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Short communication

Smallholder pig production: Prevalence and risk factors of ectoparasites

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ABSTRACT

A cross-sectional study was carried out in the Mbeya Region, Tanzania, with the aim of describing the distribution and diversity of ectoparasites on pigs, within confinement and free-range production systems of smallholder farms. A total of 128 farms were surveyed, with 96 practising confinement and 32 practising free-range production systems. The prevalence of ectoparasites on pigs within confinement and free-range production systems was 24% and 84%, respectively. Logistic regression analyses revealed that keeping pigs in a free-range system and the presence of neighbouring pigs were risk factors for ectoparasites. Within the confinement system, contact with neighbouring pigs and the time interval (in months) since last ectoparasitic treatment were additionally identified as risk factors. The prevalence of *Haematopinus suis* was 20% in confined pigs and 63% among free-range pigs. Free-ranging of pigs and presence of neighbouring pigs were also identified as risk factors for the presence of lice. Three species of fleas were identified; *Tunga penetrans*, *Echidnophaga gallinacea* and *Ctenocephalides canis*. The prevalence of fleas was 5% and 13% within confined and free-range, respectively. Two pigs (2%) were found infested with *Sarcoptes scabiei* var. *suis*. Ticks found belonged to four genera; *Amblyomma* spp., *Rhipicephalus* spp., *Haemaphysalis* spp., and *Boophilus* spp. The prevalence of hard ticks among the free-range pigs was 50%. Ectoparasites were more prevalent in the free-range system although highly prevalent within both production systems. Keeping pigs in a free-range system and contact with neighbouring pigs were main risk factors for the presence of ectoparasites. Confinement was highly effective as a preventive tool against hard ticks.

1. Introduction

Pig production in sub-Saharan Africa has been hampered by diseases such as African swine fever (ASF) and cysticercosis (Penrith, 2009; Phiri et al., 2003). However, a recent study of smallholder farmers from Kenya mentioned certain diseases as the most important constraint for sub-Saharan pig production, with ectoparasites being the most important based on clinical descriptions (Kagira et al., 2010). The aim of the present study was therefore to determine the distribution and diversity of ectoparasites, and identify risk factors for the presence of these on pigs, within confined and free-range production systems of smallholder farms.

2. Materials and methods

2.1. Study area

The study was carried out in Mbeya Region, Tanzania, in Mbeya Rural and Mbozi districts located between latitudes

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Table 1
Prevalence [95% confidence interval] of ectoparasites, *Haematopinus suis*, *Sarcoptes scabiei* var. *suis*, hard ticks and fleas from both confinement and free-range production systems in Mbeya Region, Tanzania.

Parasite	Prevalence (%)		
	Confinement system (Mbeya Rural) ($n = 96$)	Free-range system (Mbozi) ($n = 32$)	Both systems ($n = 128$)
Ectoparasites[a]	24 [15–33]	84 [71–97]	39 [30–48]
H. suis	20 [12–28]	63 [45–78]	30 [22–39]
Hard ticks	1 [0–3][b]	50 [32–68]	13 [7–19]
Fleas	5 [1–10]	13 [7–24]	7 [3–12]
S. scabiei	2 [0–5][b]	0	2 [0–4][b]

Sample size = *n*.
[a] Ectoparasites (*H. suis*, *S. scabiei* var. *suis*, hard ticks and fleas).
[b] Zero not included in the 95% confidence interval because observations were made.

8°14′ and 9°24′S, and longitudes 32°04′ and 33°49′E. Mbeya Region has a subtropical climate with bimodal rainfall from approximately October to December and March to May. Both districts are rural areas with pig production almost exclusively on a smallholder level.

2.2. Study design and sample size

A cross-sectional study was carried out in the dry season from May to August 2011 after an outbreak of African swine fever, during which farmers reported having lost or slaughtered most of their pigs. In total, 128 pigs were sampled, 96 from smallholder farmers practising confinement located in 24 villages in Mbeya Rural district and 32 from farmers practising free-range in 7 villages in Mbozi district. Four farmers from each of the 24 villages in Mbeya Rural district were identified using the 'snowball' method (Sikasunge et al., 2007). All farmers practising free-range within the 7 villages of Mbozi district were included in the study. One pig was randomly selected from each farm if farmers were keeping more than one pig.

2.3. Data collection

Structured questionnaire interviews of key farm informants were carried out to explore farm variables such as level of confinement, ectoparasitic treatment history, perception on current disease status, disease history, and pig husbandry practices. Interviews were conducted by the same interviewer in Swahili or translated to local tribal language when necessary. The presence or contact with neighbouring pigs was not investigated by observation, but relied on the farmers' statements given in the questionnaire.

Pigs were manually restrained using a pig snare and thorough full body visual inspection performed. Ectoparasites were counted and specimens were collected for further identification. Skin scrapings for mite detection were performed, with a scraping spoon, inside the pinna of both ears, until traces of blood could be seen.

2.4. Parasitological examination

Collected ectoparasites were microscopically examined (40×) and identified to nearest possible taxa according to listed keys (Okello-Onen et al., 1999; Sonenshine, 1993). Skin scrapings were examined for *S. scabiei* var. *suis* with a modified floatation fluid (saturated NaCl added 25% glucose, 1.225ρ) as previously described by Kambarage et al. (1990).

2.5. Statistical analyses

Data were analysed using STATA® (Statistical software: version 11; Stata Corporation, College Station, USA). Prevalence data were analysed using either Fisher's exact test or the χ^2-test. Logistic regression models were used to compute odds ratios (OR) to identify risk factors for the presence of ectoparasites or *H. suis* as dichotomous dependent variables. Logistic regression models were also used to explore the risk factors for the presence of ectoparasites or lice on pigs within the confinement production system only.

3. Results

The overall prevalence of ectoparasites within both production systems was 39% [30–48] and consisted of lice, hard ticks, fleas, and mites (Table 1). The prevalence of ectoparasites within the confinement production system and the free-range production system was 24% [15–33] and 84% [71–91], respectively, with a significant difference between the two ($p < 0.001$, χ^2-test). The logistic regression model for the presence of ectoparasites in regards to the two types of production systems identified free-range ($p < 0.001$, OR = 17.9 [4.0–76.1]) and the presence of neighbouring pigs ($p = 0.018$, OR = 4.33 [1.29–14.57]) as risk factors. Contact with neighbouring pigs ($p = 0.031$, OR = 4.15 [1.14–15.1]) and the time interval (in months) since last ectoparasitic treatment ($p = 0.030$, OR = 1.17 [1.02–1.35]) were identified as risk factors within the confinement system.

The prevalence of lice was 20% [12–28] within the confinement production system and 63% [45–78] in the free-range system, with an overall prevalence of 30% [22–39] among the two systems (Table 1). Free-ranging of pigs ($p = 0.003$, OR = 7.7 [2.0–30.0]) and the presence of neighbouring pigs ($p = 0.002$, OR = 8.1 [2.2–30.6]) were found as risk factors. Within the confinement production system contact with neighbouring pigs was identified as a risk factor for the presence of lice (OR = 4.68 [1.17–18.68]).

The prevalence of hard ticks among free-range pigs was 50% (Table 1). All hard ticks were found on the abdomen,