



Review of selected veterinary public health research on pigs and pig products in Southeast Asia published between 2005 and 2012

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This review builds upon a presentation given at the International South-South Symposium—Managing Risks in Emerging Pork Markets held on 23–25 April 2012 in Hanoi, Vietnam. It provides an overview of selected veterinary public health research related to pigs and pig products in Southeast Asia. It mainly considers research published under the Veterinary Public Health Centre for Asia Pacific (VPHCAP). It also includes a rapid literature search from other sources (e.g. PubMed) published between 2005 and 2012. A more in-depth literature review is currently being prepared.

With an objective of creating a regional information centre on food safety for food of animal origin in countries of the Asia-Pacific region, the VPHCAP has provided a considerable amount of information since its establishment in 2003. The VPHCAP is aligned to the Faculty of Veterinary Medicine of the Chiang Mai University and hosts a Joint Master of Science program in Veterinary Public Health (VPH). Key areas of VPHCAP research are related to pig and poultry production and products, specifically microbiological quality, antimicrobial resistance/residues and

food-borne zoonoses (e.g. *Taenia*/cysticercosis and trichinellosis). Other areas, which will not be further addressed here, include VPH research on ruminants, dogs and seafood; the last representing a growing concern.

Most VPH publications for Thailand for pigs and pig products are studies on bacteriological contamination/prevalence (predominantly *Salmonella* spp.), or classical pig zoonoses such as cysticercosis or trichinellosis. *Salmonella* studies include assessments of prevalence (pre-slaughter) and bacteriological contamination (slaughter, processing or market), either conducted alone or combined with research on anti-microbiological resistance or residues. In various publications, *Salmonella* has been demonstrated to be an important hazard. A good proportion of studies target specific questions related to genome analysis and plasmid-related antimicrobial resistance. Few studies include epidemiological aspects or hazard analysis critical control point (HACCP) approaches. While on-farm surveys often focused on large or medium-sized premises, the small-scale sector is less well documented.

Salmonella (typhoid and non-typhoid) has been also well documented from a human health perspective. A recent overview of the 10 most common Salmonella spp. isolated in patients is provided by Hendriksen et al. (2009). Studies under the VPHCAP on Salmonella spp. (prevalence and contamination) targeted the source of Salmonella spp. in fattening pigs (Wunnakhum et al. 2011), related management factors in on-farm breeder sows (Ngasaman 2007) or pre-slaughter pigs (Dorn In 2005), pork products along a specific product chain (slaughterhouse, retailer and markets) (Sanguankiat 2005), or specific end products such as northern Thai sausage (Jongchansittoe 2011; Wiratsudakul 2011). Rather exceptionally, one study investigates consumer preferences related to pork products in northern Thailand (Muenanan et al. 2012).

Though fewer in overall quantity (when compared with Thailand), related VPH publications for Vietnam on pigs and pig products frequently focused on Salmonella spp. and the classical pig zoonoses, cysticercosis and trichinellosis. Studies on Salmonella spp. (contamination/prevalence, antimicrobial resistance) included different parts of the production chain: on-farm, pre-slaughter/slaughter and/or retail/ markets. Various studies have demonstrated Salmonella spp. to be a potential health hazard. A few studies targeted the small-scale sector (e.g. on-farm, Hong et al. 2006) or slaughterhouse (Le Bas et al. 2006) or some nodes of the production chain (e.g. Takeshi et al. 2009).

Publications under the VPHCAP for Vietnam included studies on Salmonella spp. (prevalence/contamination) in pig carcasses in a Hanoi slaughterhouse (Phu Thai 2007) or in minced pork sold at Hanoi retail markets (Pham Thi Thu Hien 2009). Phu Thai (2007) reported some association between farm type and Salmonella prevalence in pig carcasses (lymph node cuts) with higher prevalence levels found in pigs from backyard farms. Pham Thi Thu Hien (2009) reported a correlation between season of the year and Salmonella contamination in sold minced pork, with higher levels of contamination during spring. Two more studies investigated antimicrobial residues (Vat Nhiem 2005) and antimicrobial resistance (Chu Van Tuat 2007) in retail/ marketed pork sold in Hanoi. Both authors reported an increased content of residues (tetracycline) or antimicrobial resistance (of Escherichia coli isolates) in meat from suburban versus urban districts (Vat Nhiem 2005) or from neighbouring provinces versus Hanoi (Chu Van Tuat 2007), respectively.

Apart from this rather classical VPH research, a recent Australian Centre for International Agricultural Research (ACIAR)-funded project by the International Livestock Research Institute (ILRI) on Improving competitiveness of smallholder pig producers in an adjusting Vietnam market provided insights on consumer concerns vis-à-vis pig diseases and smallholder pig producer competitiveness: the study also included a pilot assessment of microbiological hazards.

For the Lao PDR and Cambodia, very few VPH-related publications are available focusing on bacteriological prevalence/contamination and/or porcine cysticercosis (Lao) in pigs or pig products. Publications under the VPHCAP included the Lao PDR studies on pig carcasses (Salmonella contamination) in Vientiane municipality (Inthavong 2005) and on porcine cysticercosis in the northern part of the country (Tammajedi 2009). For Cambodia, only one study to assess the prevalence of trichinellosis and porcine cysticercosis has been undertaken, including four abattoirs in Phnom Penh (Than Sovira 2005).

Conclusion

Available VPH research on pigs and pig products in Southeast Asia varies widely by country, with the highest number of publications from Thailand followed by Vietnam. Minimal research has been internationally published for Cambodia and the Lao PDR. The review also reveals that VPH research in Southeast Asia mainly targets the study of microbiological contamination/prevalence and the collection of baseline data for certain production systems/processes, while often focusing on the slaughter process alone. Prior to slaughter investigations or on-farm surveys are considerably fewer. Some potential public health hazards along the pig food chain have been well documented. However, studies on the related consumer risk (actual/perceived), specific consumer surveys (e.g. on consumer perception or food preferences) or entire farm-to-fork approaches are still exceptional or often lacking.

Available VPH-related publications often prioritize the medium- or large-scale sector, especially in Thailand with its highly industrialized pig/pork processing sector (e.g. CP Thailand). Consequently the more informal or small-scale production sector has received less emphasis in research, with the exception of specific research questions (e.g. porcine cysticercosis in certain risk groups).

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