Participatory Risk Assessment of pork in Ha Noi and Ha Tay, Vietnam

Key points

- Food-borne disease is a major cause of sickness and death and animal-source foods such as pork are considered high risk products.
- Our survey found a high level of microbial contamination in pork sold in Hanoi and Ha Tay; 90% of samples did not meet acceptable levels.
- Pork sold in supermarkets contains significantly higher levels of hazards than pork sold in wet markets.
- However, there is little evidence that hazards in pork present a risk to human health. This could be the result of retailer and consumer practices that reduce risk (e.g. adequate cooking, short time between slaughter and sale, and between sale and consumption).
- Poor animal waste management resulting in contaminated vegetables may be the most important human health risk associated with pork.
- On the farm-to-fork risk pathway, a critical control point may be the slaughterhouse.
- Further studies are needed to better understand the hazards potentially in pork and other foods and their risks to human health.
- A risk-based approach (that is, risk analysis) will be most useful in assessing, managing and communicating the risks associated with pork.

Introduction

In Vietnam, as in other developing countries, food- and water-borne diseases are major causes of sickness and death. People are often most concerned about chemicals in food, but biological hazards (e.g. bacteria and parasites) are usually by far the most important. Given that humans share 60% of their diseases with animals and that meat is an excellent medium for bacterial growth, it is not surprising that animal-source foods are among the most risky products. In countries with good data, animal-source foods are typically the major causes of food-borne disease (69% in the USA and up to 74% in the UK).

Box 1: Hazards to human health potentially present in pork

Hazards are things that can cause harm. In food safety terminology they are divided into three categories:

- Biological hazards: These are pathogens including bacteria, parasites, viruses and protozoa. Biological hazards are responsible for the majority of the human health burden associated with food. Examples include Salmonella bacteria, Hepatitis E virus, and pig tapeworm. Previous studies have shown many of these to be present in pork in Vietnam.
- Chemical hazards: These include drug residues, growth promoters and pesticides. There is little information about chemical hazards in pork in Vietnam.
- Physical hazards: These are foreign materials in food products (e.g. metal fragments in minced meat) or naturally occurring objects (e.g. bones) that are a threat to the consumer. We did not assess these hazards.
In Vietnam little is known about the hazards that cause diarrhoea and other illness, prevalence of other food-borne diseases, high-risk foods, or the cost of illness. But to effectively tackle food-borne and zoonotic diseases, we need to know what problems are present and how common they are.

There is a common perception that smallholder production and traditional ways of marketing and selling food are less safe than large-scale, modern alternatives. If small-scale pork producers are to be competitive, it is essential to assess, communicate and manage the health risks associated with pork in general, and with pork that smallholders supply in particular, through the supply chain with which they are predominantly linked.

**Box 2: Risk analysis for improving human health**

Risk analysis offers a new approach to managing food safety. Not only is it more effective at decreasing risks, but it can also be a bridge joining food safety and livelihood concerns. It offers a science-based, structured, transparent method for answering the questions that matter to policymakers and the public alike: *Is this food safe? Is the risk big and important? What efforts are appropriate to reduce the risk?*

While conventional food safety looks at the presence of hazards, risk assessment goes beyond this to estimate the harm to human health, and what can be done about it. Sometimes hazards can be high, but because of risk-mitigating practices, the risk to human health is low. The opposite is also possible. Without risk assessment, food safety control tends to be based on tradition or anecdote and is often not only ineffective but also anti-poor.

**Box 3: Data sources and methods**

In late 2009, we conducted a rapid, participatory assessment of hazards present in pork sold in Hanoi and Hatay and the possible risk to human health. Using a farm-to-fork approach, we surveyed farms (n=18), slaughterhouses (n=2), transporters (n=3), retailers (n=37) and consumers (n=153). We also facilitated participatory rural appraisals in three villages. We took biological samples and analyzed these for important hazards at the National Institute of Veterinary Research in Hanoi. We also observed and graded the hygienic practices being carried out by different actors in the pork value chain.

**Table 1. Some of the hazards present in pork in a survey in Hanoi and Ha Tay, Vietnam, 2009**

<table>
<thead>
<tr>
<th>Hazard or indicator of hazard</th>
<th>Hazard characterisation</th>
<th>Present</th>
<th>Unacceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total bacterial counts</td>
<td>A general indicator of the quality and safety of pork</td>
<td>92%</td>
<td>55%</td>
</tr>
<tr>
<td>Faecal bacteria</td>
<td>An indicator that pork has been contaminated by faeces. Many food-borne diseases are passed via faeces.</td>
<td>86%</td>
<td>60%</td>
</tr>
<tr>
<td><em>Escherichia coli</em> O157</td>
<td>One of the most important food-borne pathogens. Can cause serious illness including renal failure in children.</td>
<td>90%</td>
<td>n/a</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>One of the most important food-borne pathogens. Both humans and animals can be the source of contamination.</td>
<td>41%</td>
<td>25%</td>
</tr>
<tr>
<td>Liver fluke</td>
<td>A zoonosis; pigs a reservoir in Southeast Asia. Exposure from aquatic plants or eating raw liver</td>
<td>8%</td>
<td>n/a</td>
</tr>
<tr>
<td>Antibiotic residues</td>
<td>Can cause reactions in sensitive people. Foster development of resistance in bacteria affecting humans.</td>
<td>9%</td>
<td>9%</td>
</tr>
</tbody>
</table>

n/a: not applicable
Results

Hazards are high

Most pork sampled was of unacceptably bad bacteriological quality. Eight hazards were detected, including bacteria, parasites and antibiotic residues. Some of the more important are shown in Table 1.

And consumers have high concerns over pork

Nearly half the consumers (43%) had concerns about pork: most common was fear of disease from pork, followed by fear of chemical contaminants, unfresh pork and bad smell. Only one person expressed nutritional concerns. Consumers bought from known and trusted sources in order to reduce risk.

Box 3: Consumer concerns about pork in a survey in Hanoi and Ha Tay, Vietnam, 2009

“I am so afraid of disease so I have to clean meat by boiling water and only eat well-cooked meat.”

“I am so afraid, so I just buy pork from butchers I know because some of my neighbours had diarrhoea and stomach pain recently.”

“I cannot believe in any butcher in the market even when I buy pork from the supermarket. But I still have to accept to buy and eat this pork.”

But risk to human health from pork appears low

Although hazards were high, pork consumers report low levels of gastrointestinal disease (one episode per person per year). In developed countries with strictly enforced food safety, consumers report from 0.1 to 5.5 cases per year.

Furthermore, there is no relation between the amount of pork consumed and risk of gastrointestinal illness (p=0.60). If contaminated pork were responsible for causing illness, we would expect that greater consumption of pork would lead to more illness. However, there is a strong positive association between consuming vegetables and reporting illness (p=0.006). This may be linked to livestock waste used as fertilizer and/or poor handling of vegetables in the house which results in them being cross-contaminated with pathogens from other sources.

The major contamination point appears to be slaughterhouses

Hygienic practices were moderate at farm level, very poor at slaughter, poor at transport, moderate in supermarkets and poor in wet markets and village butcheries. Faecal contamination is the greatest contributor to bacterial load of pork. Given the conditions of slaughter, this is most likely to be contamination of the carcass at the time of slaughter.

Supermarket pork has worse bacterial quality than pork from wet markets

Supermarkets scored higher in terms of acceptable hygienic practice (77%) than wet markets (41%). But pork from supermarkets was consistently of poorer microbiological quality (Figure 1). Although this finding seems surprising, other studies in Kenya, Ghana and India have also found that informally marketed food was more likely to meet standards than food sold in supermarkets.

It is likely that meat is already highly contaminated in slaughterhouses, and because it is kept longer in supermarkets and there is no drying of meat, bacteria are able to reach higher levels despite refrigeration.

Antibiotic residues may be of concern

Antibiotic residues are of concern because they may encourage the development of antibiotic resistant bacteria in people and, much more rarely, trigger allergic reactions in people who are sensitive. Unlike bacterial pathogens, antibiotic residues are not eliminated by thorough cooking. A high percentage of meat samples had unacceptable levels of antibiotic residues.
Conclusions

The following primary conclusions can be drawn from this study:

- The risk posed by pork to human health in Vietnam is not fully understood. More extensive studies of pork are needed to establish the risk to human health.

- Hazard is not the same as risk: hazards present at one point in the food value chain may not present risks to consumers. This preliminary study finds no evidence that pork sold in traditional wet markets is less safe than pork sold in modern outlets; indeed, it may be more safe.

- This study shows that rapid assessments using participatory methods can help in understanding the hazards and risks associated with the pork value chain.

Implications for policy and interventions

Food safety policy should be based on evidence, which means it should be based on the risk to human health and not on the presence of hazards. Currently the risk to human health posed by pork is not fully understood, nor the best ways to tackle this. Comprehensive risk assessment is urgently required to inform policy, improve consumer safety and safeguard participation of small-scale actors in the pork sector.

Risk assessment takes a farm-to-fork approach which looks at the sources of hazards and how these increase or decrease between production and consumption. This allows identification of critical control points where risk can be most effectively reduced. It also makes risk targeting possible so scarce resources can be directed at the parts of the value chain where most risk is created.

Risk is multi-source. Risk assessment should take into account other transmission routes for diseases including waste water and urban/peri-urban agriculture. Zero risk is rarely achieved and the appropriate level of risk should be determined by stakeholders, taking into account the costs as well as benefits of pork-safety measures.

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