Salmonella: how do we maintain freedom in our poultry flocks?

Today a few broiler primary breeding companies supply the majority of broiler breeding stock to producers of broiler meat products around the world. These companies have multifaceted balanced selection programs that produce a range of genetic lines to meet the evolving needs of both producers and consumers.

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Breeding companies have a leading role in the continuous evolution of the industry and, as a result, commit extensive resources to maintain the highest standards of health.

Increasingly demanding regulatory and customer requirements oblige primary breeders to operate under the strictest biosecurity and health monitoring programs in the industry.

Definition of biosecurity

Biosecurity is defined as a program comprised of policies and practices designed to prevent the introduction and spread of infectious pathogens.

The implementation of theory into practice is embodied by the breeding companies' efforts to prevent and control salmonella infections.

Initially, poultry breeding stock was required to be free of host specific salmonella species such as S. pullorum and S. gallinarum.

Over the years, these requirements were expanded to include freedom from additional species capable of causing food borne problems such as S. enteritidis, S. typhimurium, S. infantis, S. hadar, S. heidelberg, S. newport and S. virchow (EU regulations).

Today, the primary breeders' goal is to supply breeding stock free of all salmonella species, and this has become a requirement by producers of poultry products as part of their actions to safeguard food safety.

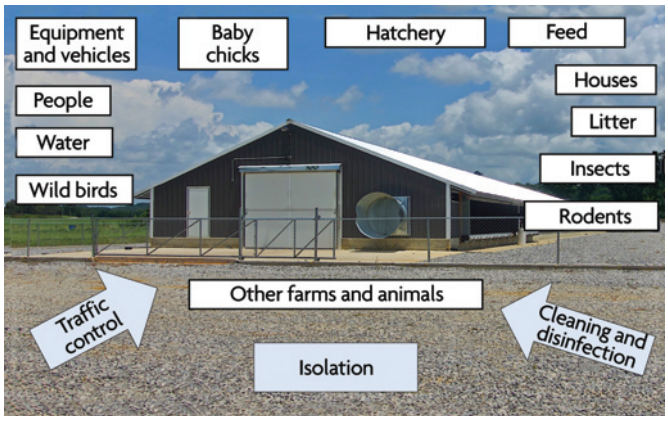


Fig. 1. Identification of potential sources for the introduction of salmonella and procedures to design an effective biosecurity program.

One of the goals of the primary breeders is to maintain breeding programs free of salmonella and other transmissible pathogens by preventing their introduction into farms, hatcheries and feed mills.

This is accomplished by establishing robust and comprehensive biosecurity programs comprised of well-defined physical barriers and operational practices to minimise or eliminate the risk posed by all known or suspected sources of salmonella infections. Identification of potential sources and the establishment of procedures to suppress them, along with isolation, traffic control, and cleaning and disinfection procedures, are essential to design and implement an effective biosecurity program (Fig. 1).

A comprehensive approach

The development of a comprehensive and effective biosecurity program includes a series of requirements and management policies that include the following components:

- Conceptual (suitable, isolated farm and hatchery locations).
- Structural (construction specifications, fencing, controlled access gates).
- Operational (day to day procedures prior to entering the farm, hatchery and while in contact with live birds).
- Cultural (requirements for employment and contract growing, education, training, goal setting, auditing, recognition).

These biosecurity components (see Fig. 2) and their implementation are critical for success.

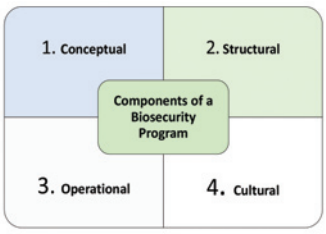
A program requires commitment at all levels and has financial implications.

The high value of the breeding stock provides justification for significant investments in facilities and procedures to ensure the highest levels of biosecurity.

Likewise, strict operational and flock monitoring expenses become part of the normal operational costs.

Continuous education and training of all employees and contract growers are essential to create a strong culture of biosecurity and promote commitment and compliance.

Fig. 2. The components of a comprehensive and effective biosecurity program.



People management

Human traffic onto farms represents a significant risk for salmonella introduction.

Authorised personnel and visitors must comply with company policies to avoid indirect contact with other flocks, farms, and livestock operations.

All personnel must be educated and required to comply with mandatory procedures (i.e. shower-in and shower-out, changing into clean farm clothing and footwear) to avoid the introduction of salmonellas and other pathogens.

Rodent and pest control

Rodents and insects are major vectors of many pathogens including salmonellas. Larvae and adult darkling beetles (Alphitobious diaperinus) can carry many different salmonella serotypes. Darkling beetles are common vectors in the reintroduction of salmonellas to chicken houses following cleaning and disinfection.

A pest control management team is required to maintain close surveillance and react promptly when problems are detected.

Identifying and monitoring pest levels or activity, altering habitats (ensuring no water or feed are available), baiting, trapping, sampling, etc, are tasks performed by trained pest control specialists.

Isolation from wild and other farm animals

All warm and cold-blooded animal species can be potential carriers of salmonella.

Environmental monitoring has demonstrated the presence of salmonellas in droppings of wild birds, rats, mice, raccoons, skunks, opossums, frogs and reptiles.

Field experiences have also shown the salmonella risk posed by cattle, sheep, and goats grazing or confined in close proximity to chicken houses. For these reasons, farms and houses must be constructed to prevent

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entrance of wild birds and other animals. All animals, including pets are banned from breeding farms.

Feed and manufacturing process

Feed is one of the most common sources of salmonella. Salmonellas found during monitoring of feed mills and feed ingredients could be eventually detected in breeder flocks and their offspring. A meticulous manufacturing process reduces the risk of salmonella introduction through biosecurity practices in combination with thermal and chemical treatments.

Feed mills must be designed to prevent the introduction of rodents, wild birds, and insects that might contaminate ingredients or the finished product. In addition, there must be complete separation between clean (biosecure finished-feed) and not-clean (non-biosecure feedstuffs) areas.

Stringent rules for personnel, visitors, and vehicles are also critical to avoid cross contamination. From an enclosed storage and loading area, finished feed must be delivered to farms by dedicated and clean transport vehicles.

Water sanitation and management

Non-potable drinking water and/or surface water can be a source of salmonella. Chlorination (3-5ppm) and other methods of water sanitation are used to minimise the risk of exposure. Water pH (‹6) can enhance the effectiveness of chlorine and other water sanitising agents and promote the growth of normal gut microflora.

Water activity in the litter has an effect on the level and survival of salmonella and other pathogenic bacteria. Water management programs and closed drinking systems, along with proper ventilation, help reduce moisture levels and lessen the risk of survival and proliferation of salmonellas.

House cleanout and disinfection

House cleanout and disinfection procedures (inside and outside) are an integral part of the biosecurity program. These procedures are required between growing cycles to eliminate or reduce the concentration of salmonellas and other pathogens that may infect subsequent flocks.

To achieve salmonella freedom all baby chicks and/or pullet flocks must be placed in an environment free of salmonella. The effectiveness of cleaning and disinfecting procedures must be routinely evaluated by routine sampling and laboratory testing procedures.

Only new bedding material, heat-treated and stored in a dedicated rodent and bird proof facilities and transported in clean and disinfected vehicles, is used. Bacteriological monitoring of new bedding material has proven to be valuable in avoiding the introduction of salmonella and mould.

Hatchery

Chicks can be exposed to salmonella in the hatchery, either by exposure to infected hatch-mates or from environmental contamination. Therefore, robust hatchery biosecurity and effective cleaning and disinfection procedures are indispensable.

Single stage incubation provides a higher degree of biosecurity as it allows the segregation of hatching eggs and chicks sourced from flocks that may be quarantined following health monitoring procedures.

Stringent biosecurity, along with a proper flock and progeny tracking system, reduces the risk of horizontal transmission during the hatching and chick servicing process.

Separation and traffic control between clean (finished feed on the left side) and non-clean (ingredient receiving and milling on the right side) areas of the feed mill.

Vaccination and other interventions

An effective biosecurity program is the first and most important barrier to protect valuable breeding stock. Vaccination and other interventions are only supplements to a biosecurity program.

Vaccination has been used strategically to protect at-risk flocks, reduce shedding, and prevent vertical transmission. Inactivated salmonella vaccines formulated against specific serotypes (autogenous bacterin) have shown benefits in breeder flocks and their offspring.

Live salmonella vaccines could provide some protection against specific salmonella species. They may also prime the immune system resulting in a better response to bacterins.

Antimicrobial treatment programs are becoming less effective at reducing environmental shedding and egg transmission of salmonella. If used, success is dependent on two factors: selection of the most appropriate antimicrobial treatment (in an era of less products available) and moving the treated flock to a clean house so the flock is not re-exposed to environmental contamination.

Healthy gut flora has shown some protection against colonisation by salmonellas and other pathogenic bacteria. Bacteria such as Lactobacillus spp. and Bacillus spp. (probiotics) have been used to maintain a healthy intestinal flora. Additionally, organic acids, phytobiotics, and nutraceuticals have been used to promote normal gut flora and inhibit colonisation by salmonella.

Monitoring

A comprehensive farm monitoring system for salmonella is essential to maintaining the effectiveness of routine biosecurity and hygiene practices at many different points of the breeding program and to assess the salmonella status of flocks and their progeny.

Routine environmental and baby chick monitoring at the hatchery also provides a useful indicator of the salmonella status of a breeding program. ■

Sample collection and testing protocols used can be found in the Program Standards of the USDA – National Poultry Improvement Plan www.poultryimprovement.org