Salmonella control: it is everyone's job from the farm to the consumer

Salmonella is one of the biggest threats to food safety worldwide. These pervasive and tenacious bacteria species are among the top four causes of foodborne diseases that affect 500 million people globally each year. Salmonella control is critical to prevent disease and maintain consumer trust in the food supply.

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Although salmonella is prevalent in many types of foods, controlling the pathogen is particularly challenging in meat and poultry products due to the multiple points of contact. A multi-hurdle and multi-technology approach is critical to control salmonella at every step from farm to consumer.

Farmers and processors share responsibility to deliver consistently safe products that are free from salmonella contamination. It is important to understand the critical control points to prevent salmonella contamination in the food chain.

Live operation strategies

The food safety continuum starts on live animal operations. Reducing salmonella contamination on the farm translates to birds and animals carrying lower pathogen loads into the processing facility. The lower the incoming load, the better the chances of controlling the pathogen with in-plant interventions.

That is why every poultry and livestock operation should follow food safety practices on the farm.

Salmonella control is troublesome on live operations because infected animals shed the bacteria into the environment, often without exhibiting disease symptoms.

Animals can contract salmonella at any point in their lives and become asymptomatic shedders.

Vertical transmission remains a critical concern at all stages of production with potential for a continuous cycle of infection and reinfection.

Poultry operations are at particular risk of vertical transmission due to the high prevalence of salmonella.

On the farm, salmonella reduction strategies must include biosecurity to prevent introduction of salmonella into the operation, along with proper hygiene to reduce exposure and transmission from bird to bird and animal to animal.

Salmonella control on the farm is complicated by the meat industry's move toward antibiotic-free production in response to marketplace demands. However, research shows that feeding strategies may help birds and animals become more resilient against salmonella without using antibiotics.

Treatment	Pullet 16 weeks	Lay 45 weeks
Control	19.9	33.75
RFCs	15.7	20.00

Table 1. The effect of treatment on salmonella presence in layers (%).

Feeding for resiliency against salmonella

The gut is the primary target for disease-causing pathogens. Exposure to pathogens causes immunity to falter and leaves animals susceptible to a range of diseases and opportunistic bacteria. Promoting a healthy gut lining is vital to make birds, pigs and cattle more resilient against challenges from salmonella and other harmful pathogens.

Research shows that livestock and poultry farmers can protect the gut by feeding

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Fig. 1. The effect of treatment on the prevalence of salmonella in breeder hen caeca (%).

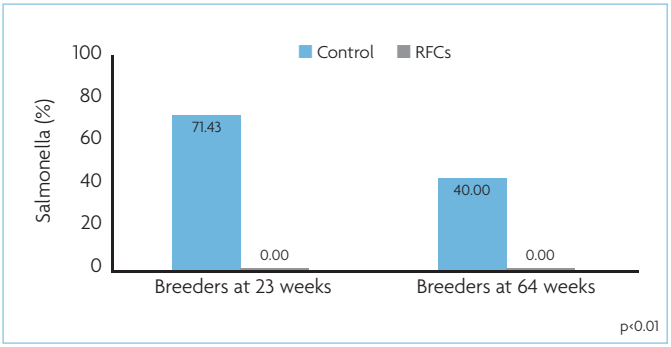
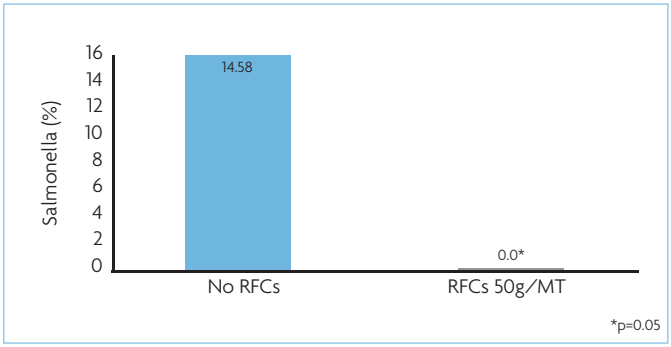


Fig. 2. The effect of treatment on the incidence of salmonella presence in broiler litter (%).



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Refined Functional Carbohydrates (RFCs) in CELMANAX to support beneficial bacteria in the animal's digestive system and block pathogen attachment sites in the gut.

Research trials at poultry production facilities demonstrate that RFC supplementation can reduce prevalence of salmonella in birds' digestive systems (Fig. 1) and prevent pathogen shedding into the litter (Fig. 2). Reducing salmonella presence helps to reduce bacterial transmission between animals and lower the overall pathogen load at harvest.

Incorporating RFCs into rations is also effective in reducing salmonella in layer operations. In a commercial trial involving four houses with 60,000-90,000 hens per house, feeding RFCs reduced the prevalence of salmonella in birds at 16 weeks and 45 weeks (Table 1).

Pathogen reduction through processing

As animals leave the farm and move to processing, it is important to monitor pathogen loads and establish a baseline level of salmonella and other pathogens entering the facility. The lower the incoming load, the greater likelihood that in-plant interventions will be effective in meeting performance standards for salmonella.

Standards for salmonella in food products continue to evolve in many countries as the industry works to protect public health. In addition to resulting in fewer cases of foodborne illness, higher standards may also reduce processors' risk of potential financial loss or damage to their brands due to recalls or outbreaks due to salmonella.

To meet standards for salmonella and other contaminants, processors need to establish a food safety programme with a multi-hurdle, multi-technology approach to reduce bacterial presence.

Plant managers have a variety of tools and technologies at their disposal to reduce, eliminate and control pathogens during meat and poultry processing. To effectively control salmonella, it is important to incorporate these technologies at the right point of intervention in the plant.

Salmonella-reducing technologies

A variety of antimicrobial interventions can aid in the fight against salmonella. An important consideration is to select complementary technologies that are effective in a multi-hurdle approach at various points in the plant, including chill tanks, inside-outside bird washers (IOBW), dip tanks and spray applications.

Post-harvest antimicrobials such as DBDHM (1,3-Dibromo-5,5-dimethylhydantoin) can be applied directly to carcases to reduce salmonella presence.

One commercial pork facility reduced salmonella surrogates by spraying carcases with DBDHM as well as a spray chill application. The DBDHM application also reduced total plate count, adding five days to product shelf life.

When selecting antimicrobial solutions for postharvest, processors must ensure the product does not affect the colour or flavour of the meat or poultry product. Another consideration is worker safety and the environment. Antimicrobials used during processing should be safe to handle and be free of negative wastewater impacts.

New phage technologies are promising tools to bolster existing antimicrobial interventions in poultry operations. In one US study, phage technology lowered salmonella prevalence to 17.8% in ground turkey.

Host-specific phages replicate within a targeted bacterium, such as salmonella. When the phages encounter salmonella, they attach to a specific receptor on the cell surface and begin to replicate rapidly until the host cell wall bursts and new phages are released to seek and destroy other salmonella cells. Phages are only active in the presence of the host cell salmonella, and naturally degrade without the host cell.

Joining the salmonella fight

Following food safety practices on the farm is the first step in the fight against salmonella, leading to more effective pathogen control at the processor level. As food safety standards continue to become more stringent, taking a full food chain approach with interventions from farm through processing can help the industry mitigate salmonella risks, while positively impacting bottom lines. ■

References are available on request: steven.larsen@churchdwight.com