Prevalence and Epidemiology of *Salmonella enterica* subsp. *enterica* in Small Pig Slaughtering Units in Hanoi, Vietnam

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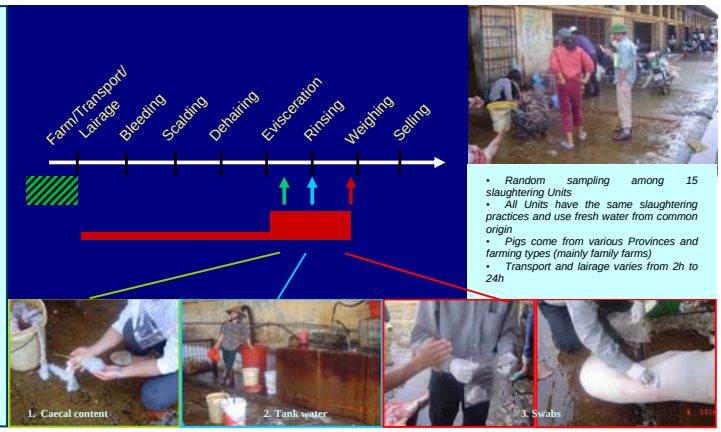
Introduction

This study aimed to make a preliminary assessment of *Salmonella* spp. prevalence and epidemiology in the pig production chain in Vietnam. Food safety of animal products is indeed an emerging research topic of preliminary importance in Vietnam [1,2] : in the frame of WTO membership, increase of demand for quality and safety [3] and need of public health improvement, risk analysis researches are urgently needed. Slaughtering is an essential step for food hygiene and gives information on upstream and downstream hygienic status for live animals or carcasses. Small abattoirs (10 to 30 pigs/day) are still the most common structure for slaughtering pigs in North Vietnam [4]. *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 [5].

Material and Methods

Sampling



- *Random sampling among 15 slaughtering Units*
- *All Units have the same slaughtering practices and use fresh water from common origin*
- *Pigs come from various Provinces and farming types (mainly family farms)*
- *Transport and lairage varies from 2h to 24h*

Analysis

- *Pre-enrichment (BPW)*
  - *Caecal content 15g (1/10)*
  - *Cotton cloth swabs (150 ml)*
- *Selective enrichment (RV)*
- *Plating (xlt4)*
- *Biochemical confirmation (Kligler and additional tests)*
- *serotyping (in progress)*

Results

Table 1 : Number of samples positive for Salmonella spp. and precision levels.

	Number of positive samples for *Salmonella* spp. *(in %=P)*	Absolute precision (A) in % (p=0,05)[(a)]	Relative precision (R) in % (p=0,05)[(b)]
1. Caeca n=116	**57 (49,14%)**	9,10%	18,51%
2. Swabs n=46	**44 (95,65%)**	5,89%	6,16%
3. Tank water n=26	**21 (80,77%)**	15,15%	18,76%

(a) $A^2=1{,}96^2\ P(1-P)/n$
(b) R=A/P

Figure 1 : Caracteristical colony of *Salmonella* spp. on XLT4 agar

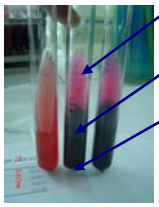


Figure 2 : Result on Kligler agar typical for *Salmonella* spp.

Discussion

- Nearly 50% of the pigs are *Salmonella* carriers –presence of *Salmonella* in caecal content- at the time of slaughtering, which represents a high contamination pressure for the slaughtering environment and the carcasses.
- Over 80% of the water tank samples are positive for *Salmonella* spp. This contamination of rinsing water is probably due to slaughtering practices (rinsing of material in the tank, for instance) and is responsible for the high contamination rate of pig carcasses.
- Contamination rate of tank water samples explain high contamination rate of swabs (>95%), since the carcasses are rinsed with tank water after evisceration.
- European literature report generally a prevalence of *Salmonella* spp. at slaughterhouse as following : 6,2 to 23% for caecal content [6,7], 1,4 to 11,2 % for carcass swabs [6,8,9], with a mean around 5% after evisceration [9]. Whereas evisceration has been described in Europe as the major cause of carcass contamination [5], the present study shows another epidemiological picture of carcass contamination.
- Indeed, our results show a lack of good hygiene slaughtering practices and the central role played by rinsing water in the contamination process. Thus, little improvement of the practices through staff education could considerably reduce the carcass contamination rate.
- If this hygienic context is not necessarily a cause of concern when consumers and food vendors are used to cook meat product enough, it can represent a bigger threat for public health at following conditions : - Cross-contamination during handling of meat with other products, - Changing of consumer habits, like eating of little cooked meat, - extension of the pig production chain with a time increase between production and consumption, - Increase of processing of pig products (consumption and production).
- This study shows the need to perform risk analysis 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.

Acknoledgement

NIVR staff, esp. vet. Hyg. and parasitology teams
Veterinary services
and slaughterhouse staff
AFSSA, HQPAP
CIRAD PRISE

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