

USA COMMENTS - TAHSC FEB2016 REPORT

DRAFT CHAPTER 6.Y.

PREVENTION AND CONTROL OF *SALMONELLA*
IN COMMERCIAL PIG PRODUCTION SYSTEMS

Article 6.Y.1.

Introduction

Nontyphoidal salmonellosis is one of the most common food-borne bacterial diseases in the world with *Salmonella* Enteritidis and *S. Typhimurium* (including monophasic variants) being the predominant serotypes identified in humans in most countries. *S. Enteritidis* is primarily associated with *poultry* while *S. Typhimurium* may be present in many mammalian and avian hosts. These serotypes and several others occur at variable prevalence in pigs depending on the region. For example, in some countries *S. Infantis* and *S. Choleraesuis* may also cause salmonellosis in humans.

Salmonella infection in pigs is mostly subclinical, although clinical disease such as enteritis and septicaemia in weaned pigs may occur. Subclinical infection, including a carrier state, can be of variable duration and can play an important role in the spread of *Salmonella* within and between herds and pose a public health risk.

Salmonella serotypes and their prevalence in pigs may vary considerably within and between farms, countries and regions. It is important for Veterinary Authorities and the producers to consider types of *Salmonella*, their occurrence and the disease burden in pig and human populations when they develop and implement strategies for the prevention and control of *Salmonella* in commercial pig production systems.

Article 6.Y.2.

Definitions

For the purpose of this chapter:

Commercial pig production systems: means those systems in which the purpose of the operation includes some or all of the breeding, rearing and management of pigs for the production of meat.

Feed: means any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial animals (except bees).

Feed ingredient: means a component part or constituent of any combination or mixture making up a feed, whether or not it has a nutritional value in the animals diet, including feed additives. Ingredients are of plant (including aquatic plants) or terrestrial or aquatic animal origin, or other organic or inorganic substances.

Article 6.Y.3.

Purpose and scope

This chapter provides recommendations for the prevention and control of *Salmonella* in commercial pig production systems in order to reduce the burden of infection in pigs and the risk of human illness through food-borne contamination as well as human infections resulting from direct or indirect contact with infected pigs.

This chapter should be read in conjunction with the Codex Alimentarius Code of Hygienic Practice for Meat (CAC/RCP 58-2005), Code of Good Animal Feeding (CAC/RCP 54-2004), and the Guidelines for the Control of Nontyphoidal *Salmonella* spp. in Pork Meat (under development), and the OIE/FAO Guide to Good Farming Practices for Animal Production Food Safety.

Article 6.Y.4.

Objectives of prevention and control measures

It is recommended that prevention and control measures be focused on those types of *Salmonella* of greatest consequence to pigs and public health.

Prevention and control measures in commercial pig production systems may:

- 1) reduce the prevalence and concentration of *Salmonella* entering the *slaughterhouse/abattoir* and therefore decrease the challenge to the slaughter and dressing procedures and the likelihood of pig *meat* contamination;
- 2) reduce *Salmonella* contamination of the environment via pig manure, which in turn ~~will~~ may limit *infection* of *animals* (including *wildlife*);

Rationale: it is not an absolute that other animals including wildlife will become infected from pig manure, so the word “may” is more appropriate than “will”

- 3) reduce the likelihood of *infections* in humans through contact with infected pigs or contaminated material.

While control in the primary production phase can decrease the number of animals carrying or shedding *Salmonella*, controls after primary production are also important to minimise the contamination and cross-contamination of carcasses and *meat products*.

Articles 6.Y.5. to 6.Y.14. provide recommendations for the prevention and control of *Salmonella* in commercial pig production systems.

These recommendations may also contribute to the prevention and control of some other *infections*.

Article 6.Y.5.

Biosecurity

Biosecurity is intended to assist with the prevention and control of *Salmonella*. The choice of specific measures will vary according to the type of commercial pig production system.

When including *Salmonella* as part of a *biosecurity* management plan, it is recommended that the following be addressed:

- 1) location, design and management of the *establishment*;
- 2) veterinary supervision of pig health;
- 3) management of the introduction and mixing of pigs;
- 4) training of personnel in their responsibilities and their role in animal health, human health, food safety;
- 5) maintenance of records including data on pig health, production, movements, medications, *vaccination*, mortality and cleaning and *disinfection* of farm buildings and equipment;
- 6) availability of test results to the farm operator when *Salmonella surveillance* is conducted;
- 7) removal of unwanted vegetation and debris that could attract or harbour pests around pig housing;
- 8) minimising the entry of *wild* birds into pig buildings and feed stores;
- 9) cleaning and *disinfection* procedures for buildings in which pigs are handled or housed, including feeding systems, drinkers, floor, walls, aisles, walkways, partitions between pens, and ventilation ducting. All visible organic material should be removed before *disinfection*.
- 10) control of pests such as rodents and arthropods, and regular assessment of effectiveness;

- 11) control and hygienic procedures for entry and movement of persons and *vehicles*;
- 12) *biosecurity* applied to all personnel and visitors entering the *establishment*. As a minimum, this should include hand washing and changing into clean clothes and footwear provided by the *establishment*. Similar precautions are recommended when they move between separate *epidemiological units* on large farms;
- 13) cleaning and *disinfection* of equipment and *vehicles* identified as posing a *risk*;
- 14) storage and disposal of dead animals, bedding, faeces and other potentially contaminated farm waste in a manner that minimises the likelihood of dissemination of *Salmonella* and prevents the direct or indirect exposure of humans, livestock and *wildlife* to *Salmonella*. Particular care should be taken when pig bedding and faeces are applied to land used for horticultural crops intended for human consumption.

Article 6.Y.6.

Location and design of pig establishments

When making decisions on the location and design of pig *establishments*, it is recommended that reduction of the likelihood of transfer of pathogens, including *Salmonella*, from major sources of contamination be considered. Sources of *Salmonella* may include other livestock *establishments* or areas of application or disposal of contaminated waste or effluent. Other sources and *vectors* of *Salmonella* include *vehicles*, equipment, water-courses, persons, domestic animals, birds, rodents, flies and *wildlife*.

It is recommended that the design of commercial pig production systems consider the following:

- 1) proximity of other livestock *establishments*, and *wild* bird and rodent populations;
- 2) management of faecal waste to minimise contamination of the *establishment*;
- 3) adequate drainage for the site and control of run-off water and untreated waste water;
- 4) use of smooth impervious materials for construction of pig houses to enable effective cleaning and *disinfection*;
- 5) ~~paving the area immediately surrounding pig houses or indoor establishments with concrete or other impervious material. This will facilitate rodent control and minimise recontamination after cleaning and disinfection;~~ the area immediately surrounding the pig houses or indoor establishments should be level ground containing bare dirt with or without residential height grass, rock, or concrete to facilitate rodent control, reduce potential harbourage for rodents and minimize recontamination after cleaning and disinfection;

Rationale: the revised language is consistent with the section “steps to control rodents” described by the International Trichinella Commission and is more achievable for a broad range of housing types including both indoor and outdoor facilities.

- 6) a control of entry and movement of *vehicles*, equipment and persons, for example, locate delivery and collection points away from pig housing or feed storage;
- 7) preventing contamination of feed and water during storage and distribution;
- 8) pig handling and movements to minimise stress and spread of *Salmonella infection*;
- 9) restriction of entry of domestic *animals*, *wild* birds, rodents, flies and other relevant *wildlife*.

Article 6.Y.7.

Management of new pig introductions into the establishment

Introduction of pigs into a *herd* is an important *risk* factor in moderate and high prevalence regions. To minimise the likelihood of introducing *Salmonella* by replacement pigs, it is recommended that:

- 1) good communication along the pig production chain be encouraged to raise awareness of the *risk* of introducing *Salmonella* through pig introductions;
- 2) consideration be given to minimising the number of sources for both replacement breeding stock and rearing pigs, and matching *Salmonella* herd status in terms of *Salmonella* freedom or occurrence of priority serotypes such as *S. Typhimurium*;³⁾ the introduction of new genetic material be through the use of semen whenever possible;
- 4) if possible, pigs be sourced directly from herds of origin because live animal markets or other places where pigs from multiple properties are mixed for resale may increase the likelihood of spread of *Salmonella* and other infectious agents among pigs;
- 4) newly introduced pigs be kept separate from the rest of the herd for a suitable period before mixing with other pigs, e.g. four weeks;
- 5) where appropriate, testing of pigs for *Salmonella* prior to introduction be considered to inform subsequent control measures, for example, when introducing pigs of unknown status.

Article 6.Y.8.

Moving and mixing of pigs

The moving and mixing of pigs increases the likelihood of spread of *Salmonella*. To minimise the spread of *Salmonella*, it is recommended that:

- 1) the number of pig movements and mixing of pigs between weaning and dispatch for *slaughter* be minimised;
- 2) if possible, the 'all-in-all-out' system with a single age group of pigs be used. In particular, the addition to younger groups of pigs held back from older groups should be avoided.

Article 6.Y.9.

Feed and feed composition

1. Feed and feed ingredients

Feed and feed ingredients can be sources of *Salmonella* infection for pigs. This is especially important in herds, countries or regions of low prevalence. To minimise the spread of *Salmonella* through feed, it is recommended that [the following should be considered](#):

Rationale: this is consistent with the wording below under feed composition and by recommending that the following should be considered and is not prescriptive in nature.

- a) feed and feed ingredients be produced, handled, stored, transported and distributed in accordance with Chapter 6.3.;
- b) where practical, feed and feed ingredients be transported, stored and fed in a hygienic manner that minimises contamination by manure and access by domestic animals, birds, rodents and *wildlife*;
- c) [where practical](#), feeds be treated with heat, bactericidal or bacteriostatic treatments e.g. organic acids.

Rationale: these feed treatments may not be available in all areas, or may be cost prohibitive in certain circumstances (e.g. subsistence farming).

2. Feed composition

When *Salmonella* is present in a pig herd, the composition of feed may influence the occurrence of *Salmonella* in individual pigs.

For the control of *Salmonella* it is recommended that the following be considered:

- a) liquid feed that is fermented or containing *milk products* has a protective effect due to the presence of beneficial bacteria and lowered pH;
- b) coarsely ground feed may reduce the occurrence of *Salmonella* by slowing gastric transit (thereby increasing exposure to gastric acid) and reducing dysbacteriosis. Coarsely ground feed ingredients may be fed alongside pelleted feed;
- c) fine grinding needed to produce heat treated pellets may result in dysbacteriosis which favours the colonisation and multiplication of *Salmonella* in the intestine. Therefore, heat treated pellets are most appropriate for situations in which *Salmonella* is uncommon;
- d) when wheat is the predominant feed ingredient, reducing the proportion of this ingredient may reduce the occurrence of *Salmonella* because the rapid fermentation of wheat promotes dysbacteriosis.

Article 6.Y.10.

Water

Drinking water should be of an appropriate quality. To minimise the spread of *Salmonella* through water, it is recommended that:

- 1) the drinking water supply be monitored and controlled to maintain it free from *Salmonella* contamination;
- 2) water holding tanks be enclosed;
- 3) the water delivery system be regularly cleaned and disinfected. For example in an 'all-in-all-out' system this occurs before restocking.

Article 6.Y.11.

Additional prevention and control measures

- 1) *Vaccination* may be considered as part of a *Salmonella* control programme. Vaccine production and use should be in accordance with Chapter 1.1.6. of the *Terrestrial Manual*. The protective effect of vaccines is generally serotype-specific and is influenced by factors such as timing of *vaccination* in relation to exposure.
- 2) *Antimicrobial agents* can be used for treatment of clinical salmonellosis and when administered, it should be in accordance with Chapter 6.9. However, *antimicrobial agents* should not be used to control subclinical *infection* with *Salmonella* in pigs because the effectiveness of the treatment is limited, they may increase the risk of *Salmonella* colonisation, and their use can contribute to the development of antimicrobial resistance.
- 3) Where approved by the *Competent Authority*, organic acids, probiotics and prebiotics may be added to feed or water to reduce shedding of *Salmonella* by pigs. However, efficacy is variable.

Article 6.Y.12.

Transportation

Hygienic maintenance of *vehicles* is recommended.

When transporting animals from multiple *establishments*, it is recommended that the *Salmonella* status of the *establishments* be considered to avoid cross-contamination of pigs.

The relevant recommendations in Chapters 7.2., 7.3. and 7.4. apply.

Article 6.Y.13.

Lairage

Lairage may be used at various stages in pig production, for example accumulation of weaned pigs before movement to nursery *herds*, holding finisher pigs before transport to *slaughter* and holding pigs at the *slaughterhouse/abattoir* before *slaughter*.

Relevant aspects of *lairage* management include consideration of effective cleaning and *disinfection* between groups, minimising mixing of animals that have not continually been kept together and managing stress.

In addition, the relevant recommendations in Articles 7.5.1., 7.5.3., and 7.5.4. apply.

Article 6.Y.14.

Surveillance for *Salmonella* in commercial pig production systems *Surveillance* data provide information to assist the *Competent Authorities* in their decision making regarding the requirement for, and design of, control programmes and in setting and verifying performance objectives. Harmonised *surveillance* systems to determine the occurrence of *Salmonella* at *herd* level are in place in some countries. Communication between *slaughterhouses/abattoirs*, *Veterinary Services* and the *herd* manager or *veterinarian* of the results of *Salmonella* *surveillance* systems is an important element of a *Salmonella* control programme.

Standards for diagnostic tests are described in the *Terrestrial Manual*. Serological testing, usually using 'meat juice' at slaughter, is one method for assessing exposure to *Salmonella* in pig *herds*. Benefits of serological testing include low cost per test, high throughput capability and the potential for automation of tests. Collection of samples at the *slaughterhouse/abattoir* enables centralised sampling of multiple *herds*. While serology is a useful tool for *risk* ranking of *herds*, serological testing does not detect exposure to all serotypes or differentiate between different serotypes within the serogroups included in the antigenic range of the test or the level of *Salmonella* in pigs at slaughter. If serology is used as the *surveillance* method, it may not be possible to distinguish between vaccinated and infected pigs by means of serological testing.

Microbiological testing, with additional phenotyping or genotyping, identifies types of *Salmonella* present in pig *herds* and can provide epidemiological information on likely sources of *Salmonella* and on the presence of strains with enhanced virulence or resistance to *antimicrobial agents*. Bacteriological sampling of individual pigs has low sensitivity but this can be overcome by repeated sampling, by pooling of samples (such as individual faecal samples or mesenteric lymph nodes) or sampling naturally pooled material (such as sampling of faeces from the floor of pig pens). Some types of *Salmonella* such as *S. Choleraesuis* can be difficult to detect using microbiological methods.

Article 6.Y.15.

Prevention and control in low prevalence regions

In regions where *Salmonella* *infection* of pigs is uncommon, it may be possible to maintain low prevalence status or eliminate *infection* from *herds* through a combination of good farming practices, *herd surveillance*, individual testing, movement controls, or removal of persistent carriers.

In individual *herds*, for example valuable breeding *herds*, in higher prevalence regions, the success of this approach is dependent upon a low likelihood of reintroduction of *infection*.

Article 6.Y.16.

Outdoor pig production

Where practicable, the prevention and control measures described in Articles 6.Y.5. to 6.Y.14. should also be applied to outdoor pigs in commercial pig production systems to reduce *Salmonella* *infection*. In addition, it is recommended that:

- 1) field rotation programmes be used to minimise *Salmonella* contamination and accumulation in soil and surface water and therefore ingestion by pigs;
- 2) systems used to provide feed, and where possible water, be designed to minimise attraction of, or access by, *wild* birds;
- 3) the location of other outdoor pig *herds* and the concentration and behaviour of wild birds in the area be considered.

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