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ORIGINAL ARTICLE

Investigation of gastrointestinal parasites of dairy cattle around Taiwan

Chiu-Chen Huang [a], Lian-Chen Wang [b], Chien-Hung Pan [a], Cheng-Hsiung Yang [c], Cheng-Hung Lai [a,*]

[a] *Department of Veterinary Medicine, College of Veterinary Medicine, National Chung Hsing University, Taichung, Taiwan*
[b] *School of Medicine, Chang Gung University, Taoyuan, Taiwan*
[c] *Livestock Disease Control of Taichung County, Taiwan*

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Background: Parasitic nematodes are one of the most important causes of production losses in most cattle-producing countries of the world. The aim of the present study is to make a through estimate of helminth and protozoan infection prevalence in dairy cattle around Taiwan.
Methods: Coprological techniques, including direct fecal smear, simple flotation, and simple sedimentation, were used to detect gastrointestinal helminths and protozoan in dairy cattle. A total of 1259 rectal fecal samples were collected from Holstein dairy cattle at 94 farms in 13 counties in Taiwan.
Results: The overall prevalence of gastrointestinal parasitic infection was 86.9%. The infection rates of protozoa, nematodes, trematodes, and cestodes were 81.3%, 7.9%, 1.6%, and 0.6%, respectively. Among all parasites, *Buxtonella sulcata* (61.7%) was the most predominant one, followed with *Cryptosporidium* spp. (32.6%) and *Eimeria* spp. (11.8%). There were significant differences in the prevalence of protozoa and nematodes between different age groups and distributional area groups.
Conclusion: The present study demonstrated that gastrointestinal parasitic infections occur frequently in dairy cattle around Taiwan, especially protozoan infections. The results indicated that a superior management system and regular anthelmintic treatment should be used for the control of parasitic infections in dairy cattle farms.
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* Corresponding author. Department of Veterinary Medicine, National Chung Hsing University, 250, Kuo-Kuang Road, 40227 Taichung, Taiwan.
E-mail address: chlai@dragon.nchu.edu.tw (C.-H. Lai).

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Introduction

Throughout Southeast Asia, infections caused by gastrointestinal parasites are prevalent in cattle because of the suitable climate for the transmission of infection.[1−3] Parasitic nematodes are one of the most important causes of production losses in most cattle-producing countries of the world. Losses may involve mortality, reduction in weight gain, retarded growth, and low fertility.[4,5] In raising livestock for food production, studies that help in quantifying the economic losses caused by parasitism are important, especially in smallholder farming systems in developing countries.[6] As parasites may cause clinical and nonclinical diseases leading to economic losses, the goal of veterinarians and producers is to prevent parasitism through management, nutrition, epidemiology, and effective treatment.[7]

Researchers have carried out several regional studies in Taiwan; however, the results are outdated and limited.[8−11] Therefore, the aim of the present study is to make a through estimate of helminth and protozoan infection prevalence in dairy cattle around Taiwan.

Materials and methods

Sample population

A total of 1259 rectal fecal samples of Holstein dairy cattle were collected from various counties of Taiwan (Table 1). The fecal samples were kept at 4°C and taken to the laboratory for parasitic examination. The age of the cattle was categorized as calves (less than 1 year old), heifers (1−2 years old), and cows (more than 2 years old).

Fecal examinations

Fecal samples were examined for the presence of helminth ova, protozoan cysts and oocysts, employing the simple floatation procedure using saturated NaCl. A simple sedimentation process was used to detect the eggs of flukes and some other tapeworms and nematodes, whose eggs do not float readily in saturated sodium chloride solution.[12] Direct fecal smears were performed to examine the presence of protozoan trophozoites.

Moreover, in order to detect the oocysts of Cryptosporidium, two smears were prepared from each fecal sample and stained using the modified Ziehl-Neelsen method.[13] The stained fecal smears were observed microscopically under oil immersion at 1000× magnification.

Table 1 Geographical distribution of fecal sample collection

Geographical area	Number of samples
Northern area	218
Taipei County	90
Taoyuan County	90
Miaoli County	58
Central area	467
Taichung County	211
Changhua County	86
Yunlin County	142
Nantou County	28
Southern area	427
Chiayi County	73
Tainan County	86
Kaohsiung County	90
Pingtung County	178
Eastern area	127
Hualien County	60
Taitung County	67
Total	1259

Statistics

The Chi-square test was used to compare the differences between the groups. Probability values below 0.05 were considered significant. The odds ratio was used to assess the risk of endoparasitic infections in different age groups and areas.

Results

A total of 1259 rectal fecal samples, including 364 calves (less than 1 year old), 420 heifers (1−2 years old), and 475 cows (more than 2 years old), were collected from around Taiwan. Of the 1259 fecal samples collected, the overall prevalence of gastrointestinal parasitic infection was 86.9%. The double-, triple-, and multi-infection rates were 42.7%, 14.9%, and 4.8%, respectively. The highest prevalence was protozoan infection (81.3%), followed by nematodes (7.9%), cestodes (1.6%), and trematodes (0.6%).

This investigation detected three types of protozoa trophozoites or cysts/oocysts in the feces, including *Buxtonella sulcata* (61.7%), *Cryptosporidium* spp. (32.6%), and *Eimeria* spp. (11.8%). The rising prevalence of *B. sulcata* correlated with an increase in age. The infection rate of *Eimeria* spp. in calves and heifers (14.8% and 16.9%) was significantly higher than that in cows (5.1%). Identified nematode eggs from fecal samples in the present study included Strongyle nematode, *Trichuris globulosa*, *Strongyloides papillosus*, and *Capillaria bovis*. Strongyle nematode (5.8%) was the most dominant species found in Holstein cattle, and the prevalence in East Taiwan was significantly higher than those in other areas. *Trichuris globulosa* infected 33 cattle (2.6%), primarily calves and heifers. The infection rate was significantly higher in East Taiwan than those in other areas (Table 2).

The prevalence of cestodes (1.6%) was relatively lower than that of other parasites. Among the infected cattle, *Moniezia benedeni* infected 18 cattle (1.4%). In addition, *Hymenolepis diminuta* infected two cattle (0.2%). There was no apparent variation between different ages of dairy cattle; however, the infection rates in northern and eastern areas were significantly higher than those in the middle and southern areas.

Trematodes infected only eight cattle (0.6%). The study found the eggs of *Eurytrema pancreaticum*, *Fasciola* spp., and *Paramphistomum* spp. from feces. There were significant differences in the infection rates of protozoa and nematodes between different age groups and distributional area groups (Table 3).

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