Occurrence of Gastrointestinal Parasites after Exposure to Natural Infection in Outdoor Reared Turopolje Pigs

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Summary

A total number of 24 local Turopolje pigs (TP) reared in outdoor area with predominantly forest vegetation were monitored for 20 weeks (from July to December 2015) with the aim to determine the prevalence of swine gastrointestinal parasites after exposure to natural infection. At the beginning of the trial, pigs were dewormed with 300 µg of doramectin per kg of body weight (Dectomax®, Pfizer; 1 ml/33 kg). Faecal egg counts (FECs) were determined after 14 and 20 weeks in individually obtained samples separately for large roundworm (*Ascaris suum*) and other gastrointestinal parasites (*Oesophagostomum* spp., *Strongyloides* spp. and *Hyostrongylus* spp.). The results of coprological examination showed that main gastrointestinal parasites in outdoor reared TP are helminth species with strongyle-type eggs and coccidian *Eimeria* spp. In typical hot and dry season, more than 14 weeks' period after antiparasitic treatment is required for infection and development of sexually mature parasite stages and eggs excretion in the faeces. These results may be important in designing of integrated gastrointestinal management practices for TP in traditional outdoor production systems, and generally useful for more sustainable management of this endangered breed in future.

Key words

swine gastrointestinal parasites, prevalence, parasites control, outdoor production system, Turopolje pig

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Introduction

Control of gastrointestinal parasites is one of the most important parts of health management in outdoor reared pigs. Due to free access to outdoor area and wide use of natural resources of soil and plants, pigs are highly exposed to intake of eggs or larval stages of various parasites (Salajpal et al., 2013). High stocking density, presence of favourable conditions for development and survival of different stages of parasites or intermediated host, as well as possibility to contact with wild animals as a potential reservoir of parasites, are all helpful factor for infection. More than 20 helminths species were found in European wild pigs (De la Muela et al., 2001; Rajkovic-Janje et al., 2002; Jarvis et al., 2007; Senlik et al., 2011), most of which can be detected in pigs reared outdoor. According to Nansen and Roepstorff (1999) and Cabaret (2003), the most prevalent internal parasites in pigs reared outdoors are protozoans (e.g. coccidia: *Eimeria* spp. *and Isospora* spp.) and nematodes: large roundworm *(Ascaris suum)*, nodular worm *(Oesophagostomum* spp.*),* whipworm *(Trichuris suis),* red stomach worm (*Hyostrongylus rubidus*) and intestinal threadworm *(Strongyloides ransomi*). The effectiveness of internal parasite control is closely related to occurrence of some parasites or their intermediated host in rearing area and knowledge of their life cycle. In this regard, some management practices (e.g. pasture rotation, feeding diets rich in digestible proteins and carbohydrates, measures to reduce rooting behaviour and consequently the uptake of infective eggs and larvae), integrated with use of antiparasitic, could significantly reduce spectrum and prevalence of helminth infection in outdoor reared pigs (Petkevicius et al., 1999; Nansen and Roepstorff, 1999; Myer et al., 1990). Turopolje pig (TP) is local pig breed traditionally reared in outdoor production system in Turopolje region and nearby areas in central Croatia. Due to its modest rearing requirements, resistance and good adaptation to local marsh meadows and oak forests, the TP breed has been an important food source for the local inhabitants for centuries (Robić, 2002, Đikić et al., 2010). However, the population of TP has dropped drastically over the time and currently it counts only 132 sows and 30 boars (Croatian Agricultural Agency, 2016). Hence, a more sustainable management of breed, including the sanitary aspects of traditional TP farming, is essential. Climate with moderate temperatures and humidity, feeding based on utilization of forages rich in insoluble dietary fibre and free access to periodically flooded forests of English oaks and marsh meadows are considered factor for survival and fecundity of gastrointestinal parasites in TP reared in traditional outdoor system. Despite this, the occurrence and importance of parasites in TP breed is still poorly investigated. The aim of this study, therefore, was to determine the gastrointestinal parasites in TP reared in outdoor production system after exposure to natural infection.

Material and methods

Animals and trial design

A total number of 24 Turopolje pigs were used in this study. All of the animals were in the age between 16 and 19 months, and reared in an outdoor production system at the experimental station of the Faculty of Agriculture in "Šiljakovačka Dubrava" near Zagreb. At the beginning of the trial, pigs were dewormed with 300 μg of doramectin per kg of body weight (Dectomax®, Pfizer; 1 ml/33 kg). During the trial period (20 weeks) pigs were kept outdoors in the fenced area for pigs with predominantly forest vegetation (mixed beech and oak forests). Feeding was based on utilizing natural resources of wood (e.g. acorns) and pastures with the addition of approximately 2.0 kg of standard feed mixture per pig (13.0 MJ ME and 15.0% of crude protein per kg). The trial was conducted from the middle of July to mid December 2015.

Parasitological parameters

Faecal egg counts were determined at 14th and 20th week after antiparasitic treatment. Individual samples were obtained. Faecal egg counts (FECs) were carried out using a modified McMaster method with saturated sodium chloride as the flotation fluid (Whitlock, 1948). Total FECs were performed separately for large roundworm (*Ascaris suum*) and other gastrointestinal parasites (*Oesophagostomum* spp., *Strongyloides* and *Hyostrongylus* spp.). Results were expressed as eggs per gram. The prevalence was calculated as ratio between number of animals having the parasites (eggs in faeces) and number of surveyed pigs. Average monthly precipitation during the trial period for study area was taken from Croatian Meteorological and Hydrological Service (DHMZ).

Results and discussion

By the coprological examination at 14th week (data not shown) after the treatment with doramectin, the strongyle-type of eggs were sporadically found at the level less than one egg per gram (EpG). In addition, *Ascaris suum* eggs were not found neither the 14th nor 20th week after the antiparasitic treatment. Doramectin is well efficient in removing adult stages of common gastrointestinal nematodes and drastically reduces eggs excretion (Stewart et al., 1996). Absence of eggs of parasites in sampled faeces could be attributed to relatively long (6-8 weeks) prepatent period (the time needed for a parasite to develop to reproductive stage and produce eggs or oocysts) for common gastrointestinal parasites (e.g. *Ascaris suum*, *Oesophagostomum* spp., *Hyostrongylus rubidus*, *Trichuris suis*), with the exception of *Strongyloides* spp., which are ready to produce eggs after 4 to7 days (Taylor et al., 2007). In addition, the survival rate and embryonation of the eggs is affected by a number of abiotic factors, such as temperature and humidity. For instance, during dry and hot months, eggs survival and occurrence of infective larvae is reduced (Larsen and Roepstorff, 1999). In central part of Croatia, such weather conditions usually take place between June and September. On the other hand, the second coprological examination at 20th week after the antiparasitic treatment (Table 1) showed low to moderate infection of TP with gastrointestinal parasites.

Endoparasites commonly occurred in outdoor managed herds are *Oesophagostomum* spp., *Hyostrongylus rubidus*, *Trichuris suis*, *Strongyloides ransomi* and *Eimeria* spp., some of which (i.e. *Hyostrongylus rubidus*) are exclusively transmitted outdoor (Nansen and Roepstorff, 1999). Mixed infection with parasites which excrete strongyle-type of eggs (*Oesophagostomum* spp., *Hyostrongilus* spp., *Strongyloides* spp.) was detected in all pigs included in the study. High prevalence of similar gastrointestinal helminths was also reported in other local pigs raised in the extensive system in Croatia, e.g. Black Slavonian Pigs (Salajpal

Table 1. Prevalence of gastrointestinal parasites after 20 weeks of exposure to natural infection in outdoor reared Turopolje pigs

	Total number of positive pigs (%), n = 24				Average FEC (range)
		FEC			
		0-50	51-100	>100	
GIN*	100.0	83.3	12.5	4.2	28,7 (2-120)
Eimeria sp.	70.8		—		
Giardia sp.	20.8		—		

*Gastrointestinal nematodes with strongyle-type eggs (*Oesophagostomum* spp., *Strongyloides* sp. and *Hyostrongylus* sp.); FEC - faecal egg counts

et al., 2004) and abroad, e.g. Black Sicilian Pigs (Brianti et al., 2007). In comparison to results of the first coprological examination at 14th week, the second examination at 20th week after deworming showed that additional 6 weeks were enough time to develop sexually mature stages of parasites and eggs excretion at detectable levels. In average, 28.7 strongyle-type of EpG was detected with range between 2 and 120. Progress in the development of parasites in the second examined period was probably additionally supported by favorable environmental conditions for grow of parasitic fauna due to the high precipitation levels during October (Figure 1).

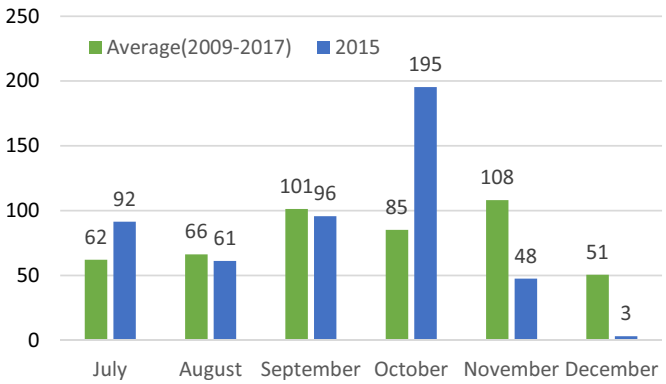

Figure 1. Average precipitation in the investigated region (2009-2017) and monthly precipitation (mm/m²) during the trial period (DHMZ, Velika Gorica)

The absence of *Ascaris* type eggs at both coprological examination and oocyst of coccidia *Isospora* sp., as swine parasites typical for conventional indoor production system, confirms previous reports of their little importance in outdoor reared pigs (Roepstorff et al., 2011). In addition, the previous study of Eriksen et al. (1992) suggests that *Ascaris suum* infections stimulate strong immune response dependent on the exposure time. In this way, older pigs, as in our study (16-19 months of age), permanently exposed to infection are probably less sensitive to infestation sustained with *A. suum* than pigs at younger age. Coccidian infection was detected at both 14th and 20th week after the antiparasitic treatment. *Eimeria* sp. oocyst was detected in 17 pigs (70.8%), while *Giardia* sp. *oocyst* only in 5 pigs (20.8%). Prevalence of coccidia oocysts was not changed during the considered period. These findings were expected, as *Eimeria* spp. oocysts are most common in older pigs, particularly in outdoor rearing systems (Nansen and Roepstorff, 1999; Eijck and Borgsteede, 2005), and several previous studies reported similar or higher prevalence of *Eimeria* sp. in free-range and organic farms (Eijck and Borgsteede, 2005; Järvis and Mägi, 2008; Roepstorff et al., 1998).

Conclusion

This study showed that main gastrointestinal parasites in outdoor reared TP exposed to natural infection are helminth species with strongyle-type eggs and coccidian *Eimeria* sp. In typical hot and dry season, more than 14 weeks' period after the antiparasitic treatment is required for infection and development of sexually mature parasite stages and eggs excretion in the faeces. These results may be important in designing of integrated gastrointestinal management practices for TP in traditional outdoor production systems, and generally useful for more sustainable management of this endangered breed in future.

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