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Epidemiological Surveillance of Zoonotic Intestinal Parasites in Beef and Dairy Cattle in a Central Area of Northeastern Thailand

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ABSTRACT

The study provides evidence of a high prevalence of zoonotic gastrointestinal parasites in fecal samples from beef and dairy cattle in a central area of northeastern Thailand. This finding is particularly significant given the lack of previously reported data on potential zoonotic intestinal parasites in cattle from this region. In total, 78 and 79 fecal samples from beef cattle and dairy cattle were collected directly from fresh stool and then processed using fecal floatation and fecal sedimentation techniques to examine for intestinal protozoa and nemathelminths, respectively. In this study, 71.79% of fecal samples from beef cattle were infected with at least one parasite. In beef cattle, five groups of parasites were strongyles (51.28%), *Strongyloides* spp. (8.97%), *Trichuris* spp. (1.28%), *Moniezia* spp. (1.28%) and *Eimeria* spp. (8.97%). In dairy cattle, 84.81% (67/79) of samples showed positive with infection. Seven species of potentially zoonotic parasites are strongyles (64.56%), *Strongyloides* spp. (1.27%), *Trichuris* spp. (2.5%), *Cappillaria* spp. (2.5%), *Toxocara* spp. (5.06%), *Eimeria* spp. (10.13%) and *Balantidium* spp. (1.27%). This study provides crucial information needed to design effective strategies for the prevention and control of the parasitic zoonoses.

Key words: Beef cattle, Dairy cattle, Intestinal parasites, Northeastern Thailand, Zoonoses

INTRODUCTION

Livestock animals, especially beef and dairy cattle play an important role as the reservoir hosts for intestinal parasites including nematode, cestode, trematode and protozoa (Anantaphruti 2001; Squire et al. 2018). Commonly protozoa found in Thailand and neighboring countries comprise *Entamoeba* spp., *Giardia* spp., *Buxtonella* spp., *Eimeria* spp. and coccidian. The major intestinal helminths are *Trichuris* spp., *Strongyloides* spp., *Nematodirus* spp., *Toxocara* spp., strongyles and hookworm for nemathelminths, *Fasciola* spp. for platyhelminthes, and *Moniezia* spp. for cestode (Kaewthamasorn and Wongsamee 2006; Jittapalapong et al. 2011; Laha et al. 2013) which can cause health problems such as depress feed intake, lower growth rate and productivity loss (Choubisa and Jaroli 2013). Moreover, some of them are recognized as zoonosis such as *Cryptosporidium* spp. (Jittapalapong et al. 2006; Nuchjangreed et al. 2008; Pumipuntu and Piratae 2018), *Giardia* spp., *Blastocystis* spp. (Popruk et al. 2015), *Fasciola* spp., *Strongyloides* spp. (Singh 2002), *Trichuris* spp. and *Toxocara* spp. (Wyckliff et al. 2017). Human can be infected with the mentioned parasites by directly ingest or expose with infective stages of the parasites (cyst, egg, and larva) or indirectly consume contaminant of the infective stages of the parasites in food or drink. The spreading of parasitic infections in cattle in farms is facilitated by poor sanitary in farm management and deworming program. From the epidemiological studies of intestinal parasitic infection in cattle in Thailand, the prevalence of parasitic infection in beef cattle was 61% in 2006 in Nan province, northern Thailand (Kaewthamasorn and Wongsamee 2006) and 46.6% in dairy cattle in 2011 (Jittapalapong et al. 2011). Although**,** there are many methods for determination parasites infection but egg examination by microscopic is the most convenience and still be the gold standard.

To date, the prevalence of gastrointestinal parasites among cattle populations in Maha Sarakham and Kalasin provinces has not been thoroughly investigated. This study presents a cross-sectional survey of the prevalence of intestinal parasitic infections among beef cattle in rural areas of Kalasin province and dairy cattle in rural areas of

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Maha Sarakham province using microscopic examination. The findings underscore the significant role that cattle play in harboring intestinal parasites, which can impact the health of other animals and humans, particularly with respect to parasitic zoonoses as One Health issues.

MATERIALS AND METHODS

Ethical consideration

This research was approved in animal sampling collection protocol was approved by the Animal Ethics Committee of Mahasarakham University (protocol numbers: IACUC-MSU-27/2023).

Study area and sample collection

This study was assessed in a population of beef cattle in Nadee sub-district, Yang Talad district, Kalasin province and a population of dairy cattle in Srisuk sub-district, Kantarawichai district, Maha Sarakham province (Fig. 1).

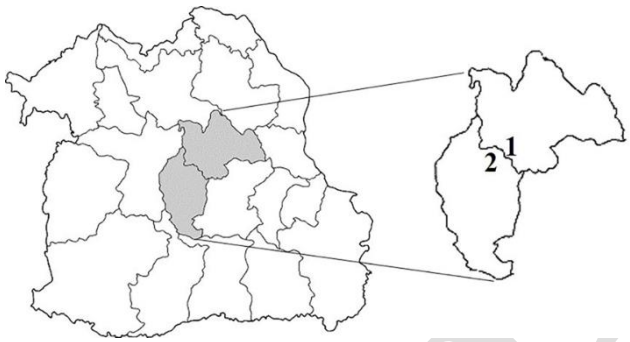

Fig. 1: Map of northeastern Thailand shows sampling locations at Nadee sub-district, Yang Talad district, Kalasin province (1) and Srisuk sub-district, Kantarawichai district, Maha Sarakham province (2)

In total of 157 samples, 78 fecal samples from beef cattle and 79 fecal samples from dairy cattle were collected from Kalasin province and Maha Sarakham province, respectively, by veterinarian students of Faculty of Veterinary Sciences, Mahasarakham University. Fecal samples were collected directly from fresh stool, placed in separate plastic bag, labeled, packed and stored in ice box for less than six hours and then processing using fecal floatation and fecal sedimentation techniques. All steps were done without contacted or perturbed with the animals.

Fecal examination

No space between values and units

Samples were examined for intestinal protozoa (cyst) and nemathelminths (egg and larva) by fecal floatation with the saturated solution of saline following the described method (Wade and Gaafar 1991) and fecal sedimentation techniques. Briefly in floatation technique, weighing approximately one gram of feces into plastic container and poured 10mL of saturated solution of saline into the container, mixed well by mingling, sieved the suspension by double layer of gauze, poured the flow through into the Falcon tube which size at 15 mL, then poured a saturated solution of saline into the 15mL tube until the flotation liquid reach the topmost of the tube, place a coverslip on the top of the tube and let the tube stand for 20min, finally protozoa cysts and nemathelminths eggs will be existing on surface the cover slip. Examined the presence of parasites under the light microscope.

For fecal sedimentation, weighing or measuring approximately 1g of feces into the plastic container, poured 10mL of normal saline solution into container, mixed feces and normal saline solution thoroughly, filtered the suspension through double layer of gauze into the new 15 mL Falcon tube, centrifuge the fecal solution in the Falcon tube with 1500rpm for 2min. Discard the supernatant carefully and transfer a small drop of the sediment to a microscope slide using a pipette. Cover droplet with a coverslip and examine under the light microscope. Each sample was observed twice in two slides by both two techniques and measured positive when parasite was found at least in one examined slide by combined methods.

Data analysis

Descriptive statistics were used to describe the prevalence of zoonotic gastrointestinal parasites. The confidence intervals with 95% and the proportion of positive results by fecal examination were used to examined. The chi-square test and Fisher's exact test of independence were performed to analyze the differentiation of positive results between the two groups of animal species (beef cattle and dairy cattle) in the SPSS statistics program (version 22). Statistically significance was set at $P<0.05$.

RESULTS AND DISCUSSION

Overall, 157 fecal samples were collected from beef cattle and dairy cattle and examined. Positive result of overall parasitic infection in dairy cattle (84.81%) was higher than beef cattle (71.79%) with statistically significant difference (P=0.047752). Total of 78 fecal samples collected from beef cattle were examined intestinal parasites. The results from combined methods found 56 (71.79%) of specimens positive with one or more egg or cysts of parasites which have been reported to be potentially zoonotic helminthes, including strongyles egg (51.28%), *Strongyloides* spp. eggs (8.97%), *Trichuris* spp. egg (1.28%), *Moniezia* spp. egg (1.28%) and *Eimeria* spp. cyst (8.97%) as presented in Table 1.

We observed dairy cattle in Maha Sarakham province and collected total of 79 fecal samples, 67 samples were infected with at least one parasite from combined methods as showed in Fig. 2. Prevalence of helminthes included strongyles egg, *Toxocara* spp. egg, *Cappillaria* spp. egg, *Trichusis* spp. egg and *Strongyloides* spp. larva were 64.56% (51/79), 5.06% (4/79), 2.5% (2/79), 2.5% (2/79) and 1.27% (1/79), respectively. Prevalence of protozoa involved *Eimeria* spp., and *Balantidium* spp. were 10.13% (8/79) and 1.27% (1/79) as presented in Table 1 as well. Among the positive samples, multiple parasitic infections (infected with more than one species of parasite) were found in dairy cattle. Write as written for Beef cattle above.

In addition, *Strongyloides* spp. infection in beef cattle (8.97%) was higher than dairy cattle (1.27%) with significantly differ (P=0.0338). However, the other positive results were not statistically significant difference

Table 1: Prevalence of intestinal parasites eggs in feces (n=157) of beef and dairy cattle reservoirs in the north-eastern part of Thailand

Animal species (No. examined)	Species of parasite eggs identified	Number of positive results	% of Positive	95% CI
Beef cattle (n=78)				
Single infection	strongyles egg	40	51.28	39.69-62.77
	Strongyloides spp.	7	8.97*	3.68-17.62
	Eimeria spp.	7	8.97	3.68-17.62
	Trichuris spp.	1	1.28	0.03-6.94
	Moniezia spp.	1	1.28	0.03-6.94
	Total*	56	71.79*	60.47-81.41
Dairy cattle (n=79)				
Single infection	strongyles egg	51	64.56	52.99-75.00
	Eimeria spp.	8	10.13	4.47-18.98
	Toxocara spp.	4	5.06	1.40-12.46
	Trichuris spp.	2	2.5	0.31-8.85
	Cappillaria spp.	2	2.5	0.31-8.85
	Strongyloides spp.	1	1.27*	0.03-6.85
	Balantidium spp.	1	1.27	0.03-6.85
Co-infection	strongyles egg + *Eimeria* spp.	1	1.27	0.03-6.85
	Eimeria spp.+ *Balantidium* spp.	1	1.27	0.03-6.85
	Total*	67	84.81*	74.97-91.9

*Significant difference (P<0.05).

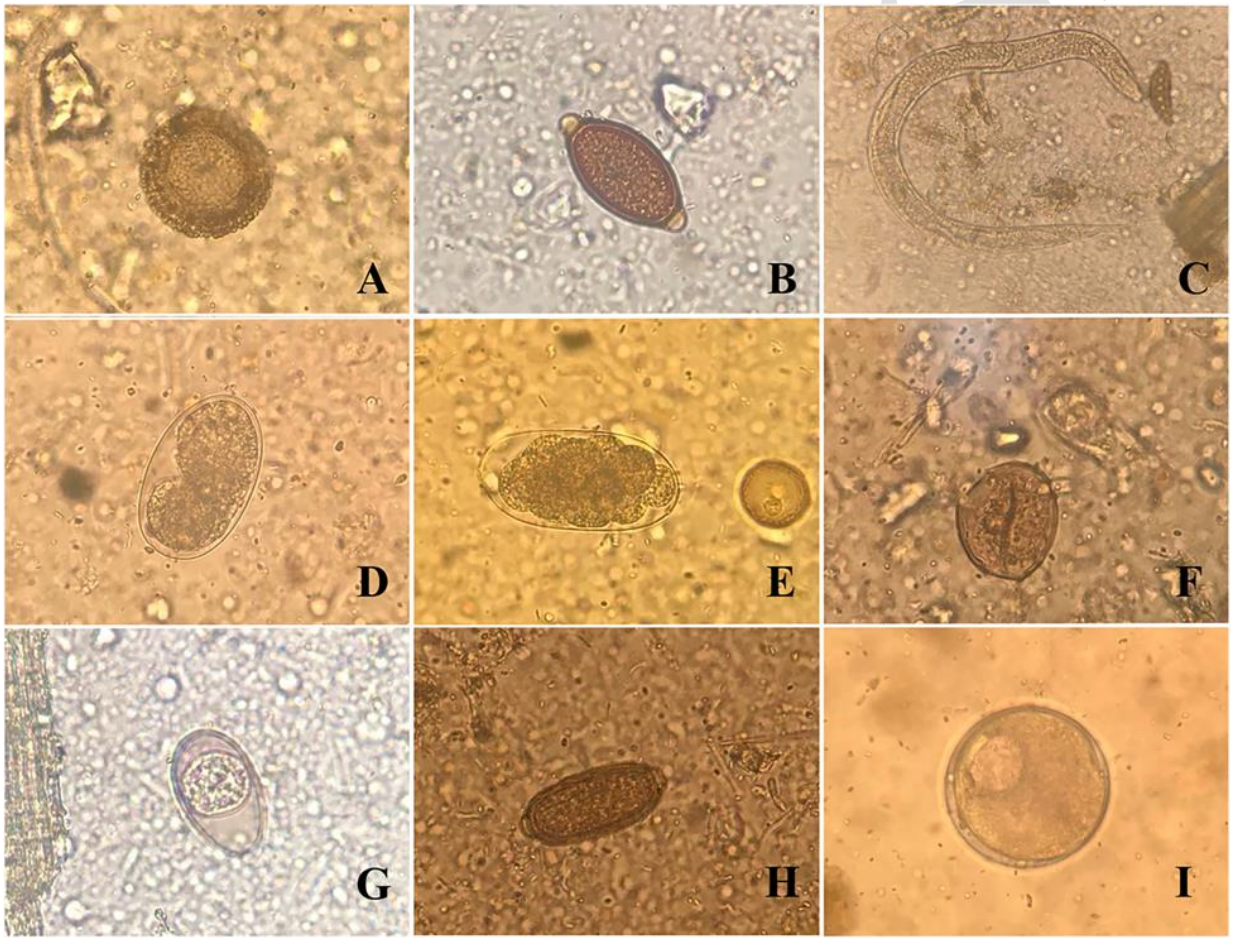

Fig. 2: Pictures of potential zoonotic gastrointestinal parasites in fecal samples of beef and dairy cattle under a light microscope. (A) Egg of *Toxocara* spp. (40×); (B) Egg of *Trichuris* spp. (40×); (C) *Strongyloides* spp. rhabditiform larva (40×); (D) and (E) Eggs of Strongyles (40×); (F) Egg of *Giardia* spp. (40×); (G) Egg of *Eimeria* spp. (40×); (H) Egg of *Capillaria* spp., (40×) and (I) Egg of *Balantidium* spp. (40×).

for both cattle groups (P>0.05). Interestingly, both beef and dairy cattle had the highest percentage of strongyles egg at 51.3% and 64.56%. Additionally, the study revealed the highest prevalence of strongyles infection in both beef cattle and dairy cattle at the study areas in the north-eastern part of Thailand.

The high prevalence of gastrointestinal parasites in livestock, particularly in beef and dairy cattle, underscores their significant zoonotic potential, posing a substantial risk to public health. Our study in northeastern Thailand, including Maha Sarakham and Kalasin provinces, provides compelling evidence of this risk, identifying various zoonotic parasites such as *Strongyloides spp.*, *Trichuris spp.*, *Capillaria spp.*, *Eimeria spp.*, *Moniezia spp.*,

Toxocara spp., and other strongyles in cattle fecal samples. These findings align with existing literature that highlights the prevalence of these parasites in tropical regions (Parmar et al. 2012; Puthiyakunnon et al. 2014; Inpankaew et al. 2015). The spillover of these parasites from animal reservoirs to humans, especially those in close contact with livestock, poses significant health risks, necessitating the development of effective control and prevention strategies (Jones et al. 2013; Borlase et al. 2021; Bartlett et al. 2022; Deiana et al. 2024).

Several risk factors contribute to the transmission of zoonotic parasites, including the close proximity of humans and livestock, agricultural activities, inadequate personal hygiene practices, and inappropriate farm biosecurity measures (Jones et al. 2013; Obanda et al. 2019; Sharma et al. 2023; Thorn et al. 2023; Tiele et al. 2023). Our findings emphasize the need for integrated surveillance and control measures that adopt a One Health approach, addressing both animal and human health sectors. This includes regular screening of livestock, improved farm management practices, and public health education to raise awareness about zoonotic risks (Rushton and Bruce 2017; Damrongsukij et al. 2021). By strengthening these preventive measures, the prevalence of parasitic infections in cattle can be significantly reduced, thereby decreasing the risk of zoonotic transmission to humans.

Our study highlights the critical role of cattle as reservoirs for zoonotic parasites and the importance of coordinated efforts between veterinary and public health authorities. The observed high prevalence rates in both beef (71.8%) and dairy cattle (84.8%) underscore the necessity of ongoing surveillance and effective management strategies to protect public health. Through a comprehensive One Health approach, interventions can be designed to simultaneously address parasitic infections in livestock and prevent zoonotic transmission, ultimately safeguarding both animal and human health (Yeh et al. 2023).

Conclusion

This study elucidates the prevalence of zoonotic gastrointestinal parasites in beef and dairy cattle across the Northeast of Thailand, specifically in Maha Sarakham and Kalasin provinces. Our findings indicate that several helminths, including *Strongyloides* spp., *Trichuris* spp., *Moniezia* spp., *Toxocara* spp., *Trichostrongylus* spp., *Capillaria* spp., and various strongyles, are commonly found in cattle in this region. Additionally, protozoan parasites such as *Eimeria* spp. and *Balantidium* spp. are endemic to these areas. Notably, the highest prevalence among the gastrointestinal parasites identified was the strongyles. These findings underscore the importance of continuous surveillance for zoonotic gastrointestinal parasites in cattle, as well as the development and implementation of effective prevention and control strategies. Such measures are essential to mitigate the risk of parasitic diseases affecting both animal and human health in these communities. Addressing the high prevalence of these parasites requires a multifaceted approach involving regular screening and deworming, improved farm management practices, public health education, ongoing research, and strengthened One Health collaboration. By implementing these measures, the health of both animals and humans can be safeguarded, reducing the impact of zoonotic parasitic diseases in the region.

Conflict of interest: The authors declare that there is no conflict of interest in this research.

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Author's contribution: SP: conceived and designed the research framework. SP and NP: collected and diagnosed the samples. ST: analyzed and confirmed the data. NP and SP: wrote the manuscript draft and arranged figures. NP: edited and revised the manuscript draft. All authors revised and approved the final version of the manuscript.

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