Risk-based approach to food safety research: application to pork value chains in Vietnam

Hung Nguyen-Viet1, Sinh Dang-Xuan2, Tran Thi Tuyet Hanh3, Pham Duc Phuc2, Delia Grace1, Fred Unger1, Kohei Makita4
1 International Livestock Research Institute, Hanoi, Vietnam & Nairobi, Kenya; 2 Center for Public Health and Ecosystem Research, Hanoi School of Public Health, Hanoi, Vietnam; 3 Environmental Health Department, Hanoi School of Public Health, Hanoi, Vietnam; 4 Rakuno Gakuen University, Ebetsu, Hokkaido, Japan

Introduction

• Food-borne disease is a major public health issue in Vietnam and the contamination of popular foods can occur along the entire food value chain.
• Risk-based approach contains tools for managing food safety (e.g. risk assessment), however in Vietnam it is rarely used and the capacity for application is still limited.
• We assessed the health risks related to pork consumption in the context of small scale pig value chains and pork traded in informal markets.

Methods

We applied the quantitative risk assessment with biological and chemical sampling and analyses, coupled with practice along the pig value chain and pork consumption assessment and modelling.

Study locations and sampling

Hung Yen and Nghe An province

Small scale pig value chain and related informal markets

Lab analyses: microbial and chemical focus

Biological analysis
(All sample types)

Chemical analysis
(Pork samples)

Salmonella
(n=1,275)
ISO 6579:2002

E. coli
(n=1,256)
Plate count

Heavy metals
(n=18, pooled)
AAS

Growth promoter
(n=18, pooled)
ELISA and LC-MS/MS

Antibiotic residue
(n=18, pooled)
ELISA and LC-MS/MS

Key findings

Salmonella and E. coli contamination

Figure 1. Overall Salmonella contamination prevalence (△, left axis) and E. coli average loads (▲, right axis) along different points of the chain at pig farms, slaughterhouses, pork shops, pork.

Chemical contamination from pooled pork samples

Table 1. Prevalence and residue level of analysed chemical on pork

<table>
<thead>
<tr>
<th>Chemical</th>
<th>No. positive or detected/n (%)</th>
<th>Residue µ (min-max) (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>5/18 (28)</td>
<td>74.1 (70.14-78.7)</td>
</tr>
<tr>
<td>Cadmium, Arsenic</td>
<td>0/18 (0)</td>
<td>-</td>
</tr>
<tr>
<td>β-agonist group</td>
<td>1/18 (5)</td>
<td>1.09a</td>
</tr>
<tr>
<td>Tetracycline group</td>
<td>0/18 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Flourquinolones group</td>
<td>0/18 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Sulfonamides group</td>
<td>9/18 (50)</td>
<td>155.5 (35.6-263.2)b</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>3/18 (16.7)</td>
<td>0.54 (0.34-0.76)</td>
</tr>
</tbody>
</table>

Conclusion and next steps

• High values for E. coli presence indicates general poor hygiene along the chain.
• High levels of Salmonella in the final pork at market and presence of the banned chemicals (sulfonamid and chloramphenicol) can induce potential health risks for the consumers.
• These data will serve as inputs for more in-depth health risk assessments related to pork consumption.

Acknowledgement

The research is under PigRISK project (2012-2017) funded by Australian Center for International Agricultural Research (ACIAR) and coordinated by the International Livestock Research Institute (ILRI).