DYNAMICS OF GASTROINTESTINAL HELMINTH INFECTIONS IN TWO SYSTEMS OF LAMB REARING

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Abstract

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The dynamics of faecal nematode, cestode and coccidia egg counts were investigated in two herds (1, 2) of ewes that had lambed in March and April and their lambs were turned out to pasture at the age of 1 to 4 weeks, and in one herd of ewes (3) that had lambed late in December and January and their lambs were turned out to pasture at the age of 3 to 4 months. The pasture growth was monitored for the presence of infectious larvae of the gastrointestinal nematodes during the grazing period. In the lambs of Herds 1 and 2, the faecal counts of eggs (EPG) of the gastrointestinal nematodes and *Moniezia* spp. rose steeply already after the first month of the grazing period and this tendency continued until stopped by anthelmintic treatment. In the lambs of Herd 3, the steep rise in the faecal egg counts was preceded by a two-month period of a slow rise. The marked rise of EPG of gastrointestinal nematodes during the lambing period (March, April), known as the „spring rise phenomenon", was observed ewes of Herds 1 and 2, but not of Herd 3. In the grazing ewes, the faecal egg counts were substantially lower than in their lambs.

Ovoscopic and larvoscopic analyses of faecal samples collected from the ewes and lambs revealed infections with the following 10 genera/species of nematodes: *Nematodirus* spp., *Ostertagia* spp., *Trichostrongylus* spp., *Chabertia ovina, Oesophagostomum* spp., *Bunostomum trigonocephalum, Cooperia* spp., *Haemonchus contortus, Strongyloides papillosus,* and *Trichuris ovis.*

The dynamics of the occurrence of La III on the pasture stand parallelled the findings in the lambs; maximum LPG values were recorded in late August and early September.

Coccidiosis was no serious problem in the housed lambs and ewes in any of the three herds and OPG counts decreased continuously to a minimum during the grazing period.

Gastrointestinal nematodes, Moniezia spp., *Coccidia, dynamics of infection, lambs, ewes, conventional rearing, new system.*

The common local system of sheep herd management, particularly the winter (December-January) lambing and the housing of the lambs up to the age of 3 to 4 months, was very unprofitable and required considerable state subsidies for their survival. The recent change of the economic environment and especially the application of the principles of market economy have given cause for a serious crisis in the sheep husbandry that can be overcome only by a considerable reduction of the costs of lamb rearing and meat production. Postponing of the lambing period to late March and April and rearing of lambs on pastures allow considerable savings of concentrates. Feeding of lambs with maternal milk combined with grazing is much more profitable (Skřivánek et al. 1991). However, the rearing of the lambs on pasture exposes them permanently to helminth infections from the first days of their life and will therefore require a new approach to the prevention and control.

The objective of the present study was to investigate by quantitative and qualitative ovoscopic and larvoscopic methods the perannual dynamics of parasitic infections, particularly those by gastrointestinal helminths, to establish a basis for the elaboration of effective methods of control.

Materials and Methods

The investigations were done in three sheep herds in 1994. Herd 1 of 400 ewes of the German Longhaired breed (Oxford-down crosses) was raised in the eastern part of the Bohemian-Moravian Highlands (elevation 660 m). The ewes lambed in April and the lambs were turned out to pasture at the age of 1 to 4 weeks with a live body mass range of 7 to 10 kg.

Herd 2 of 450 ewes of the Merino breed were raised in North Moravia (elevation approx. 300 m). The ewes lambed in April and early May and the lambs were turned out to pasture at the age of 1 to 4 weeks with a live body mass range of 6 to 10 kg.

Herd 3 of 250 ewes of the Merino breed was raised in the same area as Herd 2. The ewes lambed in December 1993 and January 1994 and the lambs were turned out to pasture at the age of 3 to 4 months.

Faecal samples were collected regularly at intervals of 3 to 5 weeks from approx. 10% of the animals (ewes and lambs). Each sample was examined separately by the flotation, sedimentation and larvoscopic methods. Counting of helminth eggs (EPG) and coccidial oocysts (OPG) were done by the C h r o u s t's (1970) modified method using the McMaster's counting slide.

Infective larvae (La III) of gastrointestinal nematodes (GIN) were cultured from pooled faecal samples by the methods of C h r o u s t and H u l í n s k á (1970), and identified using the key of H u l í n s k á (1969).

Samples of the pasture stand were collected along with the faecal samples and examined for the presence of La III of GIN. The sampling and parasitological examination were done according to the MAFF (1986) methods.

The respective biotopes were checked for the presence of intermediate hosts (water snails) and the latter were examined parasitologically (VLM 1989).

Results

The examinations by the sedimentation (trematodes) and larvoscopic (lungworms) methods yielded negative results in all the three herds throughout the period of investigation. The results of examinations for GIN done in 1994 and the EPG counts are shown in Figs. 1 - 3.

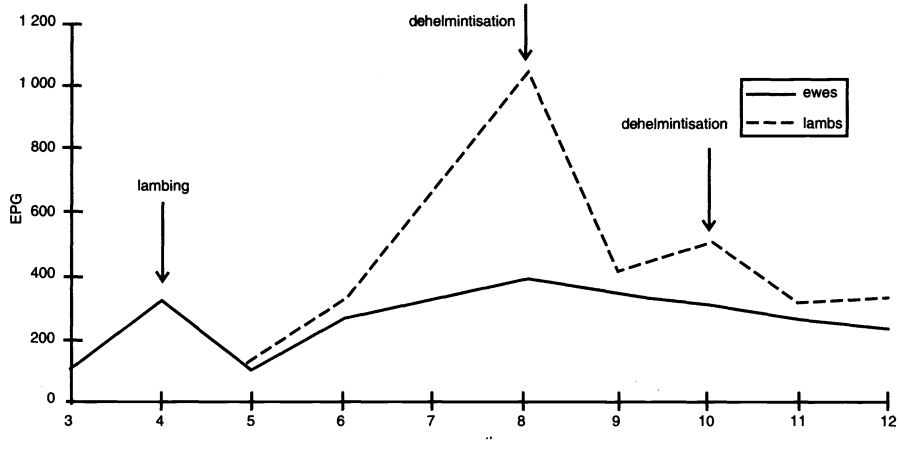

Fig. 1. Dynamics of ovoscopical findings of gastrointestinal nematodes (EPG) in ewes and lambs in herd No. 1.

Identical dynamics of GIN EPG counts were observed in Herd 1 and Herd 2, where the ewes had lambed in spring and the lambs were turned out to pasture in the first weeks of their life. The lambs became infected from the first days on pasture and a steep rise in EPG counts was observed already after 4 to 5 weeks (June) reaching its peak value (1,050 and 840 in Herd 1 and Herd 2, respectively) in August. The rise was stopped only by anthelmintic treatment with Vermitan susp. 2.5% (albendazol, 5 $mg.kg^{-1}$). The treatment was followed by a rapid decrease down to 420 and 210 EPG in Herds 1 and 2, respectively. Owing to another rise of EPG

from September, the treatment was repeated in November after the lambs had been housed. The second treatment resulted in a stabilization of EPG counts at low levels persisting up to the end of the investigation period in December (Figs. 1 and 2).

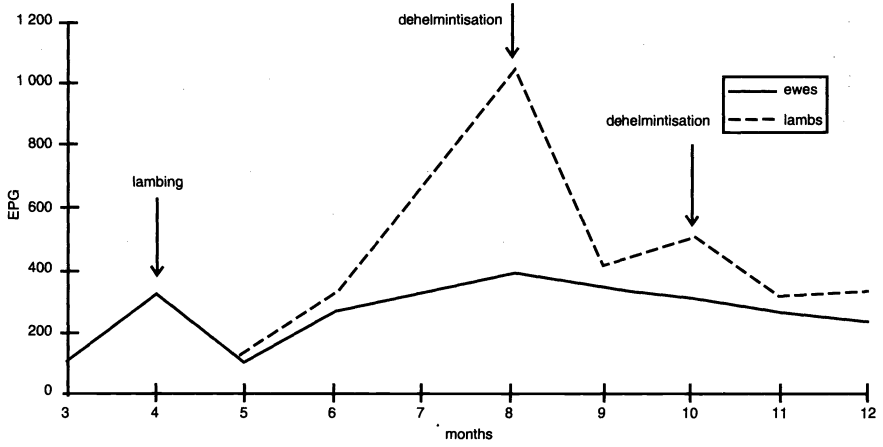

Fig. 2. Dynamics of ovoscopical findings of gastrointestinal nematodes (EPG) in ewes and lambs in herd No. 2.

Shedding of eggs of GIN by ewes in Herd 1 and Herd 2 was rather lows during the winter housing period. An increase of EPG, corresponding to the „spring rise phenomenon" was observed during the lambing period in the two herds. Thereafter, the counts of EPG decreased in both the herds to 110 and 90, respectively, to rise again from the end of May and to reach the peak values of 400 in Herd 1 towards the end of September, and 240 in Herd 2 in September. A slow decrease was observed thereafter up to the end of the investigation period in December (Figs. 1 and 2).

EPG counts in ewes and lambs of Herd 3, lambing in December 1993 and January 1994, were relatively low during the winter and spring months. The ewes were prophylactically treated with Vermitan susp. 2.5% in April before being turned out to pasture.

A slow increase in EPG counts observed in the lambs during the first two months (May, June) of grazing was followed by a steep rise to 690 in July. Like in Herds 1 and 2, the anthelmintic treatment of the lambs with Vermitan susp. reduced the EPG count down to 210.

The spring treatment of the ewes reduced their EPG counts almost to zero. Later, the counts rose slowly up to the end of August. A slight decrease was recorded in September. The herd was culled early in October.

Examinations by culture of faecal samples for La III of GIN showed the following extensities of infections: *Ostertagia spp.* 20 to 60%; *Trichostrongylus* spp. 10 to 36%; *Chabertia ovina* 5 to 32%; *Oesophagostomum* spp. 4 to 26%;, *Bunostomum trigonocephalum* 2 to 10%;, *Cooperia* spp. 2 to 8%; *Haemonchus contortus* 1 to 5%. The latter species was found only in Herd 1. The lambs, particularly those of Herd 3, were often infected by *Strongyloides papillosus.* Eggs of *Nematodirus* spp. were found in all the herds both in ewes and in lambs (up to 90%), while the findings of eggs of *Trichuris ovis* were rare.

The number of faecal samples positive for eggs of *Moniezia* spp. rose from May and June in the ewes and lambs, respectively. The extensity of infection by the cestodes increased particularly in lambs to reach the peak values of 28%, 35% and 45% in Herds 1, 2 and 3, respectively. The anthelmintic treatment eliminated the cestodes from the lambs completely and reduced the infections in ewes to relatively low levels.

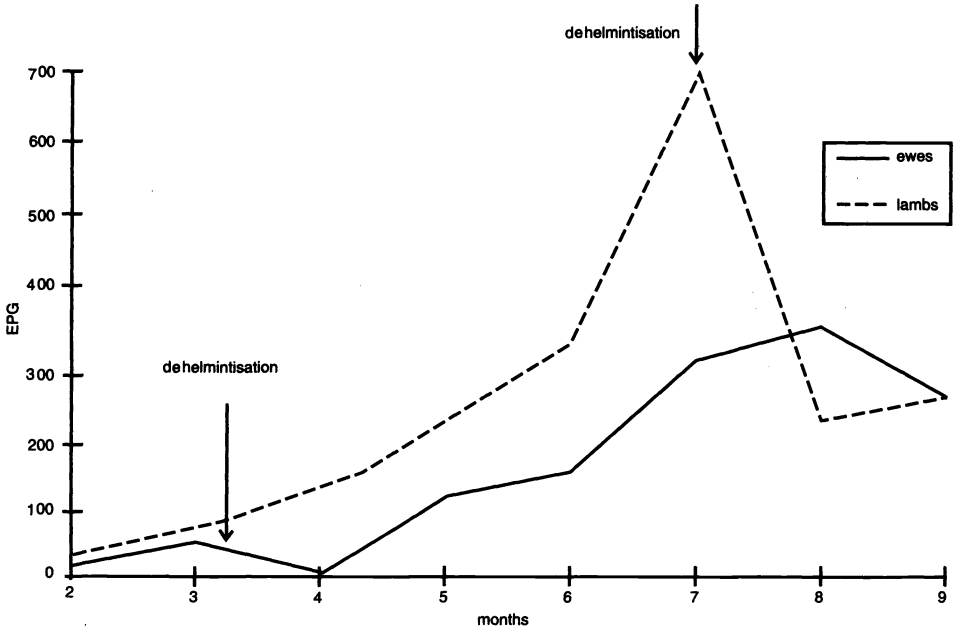

Fig. 3. Dynamics of ovoscopical findings of gastrointestinal nematodes (EPG) in ewes and lambs in herd No. 3

Coccidia are common parasites of adult sheep. Both the intensity and the extensity of coccidiosis in the adult sheep were highest (53%) in Herd 3 during the winter housing period. In Herds 1 and 2, the extensities were lower (35%). The highest extensity (98%) was found in the lambs of Herd 3. The extensity and the intensity of the coccidial infection in the ewes and lambs decreased rapidly during the grazing period. The final values were lower in the lambs of Herds 1 and 2 than in Herd 3. Treatment with anticoccidial drugs was not found necessary in any of the herds.

The dynamics of the counts of infective larvae of GIN (Fig. 4) parallelled that of the counts of eggs shed by the lambs. The peak values were found in Herd 1 at the end of August and in Herd 2 in September (LPKG 3,200 and 1,450, respectively. The dynamics were parallel in the two herds. throughout the grazing period differing only in the positions of the respective curves. In Herd 3, the highest value, found already in July (LPKG 890), decreased slowly to 710. The larvae were identified as those of *Ostertagia spp., Trichostrongylus* spp., *Chabertia ovina, Oesophagostomum spp., Bunostomum trigonocephalum, Cooperia* spp., and *Haemonchus contortus.*

Investigations of the biotopes revealed the presence of *Lymnea truncatula* and other species of this genus (*L. peregra, L. palustris*). The examinations of *L. truncatula* for larval stage of *Fasciola hepatica* yielded negative results.

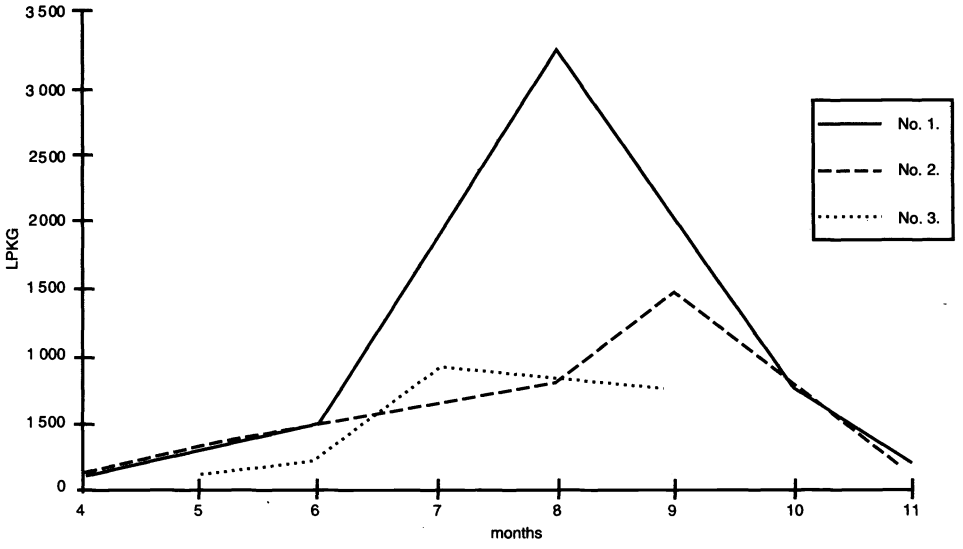

Fig. 4. Dynamics of larvoscopical findings (LPKG) of gastrointestinal nematodes in herbage in herds No. 1, 2 and 3.

Discussion

The objective of our investigations was to compare the effects of two systems of lamb rearing on seasonal dynamics of parasitic, particularly GIN, infections. The results obtained in Herd 3, in which the ewes had lambed in December and January, have confirmed our earlier findings of 1970-1974 in relatively large groups of ewes and lambs. Seasonal variations of shedding of GIN eggs were considerable. The first eggs could be found in lambs already during the winter and spring housing period, but the intensity of infection was very low. The lambs were turned out to pasture at the age of 3 to 4 months and the intensity of infection rose slowly during the first two months (May, June) of the grazing period. A steep rise occurred in July (Fig. 3).

Different dynamics of shedding of GIN eggs were observed in the herds in which the ewes had lambed in March and April. The lambs were turned out to pasture at the age of 1 to 4 weeks and the youngest of them in the first days of life. The number of eggs shed by the lambs rose steeply already during the first month, i.e. from the beginning of June, and the upward tendency continued (Figs 1 and 2). It is apparent that the susceptibility to helminth infections of young lambs that have had no chance to develop immunity, is higher.

Our results have demonstrated that the problem of GIN infections is much more serious in sheep herds in which the ewes lamb in spring and that the fully susceptible lambs turned out to pastures grazed by infected sheep in the previous year are exposed to a considerable risk. Therefore, treatment with broad-spectrum anthelmintics is necessary in such herds. The treatment should be carried out after 30 to 40 days of grazing, i.e. mid July, to reach the maximum effect. On the other hand, the lambs turned out to pasture at the age of 3 to 4 months should be, in our experience (C h r o u s t 1975), treated later, approximately after two months of grazing, i.e. towards the end of July.

The dynamics of shedding of GIN eggs by adult sheep is less pronounced. A significant

rise of EPG counts around the time of lambing, corresponding to the „spring rise phenomenon" was observed in Herds 1 and 2 towards the end of March and in the first half of April, respectively. Although followed by a spontaneous and progressive decrease, this rise should be regarded as a dangerous source of eggs infecting the lambs. Therefore, anthelmintic treatment should precede the turning out of adult sheep to pasture. No significant increase in EPG counts was evident in Herd 3 during the winter lambing period.

Our results agree with those obtained in similar investigations carried out by V á r a d y and P r a s l i č k a (1993) in Slovakia, B e n e s c h (1991) in Germany, G r ä n z e r et al. (1979) in Bavaria, T r e p p (1973) in Switzerland, P e l i n s k i (1980) in Poland and others. The very good effect of the anthelmintic treatment of the lambs at the time of the culminating infections was an evidence of a high efficacy of albendazol against all the identified species/genera of GIN.

A similar dynamics of infection was observed in monieziosis. Although the number of egg-shedding ewes was rather small at the beginning of grazing, the extensity rose rapidly in the subsequent period, particularly in the lambs of Herd 3 (up to 45%). The result of the anthelmintic treatment has confirmed the high efficacy of albendazol against these cestodes.

The culture of La III from the faecal samples revealed a rather broad spectrum of GIN including 10 genera/species. *Nematodirus spp.* were found to be the most significant among the identified GIN, particularly in lambs, in which the extensity of infection rose from 0 up to 90% at the peak of egg shedding (at the turn of July).

The percentages of other genera and species did not significantly change during the grazing period. *Ostertagia* spp., *Trichostrongylus* spp., *Chabertia ovina,* and *Oesophagostomum spp.* were found more frequently than *Bunostomum trigonocephalum, Cooperia* spp., *Trichuris ovis,* and *Strongyloides papillosus.*

The spectra of GIN found on the pasture growth during the vegetation period and in faecal samples were identical. Monitoring of the infestation of the pasture growth is of great importance for the recognition of the epidemiological pattern of GIN infections during the vegetation period. The dynamics of the findings parallelled that of egg shedding by lambs, culminating towards the end of August in Herds 1 and 2. The rapid decrease of La III counts in September and October was probably due to the reduction of egg shedding by lambs and to slowing-down of the larval development in the cooler autumn months. Nevertheless, the infestation of pastures constitutes a serious danger to grazing lambs and adult sheep throughout the vegetation period.

Dynamika gastrointestinálních helmintóz při rozdílných technologiích odchovu jehňat

V práci jsou prezentovány výsledky sledování dynamiky vylučování vajíček gastrointestinálních nematodů, tasemnic a kokcidií v průběhu zimního ustájení a pastevního období u ovcí s rozdílnou technologií odchovu jehňat. Byla sledována dvě stáda bahnic (č. 1 a 2) u nichž bahnění probíhalo v jarních měsících (březen-duben) a jehňata přicházela na pastvu ve věku 1 až 4 týdnů a jedno stádo bahnic (č. 3) u něhož bahnění probíhalo koncem prosince a v lednu a jehňata přicházela na pastvu ve věku 3-4 měsíců. V průběhu pastevního období byl dále sledován výskyt infekčních larev gastrointestinálních nematodů na pastevních porostech. Výsledky sledování u jehňat ve stádech č. 1 a 2 prokázaly prudký nárůst počtů vylučovaných vajíček (EPG) gastrointestinálních nematodů a tasemnic Moniezia spp. již po prvním měsíci pastvy, od počátku června a mělo stále vzestupnou tendenci. U jehňat ve stádě č. 3 mělo vylučování vajíček pozvolný nárůst v prvých dvou měsících pastvy, v květnu

a červnu a poté došlo k prudkému nárůstu i u těchto jehňat. U bahnic ve stádech č. 1 a 2 byl pozorován výrazný vzestup EPG u gastrointestinálních nematodů v období kolem porodu, v březnu a dubnu („spring rise phenomenon"). Tento fenomen nebyl pozorován u bahnic ve stádě č. 3. Vzestup vylučovaných vajíček u bahnic v průběhu pastevního období měl ve všech pokusech podstatně nižší hodnoty než u jehňat.

Ovoskopické a larvoskopické analýzy vzorků trusu u bahnic a jehňat prokázaly přítomnost 10 rodů resp. druhů gastrointestinálních nematodů, a to: *Nematodirus* spp., *Ostertagia* spp., *Trichostrongylus* spp., *Chabertia ovina, Oesophagostomum* spp., Bunostomum *trigonocephalum, Cooperia* spp., *Haemonchus contortus, Strongyloides papillosus* a *Trichuris ovis*.

Dynamika výskytu La III na pastevních porostech měla shodný průběh s nálezy u jehňat, maximum LPKG bylo zjištěno koncem srpna a začátkem září.

Infekce kokcidiemi nebyla ve sledovaných chovech u jehňat a ovcí závažným problémem, s příchodem zvířat na pastvu se OPG postupně snižovalo až na minimální hodnoty.

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