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Original papers

# Parasites of the digestive tract of sheep and goats from organic farms in Western Pomerania, Poland

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**ABSTRACT.** The aim of the study was to determine the prevalence and intensity of parasite infection of the digestive tract in sheep and goats from the West Pomerania region following anti-parasite treatment. Feces were freely collected from sheep and goats kept on organic farms and subjected to analysis by the Willis-Schlaf and McMaster's flotation methods. The mean extensity of infection by gastrointestinal parasites in both sheep and goats was found to be 100%. Both sheep and goats displayed the presence of gastrointestinal nematodes, *Eimeria* protozoa and *Moniezia* spp. tapeworms. The intensity of infection of sheep and goats by these parasites was arranged as follows: gastrointestinal nematodes > *Eimeria* protozoa > *Moniezia* tapeworms. Our findings confirm that a problem exists regarding the occurrence of parasites of the digestive tract among sheep and goats kept under organic conditions. Therefore, correct implementation of prophylactic programmes should be emphasised to ensure the control or elimination of parasites in animals, particularly those kept on pasture.

**Keywords:** sheep, goat, parasites, ecological farm

## Introduction

The extensity of infection of animals depends on age, sex, breed, method of feeding, system of husbandry, environmental conditions and number of species of parasites present in each animal. When raising sheep (*Ovis aries*) (Linnaeus, 1758) and goats (*Capra hircus*) (Linnaeus, 1758), special care must be taken to avoid invasion by gastrointestinal nematodes, *Moniezia* spp. tapeworms and *Eimeria* protozoa [1]. Infection with gastrointestinal nematodes is one of the main obstacles preventing efficient global livestock production on pastures. Parasite infection leads to the death of young animals and reduced production through reduced feed intake [2]. It is important to implement parasite control programmes because grazing on shared pastures often increases infection rates between animals, which are exacerbated by environmental factors affecting the survival of parasites on pastures, such as humidity and temperature. Knowledge about their influence on infection is needed for effective control [3].

Any deworming of livestock should be preceded by an investigation to determine the species composition of the parasites and select an appropriate antiparasitic preparation. In addition to deworming, cowsheds and pastures should also be disinfected. If parasitological testing indicates that parasites, or their developmental forms, are absent or present only in small numbers in stools, deworming is not recommended as it may increase the chance of drug resistance. Appropriate prophylaxis will reduce the losses caused by parasites, as well as the possibility of acquiring drug resistance. Long-term use of only a single preparation eliminates only those parasites sensitive to it; parasites resistant to the drug can develop without problems and after a certain time, only these parasites will be present in the specified herd. Such drug resistance can be avoided by studying the parasite fauna of livestock, and applying an appropriate prophylactic program [4].

The aim of the study was to determine the extensity and intensity of parasite infection of the digestive tract in sheep and goats from the West

Table 1. Prevalence and intensity of infection among sheep and goats

| Parasites | Sheep | | Goats | |
|---|---|---|---|---|
| | Prevalence (%) | Intensity | Prevalence (%) | Intensity |
| Gastrointestinal nematodes | 100 | 1050 epg (150-2500) | 86.7 | 750 epg (50-2000) |
| *Moniezia* spp. | 25 | 150 epg (50-250) | 6.7 | 50 epg (—) |
| *Eimeria* spp. | 100 | 650 epg (50-2250) | 80 | 550 epg (50-2100) |

Pomerania region following deworming.

## Materials and Methods

Feces were randomly collected in spring from sheep and goats kept on organic farms. Seasonal grazing was practiced began in April and lasted until November. Feeding in the summer period was based on rotational grazing of grasslands. Natural pastures from grazing lands were the principal sources of feed for sheep and goats. Animals on these farms were fed farm produced feeds. The animals were kept indoors in the winter. The animals included Suffolk and Pomorski sheep, as well as Burska goats, from West Pomerania. A total of 35 faecal samples were tested: 10 from the Suffolk sheep, 10 from the Pomorski sheep and 15 from the Burska goats. The efficacy of the drug was assessed on the 25. day after the specimen administration.

The extensity of infection by gastrointestinal tract parasites was determined by coproscopy studies using the Willis-Schlaf flotation method. The intensity of parasites by quantitative analysis using McMaster's methods [5]. The eggs per gram of feces (EPG) was calculated according to the bellow formula. No attempt was made to differentiate the larval forms of the invasive nematodes.

EPG (Eggs Per Gram) = (number of eggs in chamber 1 + number of eggs in chamber 2) x 50

## Results

The mean extensity of infection with gastrointestinal parasites in both sheep and goats was 100%. The sheep were found to contain gastrointestinal nematodes, *Eimeria* protozoa and *Moniezia* spp. tapeworms. The extensity of infection with gastrointestinal nematodes and *Eimeria* protozoa was 100%, while the *Moniezia* spp. tapeworms were observed in 25% of tested sheep (Table 1). The intensity of parasite infection was as follows: gastrointestinal nematodes > *Eimeria* protozoa > *Moniezia* spp. The greatest intensity of infection was observed in the case of gastrointestinal nematodes (1050 epg), and the lowest in the case of the *Moniezia* spp. tapeworms (150 epg) (Table 1).

In the goats, a similar presence was observed for the gastrointestinal nematodes, *Eimeria* spp., and *Moniezia* spp. They displayed slightly lower extensity of infection than the sheep: gastrointestinal nematodes – 87%, *Eimeria* protozoa – 80% and *Moniezia* spp. tapeworms – 6.7%. The greatest intensity of infection was observed in the case of gastrointestinal nematodes (750 epg), and the lowest in the case of the *Moniezia* spp. tapeworms (50 epg).

## Discussion

Our findings indicate that all tested animals were infected with gastrointestinal parasites, and the intensity of infection by nematodes and protozoa was high.

Pilarczyk et al. [7] report a lower mean extensity of infection among sheep on organic farms in Poland (79%) (Table 2), with six species of gastrointestinal nematode present: *Trichostrongylus* spp. (19.4%), *Nematodirus* spp. (16.1%), *Oesophagostomum* spp. (6.5%), *Cooperia* spp. (6.5%), *Haemonchus contortus* (4.8%) and *Chabertia ovina* (4.8%). In addition, significantly lower extensities of infection have been reported in sheep in the south of Asia, in Pakistan (53.3%) [8], and in eastern Africa, in Ethiopia (24.7%) together with the presence of *Haemonchus contortus*, *Trichostrongylus axei*, *Ostertagia/Teladorsagia circumcincta*, *Bunostomum trigonocephalum*, *Cooperia curticei*, *Nematodirus filicollis*, *Strongyloides papillosus*, *Trichostrongylus colubriformis*, *Chabertia ovina* and *Oesophagostomum columbianum* [9].

Our present findings indicate the presence of *Moniezia* spp. tapeworms in 25% of tested sheep. However, Koinari et al. [10] report 0% extensity of

Table 2. Prevalence of gastrointestinal parasites among sheep in various countries

| Country | Parasite | Prevalence (%) | Environment of live | References |
|---|---|---|---|---|
| **Europe** | | | | |
| Poland | Internal parasites | 79 (organic farms) 42.4 (conventional farms) | Organic farms: sheep were reared extensively in conditions that met their welfare requirements. Animals on these farms were fed farm-produced feeds. Conventional farms: sheep were reared semi-intensively. Feeding in the summer period was based on rotational grazing ofgrasslands and animals were dewormed twice a year. | Pilarczyk et al. [7] |
| Italy | Gastrointestinal parasites | 88 | Seasonal grazing was practiced began in April to May and lasted until October to November. Privately owned grazing areas at the farm location usually were below 1500 m a.s.l., with continuous grazing grazing system. On these pastures harrowing, fertilization and mowing were the most common management measured in both. | Lambertz et al. [3] |
| **Africa** | | | | |
| Ethiopia | Gastrointestinal parasites | 88.9 | Natural pastures from communal grazing lands were the principalsources of feed for sheep and other livestock during rainy season and crop residues were the major supplements available after harvest. Mostly, a large number of different livestock including sheep are grazed together on communal grazing pasture. | Aga et al. [9] |
| Egypt | Nematode parasites | 10.4 | One hundred seventy-three slaughtered sheep of different ages and sexes from the slaughterhouse. | Khalafalla et al. [17] |
| **Asia** | | | | |
| Pakistan | Gastrointestinal parasites | 53.3 | In this country the rainy season climatic factors like temperature and humidity are favorable for the development and survival of preparasitic stages of nematodes. | Gadahi et al. [8] |
| Pakistan | Gastrointestinal parasites | 46.3 | Prevalence of gastrointestinal parasites in sheep kept in different localities of three districts of Southern Punjab. | Lashari H., Tasawar Z. [18] |
| New Guinea | Gastrointestinal parasites | 72 | Prevalence of gastrointestinal parasites in sheep kept in different localities of three districts of Southern Punjab. The small infection in this countries depends mainly on the local environmental and breeding conditions. | Konari et al. [10] |

infection by *Moniezia* spp. tapeworms in New Guinea, which may suggest correct use of antiparasitic prophylaxis and a low level of invasion by the parasite. In Ghana (western Africa), the level of invasion by *Moniezia* spp. tapeworms (2.8%) was also lower than that found in the present study [11]. The small infection in this countries depends mainly on the local environmental and breeding conditions.

In the present study, *Eimeria* protozoa were found to be present in all tested sheep. However, our findings were significantly higher than those of Wang et al. [15] Heilongjiang Province in north-eastern China (28.61%). There are unique climatic and geographic conditions different from other

Table 3. Prevalence of gastrointestinal parasites among goats in various countries

| Country | Parasite | Prevalence (%) | Environment of live | References |
|---|---|---|---|---|
| **Europe** | | | | |
| Poland | Gastrointestinal parasites | 17.2 | Maintained in very good conditions. Deworming twice a year. | Ryniewicz et al. [13] |
| Dania | Gastrointestinal parasites | 69 | Used pasture rotation. | Holm [12] |
| Italy | Gastrointestinal parasites | 97.6 | Seasonalt the farm location usually were below 1500 m a.s.l., with continuous grazing being the predominant grazing system. On these pastures harrowing, fertilization and mowing were the most common management measured in both. | Lambertz et al. [3] |
| **Asia** | | | | |
| India | Gastrointestinal nematodes | 85.4 | Material from the Coastal Savannah zone of Ghana | Sharma, Shukla [19] |
| Pakistan | Gastrointestinal parasites | 66.5 | The overall higher incidence of nematodes infection in the areas surveyed could be attributed to lower immunity of hosts as a result of malnutrition. All the livestock in the area under investigation largely depended on grazing in deteriorated range-lands. | Gadahi et al. [8] |
| New Guinea | Gastrointestinal parasites | 89 | The high rates of parasitism are associated with poor farming management practices, including lack of pasture recovery time, lack of parasite control measures and poorquality feed | Konari et al. [10] |
| **North America** | | | | |
| Mexico | Gastrointestinal parasites | 88.9 | Semi-arid rangelands of northeastern Mexico | Olivas-Salazar et al. [20] |

provinces. This province has very cold and dry winter season, but has a warm and rainy temperate climate during the summer season. In New Guinea in lowland and highland regions of Papua (17.3%) [10] the mean number of *Eimeria* protozoan eggs per gram of faeces was 633, which was comparable to that observed in the present study.

Finally, the extensity of infection by gastrointestinal nematodes among goats was found to be 86.7%, which is a similar to data obtained by Konari et al. [10]. However, the value is lower than that observed in New Guinea (89%) and lower than in Italy (97.6%), but higher than in Denmark (69%) [12] (Table 3). Attention should be paid to the low intensity of nematode infestation in the goats, with over 46% of tested animals being characterized by low intensity. High-intensity infection (> 1200 epg) was only observed in two cases.

The high extensity of gastrointestinal tract parasite infection observed on the farms included in the study may be a result of the fact that the animals were allowed to graze on pasture. In addition, the animal buildings and pasture may not have been disinfected correctly. In addition, the farm may have lacked a true prophylactic programme and sick animals may have been allowed onto pasture.

Similar studies of the degree of gastrointestinal nematode infection in goats have also been performed in other areas of Poland; however, while Ryniewicz et al. [13] report an extensity of 17.2% among goats kept in conventional farm conditions, our present findings found nearly 90% to be infected. These differences may be due to the fact that the animals were regularly treated with antiparasitic drugs (twice a year) and kept under very good hygienic conditions.

As well as nematodes, tapeworms from the genus *Moniezia* were also identified. These were found to be present at low extensity and intensity (Table 1), with levels corresponding with those of Hertzberg and Kohler [14] and Wang et al. [15].

The extensity of infection by *Eimeria* protozoa in goats was found to be 80%. This is a significantly higher result than observed in Tanzania (2.4%) [16] where the goats was kept by small holders in the urban and peri-urban areas of Mwanza City and China (54%) [15]. In New Guinea, the animals were characterised by hifh extensity (89%) and moderate intensity (203 epg) [10]. Our present findings suggest a high mean intensity of protozoan infection in goats (550 epg) (Table 1).

Our findings indicate that the presence of parasites of the digestive tract of sheep and goats kept on organic farms may be a problem. Therefore there is a need to promote the correct implementation of prophylactic programmes aimed at eliminating the presence of parasites, or at least restricting their spread. This is particularly important for animals kept on pasture, which act as a reservoir for invasive forms of parasites.

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