CHAPTER 6.5.
PREVENTION, DETECTION AND CONTROL OF SALMONELLA IN POULTRY

Article 6.5.1.

Introduction

This chapter provides recommendations on the prevention, detection and control of Salmonella in poultry.

Salmonellosis is one of the most common food-borne bacterial diseases in the world. The great majority of Salmonella infections in humans are food-borne with Salmonella Enteritidis and Salmonella Typhimurium accounting for a major part of the problem. Salmonella serotypes and prevalence may vary considerably between localities, districts, regions and countries and therefore, surveillance and identification of the prevalent Salmonella serotypes in humans and poultry should be carried out in order to develop a control programme for the area.

In most food animal species, Salmonella can establish a clinically inapparent infection of variable duration, which is significant as a potential zoonosis. Such animals may be important in relation to the spread of infection between flocks and as causes of human food-borne infection. In the latter case, this can occur when meat and eggs, or their products, enter the food chain thus producing contaminated food.

Article 6.5.2.

Purpose and scope

This chapter deals with methods for on farm prevention, detection and control of Salmonella in poultry, and complements the Codex Alimentarius Code of Hygienic Practice for Meat (CAC/RCP 58-2005), Code of Hygienic Practice for Eggs and Egg Products (CAC/RCP 15-1976) and Guidelines for the control of Campylobacter and Salmonella in chicken meat (CAC/GL 78-2011). A pathogen reduction strategy at the farm level is seen as the first step in a continuum that will assist in reducing the presence of food-borne pathogens in eggs and meat.

Hygiene and biosecurity procedures to be implemented in poultry farms and hatcheries are described in Chapter 6.4. on Biosecurity Procedures in Poultry Production.

The recommendations presented in this chapter are relevant to the control of all Salmonella with special attention to S. Enteritidis and S. Typhimurium, as these are common Salmonella serotypes in many countries. It should be noted that the epidemiology of animal and human salmonellosis in a particular locality, district, region or country is important for effective control of Salmonella.

Article 6.5.3.

Definitions

**Breeders:** means poultry destined for the production of fertile eggs for incubation for the purpose of producing day-old birds.

**Competitive exclusion:** means the administration of defined or undefined bacterial flora to poultry to prevent gut colonisation by enteropathogens, including Salmonella.

**Culling:** means the destruction or slaughter of a flock before the end of its normal period.

**Layers:** means poultry during the period of laying eggs for human consumption.
Article 6.5.4.

Surveillance of poultry flocks for Salmonella

Where justified by risk assessment, surveillance should be carried out to identify infected flocks in order to take measures that will reduce the prevalence in poultry and the risk of transmission of *Salmonella* to humans. Sampling methods, frequency and type of samples required should be determined by the Veterinary Services based on a risk assessment. Microbiological testing is preferred to serological testing because of its higher sensitivity in broiler flocks and higher specificity in breeder and layer flocks. In the framework of regulatory programmes for the control of *Salmonella* in poultry and salmonellosis in humans, confirmatory testing may be required to exclude false positive or negative results.

1. Available methods for sampling

   Drag swabs: sampling is done by dragging swabs throughout the poultry house.

   Boot swabs: sampling is done by walking throughout the poultry house with absorbent material placed over the footwear of the sampler.

   Dust samples: sampling is done by collecting dust from exhaust fans, screens and other equipment in the poultry house.

   Faecal samples: multiple fresh faecal or caecal samples collected from different areas in the poultry house or caecal samples collected at the slaughterhouse/abattoir.

   Meconium, chick box liners, dead in shell and culled *day-old birds* at the hatchery.

   Hatchery samples: throughout the hatchery, including inside the incubators.

2. Sample size

   Refer to the Terrestrial Manual.

3. Laboratory methods

   Refer to the Terrestrial Manual.

4. Time and frequency of testing

   Time and frequency of sampling for each poultry type are listed below:

   a) Breeders and hatcheries

      i) Breeder flocks before lay

         - Before the end of the first week of life when the status of the breeder flock or the hatchery is not known or does not comply with this chapter.

         - Within the four weeks before being moved to another house, or before going into production if the birds will remain in the same house for the production period.

         - One or more times during the growing period if there is a culling policy in place. The frequency would be determined on commercial considerations.
ii) Breeder flocks in lay
   – At least at monthly intervals during the laying period.
   – Additional testing should be determined by the Veterinary Services.

iii) Hatcheries
   – Testing at hatcheries should complement on-farm testing.
   – The minimal frequency should be determined by the Veterinary Services.

b) Poultry for the production of eggs for human consumption
   i) Flocks grown to be layers
      – Before the end of the first week of life when the status of the breeder flock or the hatchery is not known or does not comply with this chapter.
      – Within the four weeks before being moved to another house, or before going into production if the birds will remain in the same house for the production period.
      – One or more times during the growing period if there is a culling policy in place. The frequency would be determined by commercial considerations.

   ii) Layer flocks
      – At expected peak of lay for each production cycle (the period of time in the laying cycle when the production of the flock is highest).
      – One or more times if there is a culling policy in place or if eggs are diverted to processing for the inactivation of the pathogen. The minimal frequency should be determined by the Veterinary Services.

   c) Poultry for the production of meat
      i) Flocks should be sampled at least once.
      ii) When sampling occurs on farms and when there is a long period (two weeks or more) between thinning and final depopulation, further testing should be considered.
      iii) When sampling occurs on farms, flocks should be sampled as late as possible before the first birds are transported to the slaughterhouse. In order to allow for the implementation of control measures during processing, this should be done at a time that ensures the results are available before slaughter.

      Whether sampling occurs on the farm, which is more appropriate for consequent control measures, or at the processing plant, there should be an integrated system in place which allows for investigation of the source of positive flocks.

   d) Testing of empty poultry houses

Bacteriological monitoring of the efficacy of disinfection procedures is recommended when Salmonella have been detected in the previous flock.

As appropriate, sampling of equipment and surfaces as well as boot swabs or drag swabs of the empty poultry house should be carried out after depopulation, cleaning and disinfection.
Results from *surveillance* may lead to the implementation of additional prevention and control measures to reduce the risk of transmission of *Salmonella* to humans:

1) In breeders, control measures may be implemented to reduce the transmission of *Salmonella* to the next generation, especially for trans-ovarian transmitted serotypes such as *S. Enteriditis*.

2) In layer *flocks*, control measures will reduce and may eliminate contamination of eggs with *Salmonella*.

3) In poultry for *meat* production, control measures may be implemented at *slaughter* or further down the food chain.

**Article 6.5.5.**

**Prevention and control measures**

*Salmonella* prevention and control may be achieved by adopting Good Agricultural Practices and Hazard Analysis Critical Control Point (HACCP) *principles*, and general measures detailed in Chapter 6.4. on Biosecurity Procedures in Poultry Production, in combination with the following additional measures, where appropriate. No single measure used alone will achieve effective *Salmonella* control.

Additional prevention and control measures include *vaccination*, competitive exclusion, use of organic acids, culling and product diversion to processing.

*Antimicrobial agents* should not be used to control *infection* with *Salmonella* in poultry because the effectiveness of the treatment is limited, may mask the *infection* at sampling, has the potential to produce residues in *meat* and eggs and can contribute to the development of antimicrobial resistance. *Antimicrobial agents* may also reduce normal flora in the gut and increase the likelihood of colonisation with *Salmonella*. In special circumstances *antimicrobial agents* may be used to salvage birds with high genetic value.

1) *Day-old birds* used to stock a poultry house should be obtained from breeder *flocks* and hatcheries that have been monitored according to this chapter and in which no evidence of *S. Enteritidis* and *S. Typhimurium* has been detected.

2) Layer and breeder *flocks* should be stocked from *flocks* that have been monitored according to this chapter and in which no evidence of *S. Enteritidis* and *S. Typhimurium* has been detected.

3) Feed contamination with *Salmonella* is known to be a source of *infection* for poultry. Therefore, it is recommended to monitor the *Salmonella* status of poultry feed, and if found positive to take corrective measures. Heat treated feeds with or without the addition of other bactericidal or bacteriostatic treatments, e.g. organic acids, are recommended. Where heat treatment is not possible, the use of bacteriostatic or bactericidal treatments is recommended. Feed should be stored in clean closed containers to prevent access by wild birds and rodents. Spilled feed should be cleaned up immediately to remove attractants for wild birds and rodents.

Treated feed should be handled and stored in such a way as to avoid recontamination.

4) Competitive exclusion may be used in *day-old birds* to reduce colonisation by *Salmonella*. *When used, competitive exclusion products* should be administered according to the instructions provided by the manufacturer and in accordance with the standards and recommendations of the *Veterinary Services*.

5) Vaccines are used against *Salmonella infections* caused by different serotypes in various poultry species, including single or combined vaccines. Vaccines produced according to the *Terrestrial Manual* should be used.

If live vaccines are used, it is important that field and vaccine strains be easily differentiated in the laboratory. If serology is used as the *surveillance* method, it may not be possible to distinguish between vaccination and *infection* with a field strain.
Vaccination can be used as part of an overall Salmonella control programme. It is recommended that vaccination not be used as the sole control measure.

When the status of the breeder flock or the hatchery from which the flock originates is not known or does not comply with this chapter, vaccination of flocks, starting with day-old birds, against the Salmonella serotypes known to be significant should be considered.

Vaccination against the Salmonella serotypes known to be significant should be considered when moving day-old birds to a previously contaminated shed so as to minimise the risk of the birds contracting Salmonella infection.

When used, vaccines should be administered according to the instructions provided by the manufacturer and in accordance with the standards and recommendations of the Veterinary Services.

Vaccination against S. Enteritidis can cause cross-reactions in Salmonella Pullorum/S. Gallinarum serological tests and needs to be considered when implementing measures for these pathogens.

6) Depending on animal health, risk assessment, and public health policies, culling is an option to manage infected breeder and layer flocks. Infected flocks should be destroyed or slaughtered and processed to minimise human exposure to Salmonella.

If culling is not applied, eggs for human consumption should be diverted for processing for inactivation of Salmonella.

7) S. Enteritidis is characterised by its ovarian transmission pattern. Countries should set targets for eradicating (or significantly reducing) S. Enteritidis from egg-producing flocks through a guided policy for eradication from the top of the production pyramid, i.e. from grandparent flocks through breeder flocks to layer flocks.

8) The responsible veterinarian should evaluate the results of surveillance testing for Salmonella and supervise the implementation of appropriate control measures. These results should be available to the veterinarian before marketing if a veterinary certificate for flock Salmonella status is required. When required by the Competent Authority, the veterinarian or other person responsible for notification should notify the Competent Authority if the presence of Salmonella of the relevant serotype is confirmed.

Article 6.5.6.

Prevention of Salmonella spread from infected flocks

If a flock is found infected with specific Salmonella serotypes of concern, the following actions should be taken in addition to general measures detailed in Chapter 6.4. on Biosecurity Procedures in Poultry Production:

1) According to the epidemiological situation, investigations should be carried out to determine the origin of the infection.

2) Movement of poultry flocks at the end of the production cycle should only be allowed for slaughter or destruction. Special precautions should be taken in the transport, slaughter and processing of the birds, e.g. they could be sent to a separate slaughterhouse or processed at the end of a shift before cleaning and disinfection of the equipment.

3) Litter should not be reused as such. Used poultry litter, carcasses and other potentially contaminated farm waste should be transported and disposed of in a safe manner to prevent the direct or indirect exposure of humans, livestock and wildlife to Salmonella. Particular care needs to be taken when utilising used poultry litter to fertilise plants intended for human consumption. If litter is not removed, it should be treated in a manner to inactivate infectious agents, to prevent the spread from one flock to the next.

4) Particular care should be taken in cleaning and disinfection of the poultry house and equipment.

5) Before restocking the facility, a bacteriological examination should be carried out as detailed in this chapter and the Terrestrial Manual.
Article 6.5.7.

Recommendations for introduction of live poultry (other than day-old birds)

Introduced live poultry (other than day-old birds) should:

1) originate from a flock that participates in a Salmonella surveillance programme in accordance with the recommendations in Article 6.5.4.;

2) originate from a flock in which no evidence of S. Enteritidis and S. Typhimurium has been detected prior to movement and have had no contact with birds or other material from flocks that do not comply with this chapter;

3) originate from a flock that complies with the recommendations in Chapter 6.4.

Article 6.5.8.

Recommendations for introduction of day-old birds

Introduced day-old birds should:

1) show no clinical sign of salmonellosis on the day of shipment;

2) originate from a breeder flock and a hatchery that participate in a Salmonella surveillance programme in accordance with the recommendations in Article 6.5.4.;

3) originate from a breeder flock and a hatchery in which no evidence of S. Enteritidis and S. Typhimurium has been detected and have had no contact during setting, incubation or hatching with hatching eggs or other material from establishments that do not comply with this chapter;

4) originate from a breeder flock and a hatchery that comply with the recommendations in Chapter 6.4.;

5) be transported in new and or clean containers.

Article 6.5.9.

Recommendations for introduction of hatching eggs

Introduced hatching eggs should:

1) originate from a breeder flock that participates in a Salmonella surveillance programme in accordance with the recommendations in Article 6.5.4.;

2) originate from a breeder flock in which no evidence of S. Enteritidis and S. Typhimurium has been detected and have had no contact with poultry or other material from establishments that do not comply with this chapter;

3) originate from a breeder flock that complies with the recommendations in Chapter 6.4.;

4) be transported in new and or clean packaging materials.