Embedding risk analysis into value chain approaches, the case of pork value chain in Vietnam

Fred Unger¹, Hung Nguyen¹, Sinh Dang-Xuan², Phuc Pham Duc², Pham Van Hung³, Le Thi Thanh Huyen⁴, Karl Rich¹, Minh Pham Ngoc⁵, Delia Grace¹

¹ International Livestock Research Institute, Vietnam and Kenya.
² Center for Public Health and Ecosystem Research, Hanoi School of Public Health, Vietnam
³ Faculty of Economics & Rural Development, Vietnam National University of Agriculture, Hanoi, Vietnam
⁴ National Institute for Animal Science, Vietnam
⁵ National Institute for Veterinary Research

MALICA ANNUAL SCIENTIFIC MEETING
5th June 2018, Hanoi
• Food safety, global and Vietnam

• Risk analysis

• Applied food safety assessment along the pork value chain - case studies

• Risk management
Food safety – global perspective
Global burden on Food Borne Disease (FBD)

Key facts:
• 1 in 10 people fall ill every year from eating contaminated food
• Burden of FBD comparable with those due to Malaria and HIV
• Highest burden in children <5 years
• Second highest burden in SE Asia region B (includes Vietnam)

Havelaar et al., 2015
Food safety in Vietnam

**Perception**
- Food safety is perceived as one of the most pressing issues by Vietnamese people, more important than education or health care

**Legislation**
- Vietnam has a modern food safety legislation system but the use of risk based approach is limited

**Consumers’ Behavior**
- Willing to pay 5-10% premium for safer food, not easy to decide for consumer what is “safe”

**Market Situation**
- Food exports relatively well managed but deficits in domestic markets

**Risk based approach**
- Deficites in use of risk assessment, management & communication
Aim:
To provide policy makers with evidence for effective and transparent decision-making, contributing to better food safety outcomes.
Risk assessment, management & communication

Risk Assessment

Hazard identification
• What is the hazard of concern?

Hazard characterization (Including dose response)
• What harm will it do?

Exposure assessment
• Exposure to the population

Risk characterization
• What will be the harm to the population (qualitative or quantitative)

Risk Management
• Risk assessment results
• Risk management options
• Risk management measures
• Monitoring and review

Risk communication
Food safety research along the pig value chain

**PigRISK (2012 - 17)**
- Determined the health risk for the consumer for selected food safety hazards
- Nghe An and Hung Yen
- Microbial & chemical hazards & risks

**SafePORK (2017-22)**
Focus on food safety interventions along various pork value chains (up to 10)
- Evaluate existing interventions
- Design and test new interventions
- Involvement of private sector
- 5 provinces

**Healthier native pigs (2018 -19)**
- Hoa Binh
- Focus on pork-borne parasites
1. Risk profiling & hazard identification
   Literature review, PRA, Base line

2-3. Risk assessment
   - Microbial Risk Assessment
   - Chemical Risk Assessment
   - Animal Health Risk Assessment
   - Economics (e.g., cost of illness)
   - Rapid assessment
   - Economic assessment
   - VIETGAHP
   - ....

4. Interventions (Safe PORK)
   - Intervention 1
   - Intervention 2
   - Intervention 3

5. Engaging stakeholders, advocacy, communication & capacity building on VC and risk assessment (research team & authorities)

Supporting activities:
- Behavioral studies
- Gender
- TOC
### Food-borne disease

#### Parasitic
- Cysticercus & Trichinella
- Toxoplasma gondii
- Fasciola spp. ...

#### Bacterial
- Bacillus cereus
- Campylobacter spp.
- Salmonella spp.
- Streptococcus suis
- Staphylococcus arues
- E. coli
- Yersinia enterocolitica ...

#### Chemical
- Antibiotic residues
- Growth promoters
- Heavy metal ...

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#### Risk assessment

- **Cysticercoses & Trichinellosis**
- **Salmonella spp.**
- **Antibiotic residue**
Microbial Risk Assessment

Infection risk (P)

Farm
Slaughter house
Market
Fork Consumption
Risk

Pathogen concentration (N)

Exposure assessment

Source: Microbiological Risk Assessment Series No2-2002, No7-2008
Hung Yen

Producer → Slaughter-house (60%) → Collector (39%) → Other provinces (1%)

Slaughter-house (35%) → Retailer (61%) → Consumer

Processor (4%) → Consumer

Nghe An

Producer → Slaughter-house (26%) → Collector (45%) → Other provinces (6%)

Slaughter-house (52%) → Retailer (69%) → Consumer

Processor (5%) → Consumer

More than half of pigs are slaughtered local
Few are slaughtered by/at farmers place (1-6%)

Source: Pig RISK, 2018
Microbial risk assessment
Presence of Salmonella in the pork chain

*Salmonella*, a bacterial pathogen, found in **44.7% of pork** sold at market

*Salmonella* contamination **started at farm and increased along the pork value chain** mainly due to poor hygienic practices.

<table>
<thead>
<tr>
<th>Actor</th>
<th>Sample type</th>
<th>Pos/Total</th>
<th>Prev (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Producer</strong></td>
<td>Drinking water pigs</td>
<td>14/72</td>
<td>19.4</td>
</tr>
<tr>
<td>“”</td>
<td>FloSwab</td>
<td>26/72</td>
<td>36.1</td>
</tr>
<tr>
<td>“”</td>
<td>Waste Water</td>
<td>28/72</td>
<td>38.9</td>
</tr>
<tr>
<td><strong>Slaughter</strong></td>
<td>Carcass Swab</td>
<td>58/149</td>
<td>38.9</td>
</tr>
<tr>
<td>“”</td>
<td>Feces</td>
<td>50/149</td>
<td>33.6</td>
</tr>
<tr>
<td>“”</td>
<td>MesentericLN</td>
<td>53/149</td>
<td>35.6</td>
</tr>
<tr>
<td>“”</td>
<td>SwabFlo-SH</td>
<td>11/49</td>
<td>22.4</td>
</tr>
<tr>
<td>“”</td>
<td>Water-SH</td>
<td>10/49</td>
<td>20.4</td>
</tr>
<tr>
<td><strong>Market</strong></td>
<td>Pork</td>
<td>97/217</td>
<td>44.7</td>
</tr>
<tr>
<td>“”</td>
<td>Pork-Grinded</td>
<td>33/80</td>
<td>41.3</td>
</tr>
<tr>
<td>“”</td>
<td>Cut Swab</td>
<td>55/217</td>
<td>25.3</td>
</tr>
<tr>
<td><strong>NA</strong></td>
<td>Overall</td>
<td>435/1275</td>
<td>34.1</td>
</tr>
</tbody>
</table>

*Source: Pig RISK, 2018*
Risk assessment (microbial and chemical) & cost of illness due to FBD

1. Quantitative risk assessment to assess health impacts of FBD due to Salmonella spp. (cooked pork)

One in five pork consumers are at risk of *Salmonella* poisoning annually (annual incidence 15.8-17.9)

<table>
<thead>
<tr>
<th>Risk model structure</th>
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</thead>
<tbody>
<tr>
<td><strong>Farm</strong></td>
</tr>
<tr>
<td>Drinking water</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Waste water</td>
</tr>
<tr>
<td>Water</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Minced pork</td>
</tr>
</tbody>
</table>

2. Chemical risk assessment (feed, liver and pork samples)

- Grow promoters and heavy metals did not exceed or below MRL
- Antimicrobials, only few samples above MRL (e.g. sulfamethazin), but 4% of pork samples positive for chloramphenicol

3. Cost of illness

Costs per treatment episode and per day of hospitalization due to foodborne diarrhoea:

- Per day: USD 107 and USD 34, respectively

While common perception is on risks by chemical hazards we found that microbiological risks are more prominent.
From risk assessment to risk management & communication

Pig RISK
• Health risk determined

Safe Pork & Healthier native pigs
• Risk management and communication using incentive based interventions

Study sites:
Hung Yen and Nghe An: Former Pig RISK sites

New research locations:
Hanoi: recently emerging markets for boutique-like stores such as Bac Tom
Bac Ninh: industrial zones hosting canteens for mass supply of animal-source food
Hoa Binh: native pork-producing areas with an identified strong commitment by local policymakers to expand this sector
Various approaches to improving safety had been tried, largely based on systems used in developed countries e.g.:
- GAP, traceability, certification, and modernising retail

However, safe meat production has not yet take a significant market share

The key constraints to uptake include:
- high cost of adoption
- lack of direct, visible benefits from changing behaviour
- low consumer trust in certification

We propose that incentive-based, light-touch interventions are needed to overcome these constraints

Focus will be on gradual improvements to the food system in place, rather than introduction of a new system
Key components – Safe PORK

**Assessment:**
To generate evidence on the efficacy, feasibility and reach of pork chains and approaches for improving pork safety in Vietnam (Street food, convenience stores, high quality food shops, canteen, traditional markets)
Tools: Food safety performance tool, risk assessment

**Intervention:**
Develop, pilot and test incentive-based approaches to food safety in close partnership with the private sector
Tools: RCT, risk assessment, cost benefits, behavioural studies (nudges)

**Communication:**
Understanding food safety risk, its management and effective communication among stakeholders & partners

**Cross cutting:** Gender and Theory of Change
Safe PORK - Examples for low-cost interventions

- Simple, cheap tests that detect contaminated food
  - Could be used directly by retailers or consumer to have direct verification of safety
- Reduce contamination of carcass or marketed pork
  - Portable ozone machines to plug into water supply
    - Ozone is highly effective disinfectant;
  - Avoid floor slaughter
  - Cysticercosis vaccination & treatment
- Reduce use of antimicrobial
  - Replacement of antimicrobials by pro-biotics, in collaboration with private sector.
- Increasing transparency and traceability in food system
  - 24 hour camera that shows conditions on farm
  - Branding and certification, in collaboration with private sector
Aligning food safety risk assessment and value chain approaches – experiences made

One Health in practice
- Agriculture economic research team led VC (VNUA)
- Health research team led risk assessments (Vet and PH)(VNUA & HUPH)

Training
Medium & long term: PhD (2), MSc (12), undergraduates (88)
Short term:
Risk assessment, VC assessment, System dynamics model, EcoHealth/OneHealth

Food safety risk assessment taskforce
Technical entity bringing together experts in risk assessment to conduct research, training and advocacy in food safety risk assessment in Vietnam.
Most of the members of the taskforce are part of the national working group on food safety

Outcomes: Respective teams are the to go places for VC or risk assessment capacity (food safety)
Conclusions

• Risk assessment along the pork value chain has been successfully applied to determine health risk for pork consumers

• Considerable health impact due to *Salmonella* for pork consumers, less for chemical hazards $\Rightarrow$ other biological hazards (?)

• Capacity increase on risk assessment achieved, some gaps remain (e.g. risk management and communication)

• Risk management options are currently explored aligned with risk communication, cost benefits and behavioural studies (among others)
Acknowledgement

- ACIAR, CGIAR A4NH & GIZ
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- Value chain actors and communities