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The occurrence of sheep gastrointestinal parasites in the Slovak Republic

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Summary

The occurrence of sheep gastrointestinal parasites was assessed on 37 sheep farms in the Slovak Republic from June to November 2003 and 2004. The sheep farms carried mainly Tsigaja, Valachian and Merino breeds. A total of 1519 sheep faecal samples were analysed in order to determine the presence of parasite eggs on surveyed farms. Strongyle eggs were identified in 1255 samples (82.6 %), *Nematodirus* spp. in 481 samples (31.7 %), *Strongyloides papillosus* in 431 samples (28.4 %) *Moniezia* spp. in 291 samples (19.2 %) and *Trichuris* spp. in 148 samples (9.7 %). In 27 out of 37 examined sheep farms coprocultures were prepared and the third stage larvae were morphologically identified. *Teladorsagia/Ostertagia* spp. (100 % of farms), *Trichostrongylus* spp. (92.6 % of farms), *Chabertia* spp. (81.5 % of farms) and *Oesophagostomum* spp. (70.4 % of farms) were the most prevalent genera. High numbers of surveyed farms carried also other genera as *Haemonchus* spp. (48.1 % of farms), *Cooperia* spp. (37.0 % of farms), *Nematodirus* spp. (22.2 % of farms) and *Bunostomum* spp. (18.5 % of farms). *Teladorsagia/Ostertagia* spp. were the most dominant genera on 17 out of 27 sheep farms. *Trichostrongylus* spp. was dominant on 4 farms, *Chabertia* spp. on 3 farms, *Haemonchus* spp. on 2 farms and *Oesophagostomum* spp. on 1 farm. Mean values of strongyle eggs per gram (EPG) varied from 0 to maximum value of 3731.4.

Key words: sheep-parasites; prevalence; Slovak Republic

Introduction

Sheep breeding has always been widespread in the Slovak Republic. During the transformation of the society and economy in 1989, the total number of ewes reared in Slovakia decreased from 355.5×10^3 in 1990 to 208.1×10^3 in 1999. Since than, number of ewes has slowly increased to current 221.2×10^3. Sheep in Slovakia are reared mainly as dairy animals with meat production being considered as by-product of lactation. The most common system of production is described as semi-intensive; animal feeding is based on grazing natural pastures whereas housing and additional feeding is provided during the winter months of the year. The analysis of the host-parasite relationship in a livestock production system in a specific geographical area requires an epidemiological approach (Martínez-González *et al.*, 1998). Thus it is essential to know both the environmental and management characteristics of regional production systems (Arosemena *et al.*, 1999).

Gastrointestinal helminths causes local and/or general alterations of host organism resulting in more or less apparent morbidity, even the death of infected animals (Hovorka, 1963). Parasite gastroenteritis in sheep results principally from infections with the nematodes *Haemonchus contortus*, *Teladorsagia circumcincta* and *Trichostrongylus colubriformis* (Armour & Coop, 1991).

Previous surveys of occurrence of gastrointestinal parasites in Slovak sheep flocks were conducted by Hovorka (1963), Várady and Praslička (1993) and Kočišová *et al.* (2004). The specific objectives of the work reported in this paper were to assess the extent of gastrointestinal parasitism in indigenous dairy breeds of sheep reared under traditional production systems and to identify the parasitic species involved in such production systems. This survey was run as a part of the anthelmintic resistance investigation on Slovak sheep farms.

Materials and Methods

A total of 37 sheep farms were studied during the period from June to November in 2003 and 2004. 15 farms examined in 2003 were located in Eastern part of Slovakia and 22 flocks were examined from different areas of the Slovak Republic in 2004. Visited farms were situated in various types of landscape, 4 farms in lowlands (up to 500 m above sea level), 19 in promontory region (500 – 800 m above sea level) and 14 in mountain region (800 m above sea level). A total of 1519 sheep faecal samples were analysed in order to determine the presence of parasite eggs on sur-

veyed farms. The sheep farms mainly carried Tsigaja, Valachian and Merino breeds. Animals examined were female lambs or yearlings that had not received any anthelmintic treatment for at least 8 weeks before the initiation of the survey. Approximately 45 faecal samples were taken from each flock. Faecal samples were taken individually from the rectum of each animal and were examined for the presence of parasite eggs using saturated salt solution as a flotation medium. Strongyle nematode eggs per gram (EPG) were determined using the modified Mc Master technique according to Coles *et al.* (1992) with the lowest limit of detection of 50 eggs per gram. 27 sheep farms out of 37 visited were also examined for the presence of anthelmintic resistance (will be published elsewhere). Coprocultures were prepared by mixing pooled faecal samples with vermiculite and incubating for 14 days at room temperature. The third stage larvae were morphologically differentiated and identified according to Hulínska (1969) and Van Wyk *et al.* (2004).

Results

Table 1 shows the mean strongyle EPG on 37 visited sheep farms. The mean values of EPG varied from 0 to maximum value of 3731.4. Results of faecal flotation in 37 sheep farms are shown in Table 2. A total of 1519 animals were coprologically examined for the presence of gastrointestinal parasites, 625 animals in 2003 and 894 animals in 2004. Strongyle eggs were identified in 1255 cases (82.6 %), *Nematodirus* spp. in 481 cases (31.7 %), *Strongyloides papillosus* in 431 cases (28.4 %) *Moniezia* spp. in 291 cases (19.2 %) and *Trichuris* spp. in 148 cases (9.7 %). Fig. 1 shows the presence of genera of infective nematode larvae (L_3) identified in coprocultures on 27 sheep farms. *Teladorsagia/Ostertagia* spp. (100 % of farms), *Trichostrongylus* spp. (92.6 % of farms), *Chabertia* spp. (81.5 % of farms) and *Oesophagostomum* spp. (70.4 % of farms) were

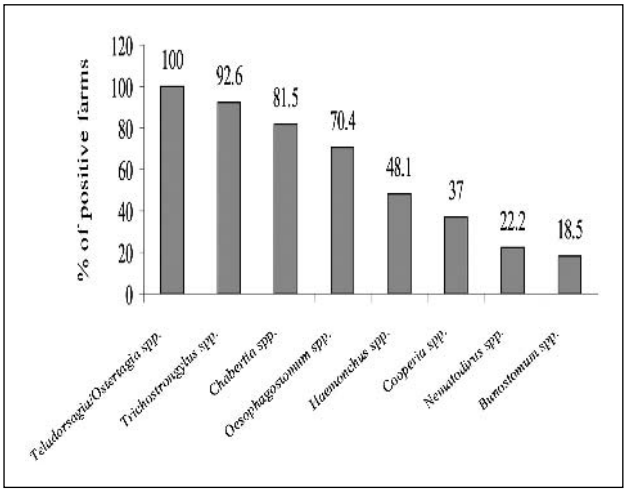

Fig. 1. Presence of infective larvae found in faecal coprocultures on Slovak sheep farms

Table 1. Mean strongyle eggs per gram of faeces (EPG) on Slovak sheep farms

Farms	EPG (range)
Lowlands	
Františkov Dvor	3731.4 (0 – 21500)
Nižný Lánec	212.0 (0 – 2300)
Debraď	0
Skároš	0
Promontory region	
Pucov	137.9 (0 – 950)
Zákamenné	23.3 (0 – 250)
Malatiná	2537.8 (50 – 6800)
Veterná Poruba	163.3 (0 – 1150)
Liptovský Peter	243.3 (0 – 1950)
Ratkovská Suchá	339.7 (0 – 650)
Lom/Rimavicou	481.1 (0 – 1550)
Detvianska Huta	187.2 (0 – 600)
Hermanovce/Topľou	544.4 (50 – 2150)
Raslavice	336.7 (0 – 1950)
Kalnište	576.7 (0 – 2050)
Hermanovce	95.7 (0 – 1000)
Nemcovce	770.0 (50 – 1950)
Klenov	675.0 (0 – 2000)
Víťaz	592.2 (0 – 3000)
Košický Klečenov	808.9 (150 – 1950)
Poproč	771.4 (100 – 1450)
Kvačany	76.0 (0 – 700)
Uzovské Pekľany	64.4 (0 – 650)
Mountain region	
Ochodnica	351.1 (0 – 1350)
Súľov	97.5 (0 – 850)
Závadka/Hronom	227.8 (0 – 1750)
Važec	135.6 (0 – 650)
Zuberec	189.1 (0 – 850)
Liptovská Teplička	418.9 (0 – 1400)
Helcmanovce	403.4 (0 – 1550)
Oščadnica	402.1 (0 – 1250)
Terchová	600.0 (100 – 2050)
Oravice	292.2 (0 – 2350)
Slovinky	311.1 (0 – 1550)
Veľký Folkmár	712.0 (0 – 4000)
Závadka	327.8 (50 – 1150)
Livov	440.0 (0 – 1700)

the most prevalent genera. However, a high numbers of surveyed farms carried also other genera as *Haemonchus* spp. (48.1 % of farms), *Cooperia* spp. (37.0 % of farms), *Nematodirus* spp. (22.2 % of farms) and *Bunostomum* spp. (18.5 % of farms). The genera compositions of infective larvae identified in coprocultures on each farm examined are shown in Table 3. Table 4 shows the dominance of infective nematode larvae on 27 surveyed farms. *Teladorsagia/Ostertagia* spp. were dominant genera on 17 sheep farms (63.0 %). *Trichostrongylus* spp. was dominant on 4 farms (14.8 %), *Chabertia* spp. on 3 farms (11.1 %), *Haemonchus* spp. on 2 farms (7.4 %) and *Oesophagostomum* spp. on 1 farm (3.7 %).

Table 2. Parasite eggs found in faeces of lambs examined in 2003 and 2004 on Slovak sheep farms

Parasites	2003		2004		Total number of positive	Total prevalence (%)
	Number of positive	Prevalence (%)	Number of positive	Prevalence (%)		
Moniezia spp.	167	26.7	124	13.9	291	19.2
strongyle eggs	505	80.8	750	83.9	1255	82.6
Strongyloides papillosus	263	42.1	168	18.8	431	28.4
Nematodirus spp.	156	25.0	325	36.4	481	31.7
Trichuris spp.	121	19.4	27	3	148	9.7

Table 3. Larval genera compositions (L_3) identified in coprocultures on sheep farms in Slovakia

Farm	L_3%							
	Tel/Ost	Trich	Chab	Oesoph	Coop	Haem	Bun	Nem
Lowlands								
Františkov Dvor	15	0	3	0	7	74	1	0
Nižný Lánec	59	31	1	0	0	4	0	5
Promontory region								
Malatiná	68	18	5	7	0	2	0	0
Veterná Poruba	62.5	22.9	0	0	0	2.1	0	12.5
Liptovský Peter	25	2	34	37	1	1	0	0
Ratkovská Suchá	71	17	5	1	0	0	3	3
Lom/Rimavicou	56.7	4.8	7.7	30.8	0	0	0	0
Detvianska Huta	75	7	18	0	0	0	0	0
Hermanovce/Topľou	41.2	19.6	0	39.2	0	0	0	0
Raslavice	48.6	28.6	0	22.8	0	0	0	0
Kalnište	12	71	7	9	0	1	0	0
Nemcovce	27	38	26	0	4	0	3	2
Klenov	44	16	30	4	4	1	0	1
Víťaz	57	4	21	5	6	2	4	1
Košický Klečenov	77	6	12	5	0	0	0	0
Poproč	54	34	5	7	0	0	0	0
Mountain region								
Závadka/Hronom	55	35	2	8	0	0	0	0
Zuberec	17	18	11	25	1	28	0	0
Liptovská Teplička	93	3	3	0	1	0	0	0
Helcmanovce	10	9	50	3	4	24	0	0
Oščadnica	37.5	62.5	0	0	0	0	0	0
Terchová	67	31	0	2	0	0	0	0
Oravice	25	41	17	17	0	0	0	0
Slovinky	23	6	71	0	0	0	0	0
Veľký Folkmár	23	6	52	9	1	8	1	0
Závadka	76	15	4	1	1	3	0	0
Livov	90	0	2	7	0	1	0	0

Bun – *Bunostomum* spp.; Coop – *Cooperia* spp.; Haem – *Haemonchus* spp.; Chab – *Chabertia* spp.; Nem – *Nematodirus* spp.; Oesoph – *Oesophagostomum* spp.; Tel/Ost – *Teladorsagia/Ostertagia* spp.; Trich – *Trichostrongylus* spp.

Table 4. Dominance of infective nematode larvae found in coprocultures on Slovak sheep farms

Dominant parasite	Number of farms	%
Teladorsagia/Ostertagia spp.	17	63.0
Trichostrongylus spp.	4	14.8
Chabertia spp.	3	11.1
Haemonchus spp.	2	7.4
Oesophagostomum spp.	1	3.7

Discussion

According to our results, strongyle nematodes were present in 80.8 % of faecal samples taken from sheep farms situated in Eastern part of the Slovak Republic in 2003. Kočišová *et al.* (2004), who also carried their survey of parasitic fauna in this part of Slovakia on 32 sheep farms in 2003, reported 45.6 % prevalence of strongyle nematodes. Our results concerning the prevalence of *Moniezia* spp. and *Trichuris* spp. also differ from the findings of Kočišová *et al.*

(2004). While we have recorded 26.7 % prevalence of *Moniezia* spp. and 19.4 % prevalence of *Trichuris* spp., Kočišová *et al.* (2004) reported 10.8 % prevalence of *Moniezia* spp. and 1.5 % prevalence of *Trichuris* spp. The inequality of the results may be caused by differences of animal management of the two respective investigations. Kočišová *et al.* (2004) provided their survey with sheep of all age categories while animals in our experiment were female lambs or yearlings that are more susceptible to parasitic infection than adult sheep. The immune capability of lambs is initially low but increases with the magnitude and duration of exposure to infection. Once significant immunity has developed (usually by 10 – 12 months of age), sheep are capable of markedly restricting parasite infection, except during times of disease, malnutrition or stress (Vlassoff *et al.*, 2001). Additionally, Kočišová *et al.* (2004) did not request the farmers to carry out no anthelmintic treatment for at least 8 weeks before the start of their investigation in a sheep flock.

In 1992 Várady and Praslička (1993) conducted the survey of parasitic fauna in 9 districts of the Slovak Republic. Following their findings, *Teladorsagia/Ostertagia* spp. (94 %), *Trichostrongylus* spp. (97 %) and *Chabertia* spp. (74 %) were the most prevalent genera which is in accordance with our results where *Teladorsagia/Ostertagia* spp. were 100 %, *Trichostrongylus* spp. was 92.6 % and *Chabertia* spp. was 81.5 % prevalent. Although the extend of *Teladorsagia/Ostertagia* spp., *Trichostrongylus* spp. and *Chabertia* spp. have not changed in Slovak sheep farms during the last decade, the prevalence of *Oesophagostomum* spp. rapidly increased from 6 % (Várady & Praslička, 1993) to 70.4 % (our findings) and the prevalence of *Haemonchus* spp. increased from 26 % (Várady & Praslička, 1993) to 48.1 % (our findings). The prevalence of *Cooperia* spp. decreased from 50 % (Várady & Praslička, 1993) to 37 % (our findings), of *Nematodirus* spp. from 62 % (Várady & Praslička, 1993) to 22.2 % (our findings) and of *Bunostomum* spp. from 32 % (Várady & Praslička, 1993) to 18.5 % (our findings). According to Várady and Praslička (1993) *Trichostrongylus* spp. was dominant genus on 42 % of examined farms and genera *Teladorsagia/Ostertagia* spp. were dominant on 17 %, *Chabertia* spp. on 17 %, *Cooperia* spp. on 17 % and *Haemonchus* spp. on 6 % of farms. In our findings *Teladorsagia/Ostertagia* spp. were dominant on 63 %, *Trichostrongylus* on 14.8 %, *Chabertia* spp. on 11.1 %, *Haemonchus* spp. on 7.4 % and *Oesophagostomum* spp. on 3.7 % of farms.

Surveys in European countries revealed the presence of anthelmintic resistant *Teladorsagia/Ostertagia* spp. or *Trichostrongylus* spp. (Hong *et al.*, 1996; Maingi *et al.*, 1996; Chartier *et al.*, 1998; Álvarez-Sánchez *et al.*, 2001; Papadopoulos *et al.*, 2001; Bartley *et al.*, 2003). Recently Sargison *et al.* (2001) confirmed the presence of *Teladorsagia* spp. exhibiting resistance to benzimidazole, imidazothiazole and macrocyclic lactone on one sheep farm in United Kingdom. Therefore the fact, that *Teladorsagia/Ostertagia* spp. and *Trichostrongylus* spp. are the most prevalent and also the most dominant genera in sheep flocks in the Slovak Republic should warn our farmers, because of the potential to develop anthelmintic resistance. *Haemonchus contortus*, a blood feeding trichostrongyle of the abomasum, is one of the most pathogenic gastrointestinal nematode species of sheep (Kaufmann, 1996). This nematode infecting ruminants is a widely spread in warm regions of South Africa, South America and Australia (Waller *et al.*, 1995; Waller *et al.*, 1996; Malan *et al.*, 2001), where often causes the deaths of young sheep. Fortunately, even though there is relatively high prevalence of genera *Haemonchus* spp., it is still not so dominant in the sheep flocks of the Slovak Republic.

Mean strongyle EPG was counted in order to determine the level of strongyle infection in sheep reared under traditionnal production system in the Slovak Republic. Considering EPG $\leq$ 500 being "low", EPG from 500 to 2000 being "moderate" and EPG $\geq$ 2000 being "high", in the present study there were 26 farms with the low and 9 farms with moderate values of EPG. Only two farms had EPG above 2000. Moreover, sheep on 2 farms had no strongyle egg in faeces. This fact could be explained by not fulfilling the condition of no anthelmintic treatment for at least 8 weeks before the initiation of our survey on these farms. Out of 37 visited, 4 farms were situated in lowlands, 19 in promontory region and 14 farms in mountain region. Farmers in hilly and mountainous areas in Slovakia do not have to rely merely on grazing a small paddock, they have an opportunity to change their pastures every year or several times during pasture season to avoid parasitic infection. In addition, weather conditions as higher temperatures and periods of drought in the summer and freezing temperatures during the winter may influence the number of surviving eggs and larvae on pastures (Vlassoff *et al.*, 2001).

Sheep in Slovak pastoral systems are continually exposed to infection by parasites. As eradication of the parasites is not practical, the aim of the control measures is to maintain their populations at levels that are compatible with economic production. Relying exclusively on drug use leads to the development of anthelmintic resistance. Thus integrated approaches to the control of nematode parasites in livestock are the only way to ensure sustainability of parasite control (Waller, 2003). Effective control must be based on the application of knowledge of the life cycles, larval ecology and epidemiology to husbandry practices designed to prevent or limit contact between parasite and host (Brunsdon, 1980).

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