

CHAPTER X.X.

GUIDELINES ON THE DETECTION, CONTROL AND PREVENTION OF NON-TYPHOID SALMONELLA SPP. IN POULTRY CHICKENS

Article X.X.1.

Introduction

~~The aim of the Code is to assist Members in the management and control of significant animal diseases, including diseases with zoonotic potential, and in developing animal health measures applicable to trade in terrestrial animals and their products. These guidelines~~ This Chapter provides recommendations on the detection, control and prevention of non-typhoid *Salmonella* spp. in poultry chickens (*Gallus gallus domesticus*) used for the production of meat and eggs for human consumption.

In most food animal species, non-typhoid *Salmonella* spp. 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 foodborne *infection*. In the latter case, this can occur when *meat* and eggs, or their products, enter the food chain thus producing contaminated food ~~products~~.

Salmonellosis is one of the most common foodborne bacterial *diseases* in the world. ~~It is estimated that over 90%~~ The great majority of *Salmonella* *infections* in humans are foodborne with *Salmonella* Enteritidis Phage Type 4 (PT4) and *Salmonella* Typhimurium serotypes accounting for a major part of the problem. *Salmonella* serotypes may vary considerable between localities, districts, regions and countries.

In the development and implementation of programmes to achieve control of *S. Enteritidis* PT4 and *S. Typhimurium*, an improvement in *flock* status for other *Salmonella* serotypes can be expected.

Article X.X.2.

Purpose and scope

~~These guidelines~~ This Chapter deals with methods for on farm detection, control and prevention of *Salmonella* ~~spp.~~ in poultry chickens, and ~~These guidelines~~ complements the Codex Alimentarius Code of Hygiene Practice for Meat (CAC/RCP 58-2005) and Code of Hygienic Practice for Eggs and Egg Products (CAC/RCP 15-1976 Revision 2007). A pathogen reduction strategy at the farm level is seen as the first step in a continuum that will assist in minimizing the presence of foodborne pathogens in producing eggs and meat that are safe to eat.

All hygiene and biosecurity procedures to be implemented in poultry chicken flocks and hatcheries are described in Chapter 6.3. ~~on~~ Hygiene and Biosecurity Procedures in Poultry Production.

The scope covers ~~breeding flocks, chickens and other domesticated birds~~ used for the production of eggs and *meat* for human consumption. The recommendations presented in ~~these guidelines~~ this Chapter are relevant to the control of all non-typhoid *Salmonella* spp. with special attention to *S. Enteritidis* PT4 and *S. Typhimurium* serotypes, as these are problems in many countries. It should be noted that the definition of the epidemiology of animal and human salmonellosis in a particular locality, district, region or country is important for effective control of salmonellosis.

Article X.X.3.

Definitions (for this chapter only)

Broilers

means birds of the species *Gallus gallus* selectively bred and reared for their *meat* rather than eggs.

Broken/leaker egg

means an egg showing breaks of both the shell and the membrane, resulting in the exposure of its contents.

Competitive exclusion

means the administration of defined or undefined bacterial flora ~~to poultry to~~ or the administration of substrates which allow for the proliferation of beneficial bacteria and which prevent gut colonisation by enteropathogens, including non-typhoid *Salmonella*.

Cracked egg

means an egg with a damaged shell, but with intact membrane.

Culling

means the depopulation of a *flock* before the end of its normal production period.

Dirty egg

means an egg with foreign matter on the shell surface, including egg yolk, manure or soil.

Layer or laying flock

means a *flock* of ~~poultry~~ chickens during the period of laying eggs for human consumption.

Non-typhoid Salmonella

means those serotypes of *Salmonella enterica* for which the reservoir hosts are domestic and wild animals, as opposed to the serotypes *S. Typhi* and *S. Paratyphi* which cause typhoid fever in humans, which are the reservoir host.

Peak of lay

means the period of time in the laying cycle (normally expressed as age in weeks) when the production of the *flock* is highest.

Poultry

means members of the class Aves that are kept for the purpose of breeding or for the production of meat or eggs.

Pullet flock

means a *flock* of ~~poultry~~ chickens prior to the period of laying eggs for human consumption or hatching.

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Surveillance of ~~poultry~~ chickens flocks for *Salmonella* ~~spp~~ serotype

Where justified by *risk assessment*, *surveillance* should be performed to identify infected *flocks* in order to take measures that will reduce the prevalence in ~~poultry~~ chickens and the risk of transmission of *Salmonella* ~~spp.~~ serotypes to humans. Microbiological testing is preferred to serological testing because of its higher sensitivity in broilers and higher specificity in breeders and layers. In the framework of regulatory programmes for the control of ~~*Salmonella* spp.~~ salmonellosis, confirmatory testing may be appropriate to ensure that decisions are soundly based.

Results ~~of from~~ surveillance may lead to the implementation of ~~will allow~~ control measures ~~to be implemented~~ to reduce the risk of transmission of *Salmonella* ~~spp.~~ serotypes to humans:

- a) In breeders, control measures may be taken implemented to ~~will minimise prevent~~ the transmission of *Salmonella* ~~spp.~~ serotypes to the next generation.
- b) In layers control measures will reduce or eliminate ~~*Salmonella* spp.~~ contamination of eggs ~~for human consumption~~ with *Salmonella* serotypes.
- c) In broilers, ~~this control measures, such as logistic slaughter and channelling, may will permit measures to be taken implemented at slaughter and or~~ further down the food chain (~~logistic slaughter and channelling~~).

Sampling

1. Available methods for sampling

Drag swabs: sampling is done by dragging swabs around the poultry building to collect samples of 10-25 g and to include faeces, and moist and dry litter.

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

Faecal samples: multiple samples of fresh faeces collected from different areas in the poultry building.

Meconium, dead in shell and culled chicks at the hatchery.

Additional sampling of equipment and surfaces may be performed to increase sensitivity.

2. Number of samples to be taken according to the chosen method

Recommendation is five pairs of boot swabs or 10 drag swabs. These swabs may be pooled into no less than two samples with each pool containing 10-25 g of material.

The total number of faecal samples to be taken on each occasion is shown in Table I and is based on the random statistical sample required to give a probability of 95% to detect at least one positive sample given that *infection* is present in the population at a level of 5% or greater.

Table I

Number of birds in the flock	Number of faecal samples to be taken on each occasion
25-29	20
30-39	25
40-49	30
50-59	35
60-89	40
90-199	50
200-499	55
500 or more	60

3. Laboratory methods

Refer to the *Terrestrial Manual*.

4. Time, frequency and type of samples to be tested-Testing of samples

Time, frequency and type of sample for each ~~poultry~~ category listed below are based on *risk assessment* and production methods:

a) Breeders and hatcheries

i) Breeder pullet flock

- At the end of the first week of life.
- Within the four weeks before being moved to another house, or before going into production if the animals 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) Breeding flocks in lay

- At least at monthly intervals during the laying period.
- The minimal frequency would be determined by the *Veterinary Services*.

iii) Hatcheries

- Testing in hatcheries complements on farm testing.

- The minimal frequency would be determined by the *Veterinary Services*.
- b) ~~Poultry~~ Chickens for the production of eggs for human consumption
- i) Layer pullet flocks
 - At the end of the first week of life when the status of the breeding farm and the hatchery is not known or does not comply with ~~these guidelines~~ this Chapter.
 - Within the four weeks before being moved to another house, or before going into production if the animals 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) Layer or laying flocks
 - At expected peak of lay for each production cycle.
 - 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 would be determined by the *Veterinary Services*.
- c) Broilers
- i) *Flocks* should be sampled at least once. On farms where there is a long period (2 weeks or more) between thinning and final depopulation further testing should be considered.
 - ii) *Flocks* should be sampled as late as possible before the first birds are transported to the slaughterhouse. However, this must be done at a time that ensures the results are available before *slaughter*.
- d) Empty building testing
- i) Bacteriological monitoring of the efficacy of *disinfection* procedures is recommended when any of the *Salmonella* spp. serotypes have been detected in the previous *flock*.
 - ii) As appropriate, sampling of equipment and surfaces as well as boot swabs or drag swabs of the empty building after depopulation, cleaning and *disinfection*.

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Control measures

Salmonella control can be achieved by adopting Good Agricultural Practices and Hazard Analysis Critical Control Point (HACCP) in combination with the following measures. No single measure used alone will achieve effective *Salmonella* control.

Additional control measures currently available include: vaccination, *competitive exclusion*, *flock* culling and product diversion to processing.

Antimicrobials should not be used to control infection with *Salmonella* spp. serotypes in poultry chickens for human consumption because the effectiveness of the therapy is limited; it has the potential to produce residues in *meat* and eggs and can contribute to the development of antimicrobial resistance. Antimicrobials may also reduce normal flora in the gut and increase the likelihood of colonisation with *Salmonella* spp. In special circumstances antimicrobials may be used to salvage animals with high genetic value.

1. Day old chicks used to stock a poultry house should be obtained from breeding *flocks* and hatcheries that are certified as free from at least *S. Enteritidis* PT4 and *S. Typhimurium* and have been monitored according to ~~these guidelines~~ this Chapter.
2. Layer ~~or~~ and laying *flocks* ~~or~~ and breeder *flocks* should be stocked from pullet *flocks* that are certified as free from at least *S. Enteritidis* PT4 and *S. Typhimurium* and have been monitored according to ~~these guidelines~~ this Chapter.
3. Feed ~~may be contaminated~~ contaminated with *Salmonella* is known to be a source of infection for chickens. Therefore, it is recommended to monitor the *Salmonella* status of poultry chicken feed, and if found positive to take corrective measures. The use of pelletised heat treated feeds or feeds subjected to other bactericidal treatment 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.
4. *Competitive exclusion* can be used in day old chicks to reduce colonisation by *Salmonella* ~~spp~~ serotypes.
5. As far as vaccination is concerned, many vaccines are used against *Salmonella* infections caused by different ~~serovars~~ serotypes in various poultry chicken species, including single or combined vaccines ~~against *S. Enteritidis* and *S. Typhimurium*~~. Vaccines produced according to the *Terrestrial Manual* should be used.

If live vaccines are used it is important that field and vaccine strains ~~can be~~ can be easily ~~be~~ differentiated in the laboratory. If serology is used as the *surveillance* method, it may not be possible to distinguish between vaccination ~~or~~ and *infection* with a field strain.

Vaccination can be used as part of an overall *Salmonella* control programme. ~~Vaccination should never be used as the sole control measure.~~ It is recommended that vaccination not be used as the sole control measure.

When the status of the breeding farm and the hatchery from which the pullet *flock* originates is not known or does not comply with ~~these guidelines~~ this Chapter, vaccination of pullet *flocks*, starting with day-old chicks, against *S. Enteritidis* or *S. Enteritidis/S. Typhimurium* should be considered.

Vaccination should be considered when moving day-old chicks to a previously contaminated shed so as to minimize the risk of the birds contracting *infection* with *S. Enteritidis* and *S. Typhimurium*.

When used, vaccination should be performed according to the instructions provided by the manufacturer and in accordance with the instructions of the *Veterinary Services*.

Vaccination against *S. Enteritidis* can cause a positive reaction in *Salmonella Pullorum-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 in a manner that minimises human exposure to *Salmonella spp serotypes*.

If poultry chickens are not culled, eggs for human consumption should be diverted for processing for inactivation of *Salmonella spp*.

7. As far as the veterinary involvement is concerned, the responsible veterinarian should monitor the results of *surveillance* testing for *Salmonella spp*. This information should be available to the veterinarian before marketing if a certificate for flock *Salmonella* status is required prior to in order to certify the flock for the flock for slaughter. When required by the Competent Authority, This the veterinarian or other authorised person should notify the Veterinary Competent Authority if the presence of *Salmonella spp. of the relevant serotypes* is confirmed.

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Prevention of Salmonella spread

If a *flock* is found infected with non-typhoid *Salmonella spp*, the following actions should be taken in addition to general measures detailed in the Chapter 6.3. ~~on~~ Hygiene and Biosecurity Procedures in Poultry Production:

1. Epidemiological investigations should be carried out to determine the origin of the *infection* as appropriate to the epidemiological situation.
2. Movement of broilers, culled poultry chickens or layers 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. Poultry Chicken litter/faeces and other potentially contaminated farm waste should be disposed of in a safe manner to prevent the ~~spread of infections with direct or indirect exposure of humans, livestock and wildlife to~~ with *Salmonella spp*. Particular care needs to be taken in regard to poultry chicken litter/faeces used to fertilise plants intended for human consumption.
4. Particular care should be taken in cleaning and *disinfection* of the poultry house and equipment.
- 4.5. Before restocking bacteriological examination should be carried out as detailed in ~~these guidelines~~ this Chapter.

Article X.X.7.

Special considerations for broiler flocks

1. The grow out phase of broiler production is short and therefore it is important to emphasize the *Salmonella* status of the source flock.
2. Broilers are susceptible to colonisation with non-typhoid *Salmonella* spp. because of high-level exposure ~~they are young and are grown~~ at the high stocking rates at which they are kept and because they are immunologically naive.

3. To reduce *Salmonella* spp. contamination in the abattoir it is helpful to reduce the amount of feed in the bird's gut at the time of *slaughter*. Feed transits the gut in about four hours; therefore, it is recommended to withdraw feed to the birds at an appropriate period before *slaughter* (8-10 hours).
4. *Slaughter* processing should be conducted in accordance with Chapter 6.2.

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