions, we saw that the application of Sal CURB Ba to naturally infected feed materials reduced the contamination, one week after treatment with reference to the untreated control.

The experimental lab data demonstrated the antimicrobial efficacy of Sal CURB Ba on artificially contaminated wheat and broiler feed.

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FormaXOL™

A non-antibiotic solution, supported by its encapsulation technology and empowering synergism between its ingredients, to manage *Enterobacteriaceae* (e.g. *Salmonella*)

Is a doubly microencapsulated product that uses the synergism of functional flavours (cinnamaldehyde, orange terpenes, thymol, eugenol, carvacrol and capsicum oleoresin) and organic acids (formic acid and citric acid) to control *Salmonella* spp in the animals. The functional flavours will damage the gram-negative bacterial cell wall and facilitate the entrance of the organic acid within the bacteria, resulting in bacterial death.

Non-antibiotic solutions can have a crucial role in reducing intestinal carriage and farm prevalence of *Salmonella* spp., both in breeding or commercial poultry flocks. Results consistently demonstrate a reduction of carriage in the intestinal tract of infected birds by up to 2 $\log^{10}$ cfu per gram of content as well as a reduction of the percentage of positive analyses. By doing so, FormaXOL can mitigate the risks of contamination of poultry products.

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Efficacy of FormaXOL:

The aim of this trial was to evaluate the efficacy of FormaXOL to reduce *Salmonella* colonization and shedding in infected broilers.

In our document we take a closer look at the efficacy of FormaXOL to control *Salmonella* prevalence in infected broilers.

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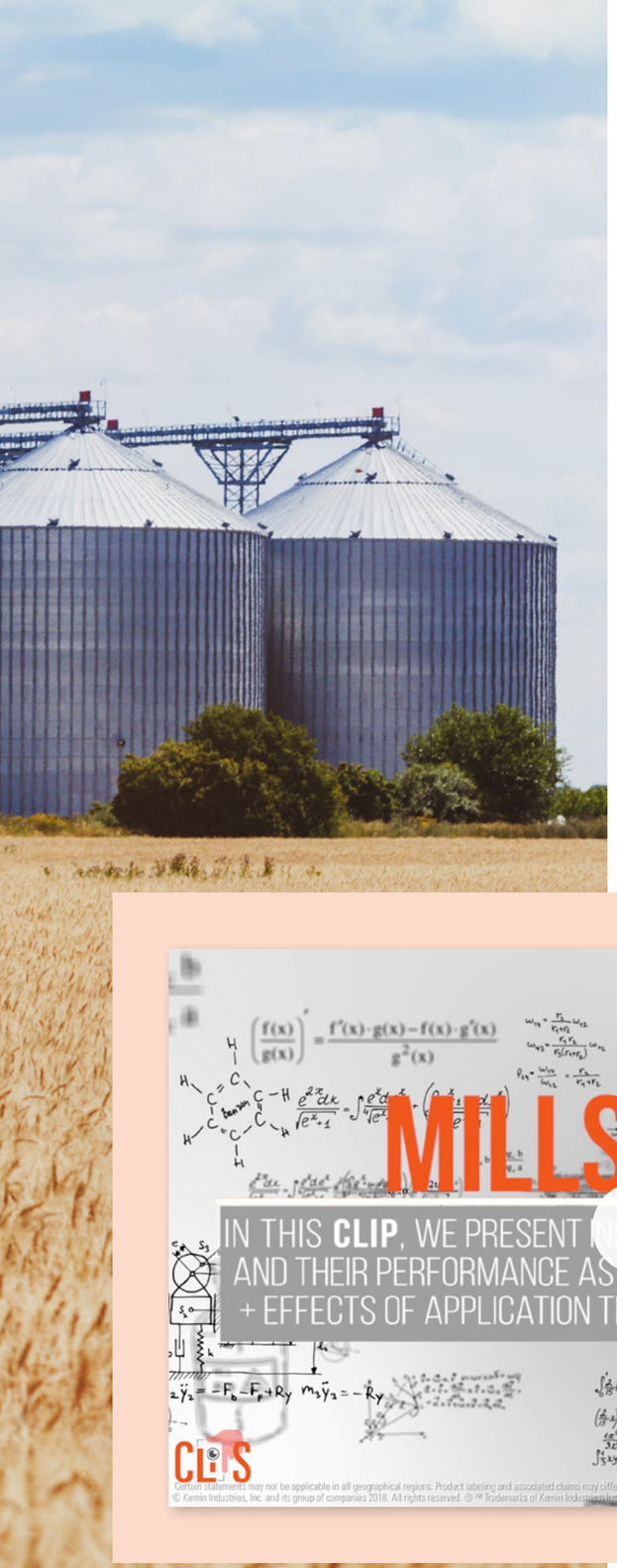
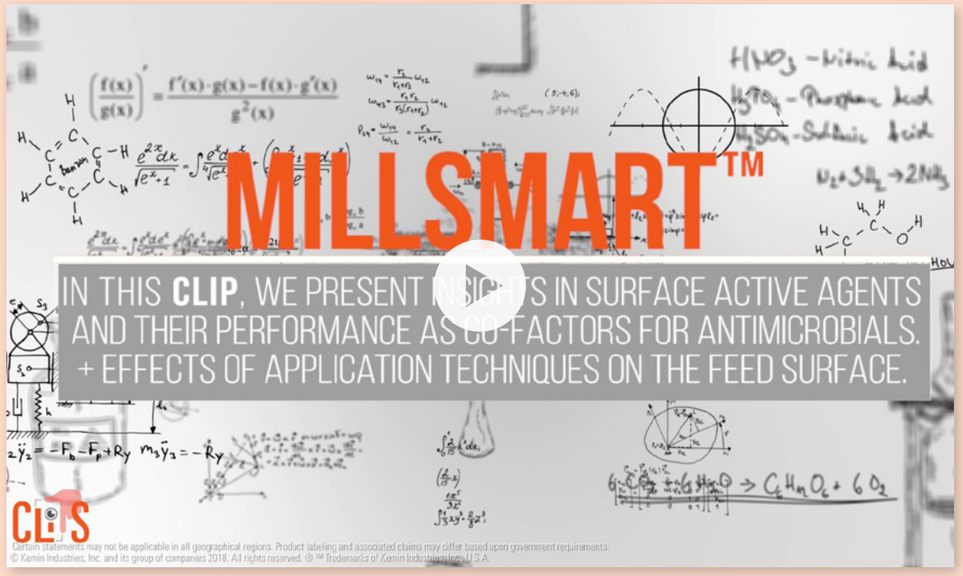


Our services dedicated to *Salmonella* control

To ensure a profitable and sustainable business, thorough technical knowledge and understanding of available supportive tools is imperative. That's why Kemin not only offers highly efficient, science-based solutions to help you manage this intense challenge, but also close, tailormade services. To build a successful mitigation strategy, we support you with excellent technical expertise, necessary research insights, with long-term guidance and training opportunities. Kemin's team can help you to design an appropriate strategy.



The effective implementation of HACCP, biosecurity measures and GMP/GHP procedures throughout the feed to food chain is crucial, to ensure *Salmonella* contamination and recontamination is prevented, in order to secure feed safety and animal health. The interventions aligned with these measures and procedures are supported by a team of experts, to tailor a *Salmonella* monitoring and control programme. These effective feed safety and animal health risk assessments should ensure that the corrective actions within the monitoring programme are preventing *Salmonella* re-contamination throughout the value chain.

The three critical Kemin services include customer laboratory monitoring, application engineering technology and technical support.

CUSTOMER LABORATORY SERVICES (CLS)

The Customer Laboratory Services (CLS) ensure that representative sampling techniques are adopted. That a thorough risk assessment is conducted through feed mill audits coupled with a comprehensive list of possible laboratory analyses. Tailored protocols and kill-off trials are an additional option for more specific dosage application recommendations. The efficacy monitoring is done continuously, and the results and data are logged and benchmarked with raw materials and feed received from all regions of EMENA.

KEMIN APPLICATION SERVICES (KAS)

The Kemin Application Services (KAS) form part of the efficacy and performance of the antimicrobial products applied. The challenge in feed safety is not only preventing contamination and re-contamination but also directly targeting the unsafe feed material. This is especially a challenge as *Salmonella* is distributed heterogeneously. The application equipment utilizes advanced nozzle application technology to ensure that the product is applied as a low surface tension dispersing solution, to ensure that smaller droplets that are sprayed from the nozzles, cover a larger surface area, getting maximum coverage. This ensures spreading and penetration of the applied antimicrobial. The product is therefore homogenously applied, securing feed safety and reducing *Salmonella* risks.

TECHNICAL SUPPORT SERVICES

The technical support services are comprised of industry experts in feed processing, feed safety and animal health, offering support, recommendations and guidelines that align with the biosecurity programmes, offering practical and tailor-made expert advice.

Want to know more?

VISIT OUR WEBSITE:

- *Salmonella* spp transmission threatens Food Safety and One Health
- FormaXOL, Kemin's non-antibiotic solution for *Enterobacteriaceae* management
- Sal CURB, kill bacterial pathogens in animal feeds
- Kemin's Customer Laboratory Services, our tailored scientific support
- Kemin Application Solutions, tailored engineering services and solutions to optimize your production process

READ MORE:

- Antimicrobial efficacy of Sal CURB® Ba under field conditions
- Antimicrobial efficacy of Sal CURB® Ba under lab conditions
- Efficacy of FormaXOL™ to control *Salmonella* prevalence in infected broilers

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