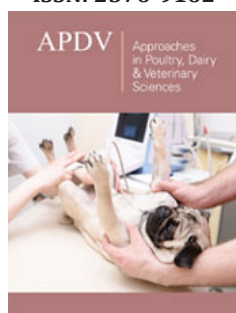


Measures to Control *Salmonella* in Turkey Slaughterhouses

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Introduction

Salmonella is one of the main bacteria involved in food outbreaks, with sensible health and economic consequences. Genus *Salmonella* includes two species, *Salmonella enterica* and *Salmonella bongori*. *S. enterica* is the type specie and is further divided into six subspecies that include more than 2500 serotypes. Poultry are one of the main reservoirs, spreading the bacteria through faecal contamination. In 2018, 91.857 cases of salmonellosis were confirmed in EU. 16.556 of those cases were hospitalized and 119 dead [1]. Spain was sixth in this recording with 8730 cases. Regarding to the foods involved in food outbreaks by *Salmonella*, the main and first source is turkey meat and their products, with a 7,74% of positives [2].

In this article we try to describe some brief strokes of the main measures of turkey meat producers devoted to control *Salmonella* based in our experience. To this purpose, it is necessary to take into account its normative context. Thanks to White Paper on Food Safety, the European Commission designed a radical revision of food hygiene and safety for EU, defining food operators as main responsible for food safety. Based in this White Paper, the EU determines the Food Hygiene Package, published in Regulations 852/2004 and 853/2004, as well as 2019/624 and 2019/627 or 178/2002. Particularly important is the normative about Microbiological Criteria for industries to commercialize these products, published in Regulation 2073/2005 and its further amendment 229/2019. Regarding to *Salmonella*, these main criteria are: Absence in 25g of *Salmonella* Typhimurium and Enteritidis serovars for Raw meat; and absence in 25g of *Salmonella* spp. for processed meats.

The measures taken in these industries to decrease the *Salmonella* prevalence and to fulfil these obligations have to take into account the growth parameters of this microorganism (mainly temperature -5 to 47 °C, optimum 37 °C- and pH -4.5 to 9, optimum 7.5). Thus, most of the measures must control those parameters, and increasing a great number of hygienic measures, applying a basic principle based in treating the early steps in productive processes, to control primary contamination, and to avoid cross and further contamination.

We are carrying out three studies of different measures to decrease the *Salmonella* prevalence in slaughterhouse step:

Cage washing: The purpose is to avoid the contamination due to dirt generated in cages used for poultry transport from farms to slaughterhouse. Usually, in those cages a great amount of organic material from faeces is placed. The most efficient washing method has different steps:

- a. Initial treatment with water (usually at water network temperature, around 20 oC -it depends on geographical area-).
- b. Washing: The most important step, with a combined action of temperature and pH, with alkaline foaming; the washing pH is between 9-11, using hot water (behind 65 oC).
- c. Rinsing with water (at water network temperature)
- d. Disinfection with sodium hypochlorite (5-10ppm.).
- e. Rinsing

Time for this washing cycle is no more than 2 minutes, being washing the most important step (30 seconds). In this way, from an initial value of prevalence of 80%, it reaches to final absence after complete washing cycle.

Treatments in scalding tank: Usually, scalding and further plucking are carried out at 48-55 °C, depending on the turkey size, gender, and time (number of hours) of production (due to the organic matter accumulation). Usually, scalding devices works in two steps:

A. Initial step: Turkeys scalds at 43-50 oC. The main goal is to remove organic matter from the birds, usually impregnated in their feathers. In this step, the water turnover rate is 1-1.5 l/turkey.

B. Final step: Scalding itself; with a temperature interval of 48-55 oC and a drop in water turnover rate (about 0.5 l/turkey).

As scalding tanks have optimal conditions for microbial growth, due to the high amount of organic matter and the temperature interval. The treatment is a combined action of removing of organic matter using filters (grain activated carbon on a bituminous base) and a continuous clean water turnover, combining the synergy effects of temperature increasing in the four stops of producing process (around 65-70 °C (in order to get a pasteurization effect).

Increasing temperature four times in sixteen hours production (every 4 hours approximately), it is possible to obtain the absence of *Salmonella* (100% of the cases). We tested only apply the removing of organic matter. After sampling to know about the evolution of this contamination. The conclusion of this work was that, from an initial prevalence of 85%, we obtained a decreasing to values below

40% (sampling was carried out in last hours of the process -with most adverse conditions due to organic matter accumulation-). Combining this treatment together with the temperature increasing aforementioned, we obtained a synergic effect, decreasing the *Salmonella* prevalence value in scalding tanks to a 25% in final steps.

Final washing before airing step: In this final step, in which turkey carcasses are already completely plucked and gutted with no handling, and no possibilities of secondary or cross contamination. In this moment carcasses are washed with a combined treatment with water pressure and at temperature (< 4 °C) to drag small particles from gut, feathers, or traces of bloods, mixed with water derived from abdominal cavity and bled.

The combination of cold water and water pressure for 90s is enough to decrease the *Salmonella* prevalence from 30-35% to 10% in all the cases. If we use water at atmosphere temperature, the efficiency of this treatment is less effective, and the prevalence is above 20% in all the cases. These results remarks the importance of the synergy effect, hence the importance of the synergistic effect of temperature. (It should be noted that the turkey carcass is at temperatures between 35-40 °C at the time of placement on the perch, hence the importance of thermal shock with cold water).

References

1. EFSA (2019) The European union one health 2018 zoonoses report, Europe.
2. EFSA (2017) The European union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017, Europe.

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