



Manure management and public health: Sanitary and socio-economic aspects among urban livestock-keepers in Cambodia

Gunilla Ström^a, Ann Albihn^{b,c}, Tomas Jinnerot^d, Sofia Boqvist^c, Agnes Andersson-Djurfeldt^e, Seng Sokerya^{f,1}, Kristina Osbjer^{a,1}, Sorn San^{g,2}, Holl Davun^{g,2}, Ulf Magnusson^{a,*}

^a Department of Clinical Sciences, Swedish University of Agricultural Sciences, PO Box 7054, 750 07 Uppsala, Sweden

^b Department of Chemistry, Environment and Feed Hygiene, National Veterinary Institute, Ulls väg 2B, SE-751 89 Uppsala, Sweden

^c Department of Biomedical Sciences and Veterinary Public Health, Swedish University of Agricultural Sciences, PO Box 7036, 750 07 Uppsala, Sweden

^d Department of Microbiology, Section for Molecular Diagnostics, National Veterinary Institute, Ulls väg 2B, SE-751 89 Uppsala, Sweden

^e Department of Human Geography, Lund University, Sölvegatan 10, 223 62 Lund, Sweden

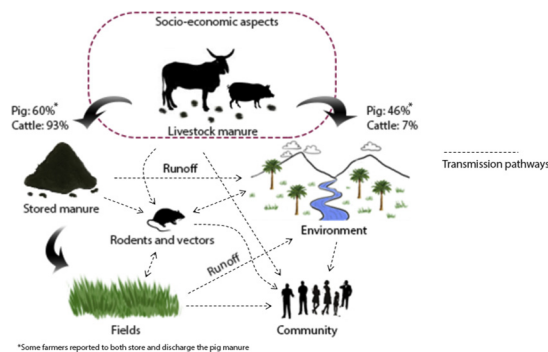
^f Centre for Livestock and Agriculture Development, PO Box 2423, Phnom Penh 3, Cambodia

^g National Veterinary Research Institute, St 371, Phnom Penh, Cambodia

HIGHLIGHTS

- Poorly handled livestock manure may constitute a public health hazard.
- Socio-economic factors that may contribute to poor manure disposal were identified.
- There was a difference in the management of pig and cattle manure.
- Almost half of the pig-keepers in Phnom Penh dump pig manure to the environment.
- There is a need for further knowledge support to promote good manure management.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 28 August 2017

Received in revised form 21 November 2017

Accepted 22 November 2017

Available online xxxx

Editor: Simon Pollard

Keywords:

Manure management

Urban livestock

Pig production

ABSTRACT

Livestock manure is a valuable source of nutrients for crop production, but can also pose a public health hazard and have negative environmental impacts. This study investigated manure management practices among urban and peri-urban livestock keepers in Cambodia, to identify risk behaviours and socio-economic aspects associated with the handling of manure. A survey including 204 households was conducted, using a structured questionnaire with questions on demographics, socio-economic characteristics and household practices related to manure management. Faecal samples were obtained from pig pens and pig manure storage units for analysis of the potential zoonotic pathogens *Salmonella enterica* (Polymerase Chain Reaction (PCR)), *Ascaris suum* and *Trichuris suis* (McMaster flotation technique). The survey revealed a difference in management between cattle and pig manure. Cattle manure was most commonly used as fertiliser for crop production (66%) ($p < 0.001$), whereas pig manure was most commonly dumped in the environment (46%) ($p < 0.001$). Logistic regression models showed that households with a lower socio-economic position were more likely to dump pig manure

* Corresponding author at: Department of Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden.

E-mail addresses: gunilla.strom@slu.se (G. Ström), ann.albihn@sva.se (A. Albihn), tomas.jinnerot@sva.se (T. Jinnerot), sofia.boqvist@slu.se (S. Boqvist), agnes.andersson_djurfeldt@keg.lu.se (A. Andersson-Djurfeldt), sokerya.seng@fao.org (S. Sokerya), kristina.osbjer@fao.org (K. Osbjer), ulf.magnusson@slu.se (U. Magnusson).

¹ Present address: Food and Agriculture Organization of the United Nations, St 370, Phnom Penh, Cambodia.

² Present address: General Department of Animal Health and Production, St 371, Phnom Penh, Cambodia.

Socio-economic
Public health
Cambodia

($p < 0.001$), with scarcity of agricultural land ($p < 0.001$) and lack of carts for transportation of manure ($p < 0.01$) being identified as contributing factors. *Salmonella enterica* was detected in 9.7% of manure samples, while *Ascaris suum* and *Trichuris suis* were detected in 1.6% and 2.4% of the samples, respectively. The results presented in this study indicate that manure management by urban and peri-urban households may pose a public health threat and an environmental hazard. There is evidently a need for further knowledge support to the livestock keepers to promote good management practices.

© 2017 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Urbanisation and economic growth are fuelling an increasing demand for animal-based foods in many developing regions of the world, including Southeast Asia (Delgado, 2003; De Haan et al., 1998). This demand has contributed to a shift in livestock production to the vicinity of urban areas, where it is often carried out in landless systems and is characterised by general low biosecurity and inadequate manure management (Bonfoh et al., 2010; Gerber et al., 2005; FAO, 2001).

When managed properly, livestock manure is a valuable fertiliser that may contribute to enhanced food security by improving soils and increasing crop yields (Rufino et al., 2006). However, mismanagement of livestock manure, including improper handling, storage and disposal, can instead pose a sanitary hazard and cause excessive greenhouse gas emissions and eutrophication (Gerba and Smith, 2005; Jongbloed and Lenis, 1998). Untreated livestock manure may also contain a wide range of zoonotic pathogens that can cause disease in humans (Carrique-Mas and Bryant, 2013; Yugo and Meng, 2013; Milinovich and Klieve, 2011). These pathogens are mostly spread by food and water that have been contaminated with manure. The risk of transmission to humans may be enhanced by certain consumption habits, such as source of drinking water and consumption of raw or undercooked food, or by the lack of sanitary precautions, including proper hand washing (Lam et al., 2015; Gerba and Smith, 2005). Additional health problems may arise if manure containing antimicrobials or antimicrobial-resistant bacteria ends up in the environment, as they may contribute to the emergence of antimicrobial resistance (Heuer et al., 2011; Venglovsky et al., 2009).

Implementation of proper management practices for livestock manure is often challenged by ineffective manure management policies and a lack of incentives for good management (Teenstra et al., 2014). In addition, poor farmers may not have enough capital to invest in the equipment necessary for improvements, and there is often insufficient knowledge among farmers about the value of manure as a fertiliser, and about the biosecurity hazards arising from improper handling and use of manure. The hygiene aspects and potential public health hazards arising from management of livestock manure have been emphasised in several studies (Huong et al., 2014b; Dang et al., 2011; Vu et al., 2007). To the best of our knowledge, however, no published study has focused on possible socio-economic factors that impede proper handling of manure. The present study was therefore conducted to map and describe existing manure management practices among urban and peri-urban livestock keepers in Phnom Penh, the capital of Cambodia, with the objective of identifying risk behaviours and socio-economic aspects related to management practices. Furthermore, faecal samples from pigs and pig manure storage units were collected and analysed for the presence of *Salmonella enterica*, *Ascaris suum* and *Trichuris suis*. These microorganisms were selected as indicator pathogens as they are commonly present in pig manure and may survive for months in favourable environmental conditions (McCarthy et al., 2015; Katakam et al., 2014; Pittman et al., 2010).

2. Methods

2.1. Study area

The study was conducted in the urban and peri-urban areas of Phnom Penh, which has a total population of 1.7 million (World Bank,

2015). Phnom Penh is located in southern Cambodia (11°33 N, 104°55 E), at the convergence of the Mekong, Tonle Sap and Tonle Bassac rivers. Cambodia has a tropical climate, characterised by two distinct seasons; a dry season from November to April and a rainy season from May to October, when 75% of annual rainfall occurs. During the rainy season, flooding is a common occurrence in Phnom Penh. When this study was conducted, in 2014 and 2015, livestock keeping within urban areas of Cambodia was unregulated (Department of Animal Health and Production, Cambodia, 2014, personal communication), implying that farmers and government officials had no guidelines or official regulations to adhere to.

2.2. Study design and data collection

Data were collected in November–December 2014, and in February 2015. The procedure used to locate and select households has been described previously in detail by Ström et al. (2017). In brief, prior to the study, a field team used the procedure of snowball sampling (Faugier and Sargeant, 1997), with the aim to locate all households keeping pigs under family farm conditions in Phnom Penh (FAO, 2014). All households located were then visited, and were included in the study if a household member was at home and willing to participate, resulting in a total sample of 204 households.

A questionnaire written in English was used to interview the person responsible for the daily management of the household's pigs. A draft of the questionnaire was pre-tested in households close to Phnom Penh and was refined based on to input from these pre-testing sessions. Interviews were conducted in the native language Khmer with the assistance of the same interpreter, provided by the Centre for Livestock and Agriculture Development (CeLAgrid), throughout the study. In brief, the questionnaire contained around 90 questions, including dichotomous, multiple choice and open-ended questions, concerning household demographics, socio-economic characteristics and practices related to animal husbandry and manure management. The term 'manure' is here referring to faeces and does hence not include management of urine. The questionnaire is available as supplementary material in Ström et al. (2017).

2.3. Collection of manure samples

Samples were obtained from households where fresh manure was available, which amounted to a total of 176 households (86%). Faecal samples were collected from a maximum of four pig pens in each household and, if possible, from the manure storage unit. Only pens with fresh manure were sampled, to avoid deterioration of any parasite eggs in the manure. For pens with growers or fatteners, a pooled manure sample of about 200 g was collected from up to five different droppings per pen. For pens with individual sows, up to 200 g of fresh manure were collected. For the manure storage unit, a total sample of 200 g per household was collected from three different places, at a depth of approximately 30 cm. Each sample was thoroughly mixed in a clean 500 mL plastic container and approximately a 20 g portion of mixed sample was then transferred to a smaller plastic container with screw cap. Samples were stored and transported on ice to the laboratory of the National Veterinary Research Institute (NaVRI), Phnom Penh, for processing and analysis.

Download English Version:

<https://daneshyari.com/en/article/8861760>

Download Persian Version:

<https://daneshyari.com/article/8861760>

[Daneshyari.com](https://daneshyari.com)