

Prevalence and Epidemiology of *Salmonella* spp. in some Small Pig Abattoirs of Hanoi, Vietnam.

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Introduction

Food safety is an emerging research topic of preliminary importance in Vietnam (2, 7), mainly because of the foreseen WTO membership, the increase of consumer demand for quality and safety (6) and the need for a global public health improvement. In this context, risk analysis researches are urgently needed. Slaughtering is an essential step in the risk assessment of food zoonotic pathogens in animal productions. This step gives information on upstream and downstream hygienic status for live animals or carcasses (1, 4). Small abattoirs (10 to 30 pigs/day) are still the most common structure for slaughtering pigs in North Vietnam (9). *Salmonella* spp. remains one of the most frequent zoonotic food pathogen reported in the world and pigs are known to be asymptomatic carrier. The *Salmonella* spp. shedding pigs are most likely to contaminate carcasses and slaughtering environment, and following the entire production chain downstream (4). This study aimed to make a preliminary assessment of *Salmonella* spp. prevalence and epidemiology in some pig slaughtering units in Hanoi.

Material and Methods

Sampling:

Caecal contents were chosen to provide an estimation of the upstream load with *Salmonella* spp. (farm, transport and lairage). The carcass swabs, taken short time prior to the expedition to the market, give a picture of the cross-contamination during the slaughtering process. Tank water samples allow an estimation of the water contamination, which can represent an important vehicle of contamination. Prior to the sampling, an analysis of the slaughtering practices was performed in different units. Caecal content of slaughtered pigs, carcass swabs and tank water samples were taken randomly among 15 slaughtering units. Slaughtering practices are identical in the 15 units. Units and pigs were chosen at random. Water and swab samples were taken aseptically. Caeca were tied up with 2 strings, cut and transported in plastic bags. All samples were transported to the laboratory at 5°C. The get 15g of caecal content, caeca were cauterized and incised with sterile chisels.

Analysis:

Samples were diluted to 1/10 with buffered peptone water and incubated 16-20h at 37°C for pre-enrichment: 15g caecum content up to 150g, cotton swabs up to 150g and 15g water up to 150g. 100µl of pre-enrichment broth were added to 10 ml of Rappaport-Vassiliadis broth, incubated 24h at 42°C for selective enrichment. Isolation was performed through streaking out 1µl of the enrichment broth onto XLT4 agar, incubated 24h at 37°C. At least one *Salmonella* spp. characteristic colony was identified on Kligler-Iron tubes, incubated 24h at 37°C. Each characteristic *Salmonella* spp. strain on Kligler-Iron was confirmed through additional biochemical tests – manitol, motility, urease, indol, Lysin decarboxylase, ONPG, ADH, ODC- and serotyping – results of serotyping not presented.

Statistical analysis:

Prevalence estimates are given for each sample type with the corresponding absolute precision at a confidence level of 95%. The absolute precision was calculated following the One Mean procedure of Poisson analysis: $i^2 = \varepsilon pq/n$ (i , absolute precision, ε depending on the confidence level, p , estimated prevalence, $q=1-p$ and n , number of samples).

Results

Sample type	Positive samples for <i>Salmonella</i> spp.	Confidence Interval at 95% confidence level
Caeca	52.1% (61/117)	43.1%-61.2%
Swabs	95.7% (44/46)	89.8%-100%
Water (tank)	62.5% (20/32)	45.7%-79.3%

Table 1: Positive samples for *Salmonella* spp. and confidence intervals

Discussion

More than 50% of the pigs are *Salmonella* spp. carriers –presence of *Salmonella* spp. in caecal content- and potential shedders at the time of slaughtering, which represents a high contamination pressure for the slaughtering environment and therefore downstream the production chain. This prevalence rate is higher than reported in other studies, usually between 6 and 23% for caecal samples at slaughterhouse (5, 10). This seems to indicate that practices at farm, transport and lairage in the study area are favourable for a *Salmonella* spp. dissemination between pigs. Compared to international literature, usually reporting a carcass contamination rate from 1.4 to 11.2% (3, 8, 10), the percentage (95%) of positive swabs samples of our study is extremely high. This can be explained by several factors: Firstly because of the high contamination pressure from the pigs, then because of the slaughtering practices. Indeed, in the studied units, there are no strictly separated areas for the different slaughtering steps and after evisceration carcasses are lying on the ground with many manipulations by the workers, allowing cross-contaminations before their transport to the market. Moreover, the workers use tank water to rinse carcasses after evisceration, and we showed that this water is highly contaminated, with 62% of positive samples. This contamination seems to be due to the occasionally use of tank water for washing hands or material and to absence of cleaning and disinfection every slaughtering day. Besides this, we found some positive well water samples –the water used as a source for boiling or filled in the tank- although we have not enough samples to give a statistical valid picture of this contamination rate. Thus, the water source could also potentially play a role in the epidemiology of *Salmonella* spp. at those slaughter places. Whereas evisceration has been described in Europe as the major cause of carcass contamination (4), this study in some abattoir places of Hanoi show the central role played by the lack of good hygiene slaughtering practices and by the contamination of water used for rinsing carcasses. Thus, it is interesting to notice that little improvement of the practices could considerably reduce the carcass contamination rate. If this hygienic context is not necessarily a cause of public health concern for sufficiently cooked traditional pork products, the risk is now growing because of rising of industrial processed products and implementing of cold chain. Besides this, the contamination rate of some traditional products still should be assessed, like raw fermented meat or traditional sausages. This study shows the need to perform risk assessment for specific issues on the entire production chain with a farm to fork approach. This should be led with a multidisciplinary approach involving socio-economical researches on production and consumption levels.

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