

**Original Contribution****CLINICAL STUDY OF ACUTE HAEMONCHOSIS IN LAMBS****P. T. Iliev*, P. Prelezov, A. Ivanov, Z. Kirkova, A. Tonev**

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ABSTRACT

In this study are presented clinical approaches in lambs with experimentally induced haemonchosis. Eighteen lambs aged about 3 months were included in the investigation. The animals were divided into 3 groups and were inoculated by *Haemonchus contortus* infective larvae (L₃) in following order: G1 - 6000 L₃; G2 - 4000 L₃ and G3 served as a noninfected control group. Clinical signs were observed weekly for 77 days. Simultaneously, we also studied the changes in bodyweight and egg shedding from the lambs. The aim of this study was to investigate the influence of infective dose on degree of clinical manifestation and bodyweight, and also a rate of egg excretion by feces. The results showed that the most common clinical signs in haemonchosis are weakness, lethargy, lack of appetite, thirst, increased heart rate and breathing, pale conjunctiva and gingiva and mushy stools. Those signs started at 21st day after infection and were most pronounced about 35th day in G2 and 49th day in G1.

Key words: haemonchosis, sheep, clinical signs, *Haemonchus contortus***INTRODUCTION**

Sheep breeding is widespread and important livestock sector in many countries around the world including Bulgaria. Climatic conditions of our country and almost year-round grazing of sheep make them an easy target of various parasite attacks. The most common nematodes infected small ruminants are gastrointestinal strongylids. *Haemonchus contortus* is one of the most pathogenic species belonging to this parasite group and is an important limiting factor for the health and productivity of small ruminants (1). Pathogenicity of *H. contortus* consists of blood loss due to the way of eating of both adults and larvae fourth stage which are obligate hematofagous (2). This leads to decrease the number of red blood cells, hematocrit and hemoglobin levels (3) and quantity of total serum protein and albumin (4). Hypoproteinaemia and hypoalbuminaemia are an important element for the occurrence of edema. Clinical manifestation of haemonchosis is largely dependent on the breed, age, sex and immunological status of the hosts and also the degree of infection dose, stage of disease and diet (2, 5, 6, 7). The content of protein in the

diet significantly affects the pathogenesis of the disease (8). The appearance and severity of the clinical signs are also a direct consequence of factors mentioned above. Haemonchosis is manifested in three different clinical forms - hyperacute, acute and chronic (2). Animals infected with more than 10 000 L₃ of *H. contortus* develop hyperacute form and those who received 1000 larvae show a signs of chronic haemonchosis. In the acute form, sheep exhibit signs such as lethargy, lack of appetite, loss of bodyweight, thirst, pale mucous membranes, increased heart rate and breathing and sometimes diarrhea (2, 6, 9, 10). The signs of anasarca (submandibular oedema - "bottle jaw") are also observed in more severe conditions (11, 12).

MATERIAL AND METHODS

This experiment has been previously approved by Bulgarian Food Safety Agency (license №107). Keeping the animals was according to the requirements of Bulgarian legislation. The study included 18 lambs divided into 3 groups (G1, G2 and G3), each consisting of 6 animals. Before starting of experiment, the lambs were vaccinated against clostridial infections (Coglavax®, 2 ml per animal, twice, subcutaneously), muscular dystrophy (Bioselet E®, 1.5-2 ml per animal, intramuscularly, 3 consecutive days) and ectoparasitoses (Neostomosan®). Prior inoculation, all animals were treated against gastrointestinal nematodes

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(including strongylids) with 10% Vermitan® (1ml/10 kg, per os). After treatment, the lambs were examined twice (10th and 20th day) for presence of infection with helminths by flotation and sedimentation methods. Animals from each group were kept separately under conditions which prevent further infection. The lambs from G1 and G2 were infected with 6000 and 4000 third stage larvae of *H. contortus* (L₃) and those of G3 served as a negative control. Inoculation of the two treatment groups was performed orally. Clinical manifestation, bodyweight changes and egg excretion were observed in dynamics for 77 days. Eggs per gram feces (EPG) were done by McMaster technique.

Statistical analysis of the data was achieved by Microsoft Excel Tool Pack® (Descriptive statistics). Unpaired t-test was used for comparison of results between experimental and control groups. For statistically significant differences we accepted those in which p-value is less than 0.05.

RESULTS

The results showed that the first symptoms of the disease have appeared at 21st day post inoculation (DPI) and were most pronounced at 35th DPI in G2 and 49th in G1. After this period some of the signs gradually disappeared and general condition improved at the end of experiment. The animals from G1 showed weakness, lethargy, lack of appetite, thirst, increased heart rate and breathing, pale conjunctiva and gingiva (**Figure 1 and 2**) and mushy stools (but not diarrhea). The submandibular and cervical oedema was observed only in two lambs (**Figure 3**). Similar symptoms were noticed in animals from G2 which also showed a bad general condition, but there were no changes in fecal consistency.



Figure 1. Pale conjunctiva in a lamb infected with *H. contortus*.



Figure 2. Pale gingiva in a lamb infected with *H. contortus*.



Figure 3. Submandibular and cervical oedema in a lamb infected with *H. contortus*.

Submandibular oedema has also not been observed. The color of conjunctiva ranged from pale-pink to pale. The animals in control group showed no signs of illness during all the weeks of the test period. We found no negative growth in G1 and G2 but bodyweight loss was seen compared to the control group. **Figure 4** shows no noticeable difference in growth between the three groups up to 35th DPI. We observed a clear tendency to increase bodyweight for all animals. However, clear differences occurred between 42th and 77th DPI in G1 ($p < 0.05$) compared to G3. Statistically significant difference was not observed in G2 compared to G3, and also between the G1 and G2. The differences were most significant compared to initial values at day 0 (zero) where a clear tendency to gain bodyweight in G1 was seen from 56th to 77th DPI ($p < 0.01$), while those in G2 - from 21th to 77th DPI ($p < 0.01$). We calculated that for 77 days a total growth in animals compared to baseline was 6.06 kg in G1 and 8.04 kg in G2 which means an weight gain of 23.78% in G1 and 29.33% in G2. It was also indicative that loss of bodyweight in G1 and G2 was 14.84% (4.44 kg) and 8.39% (2.51 kg) compared to G3 at

77th DPI. Along with the changes of bodyweight, we also observed an egg shedding in infected animals (**Figure 5**). Prepatent period started between 18th and 19th DPI. Statistically significant differences between the two groups was found between 35th and 77th DPI ($p < 0.01$). The highest levels of egg per

gram feces was noticed at 49th DPI in G1 (10 290 eggs) and 42th DPI in G2 (5618 eggs) and then the number of eggs declined and at 77th DPI reached 5575 egg per gram in G1 and 2250 in G2.

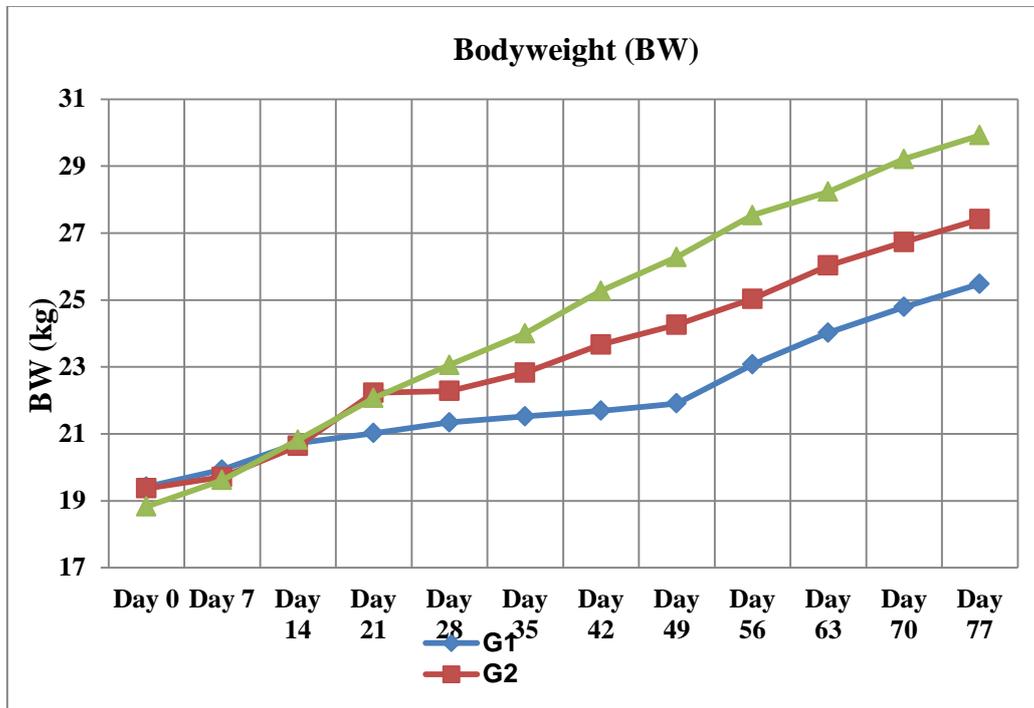


Figure 4. Dynamics in the values of bodyweight in experimental infection by *H. contortus* in lambs.

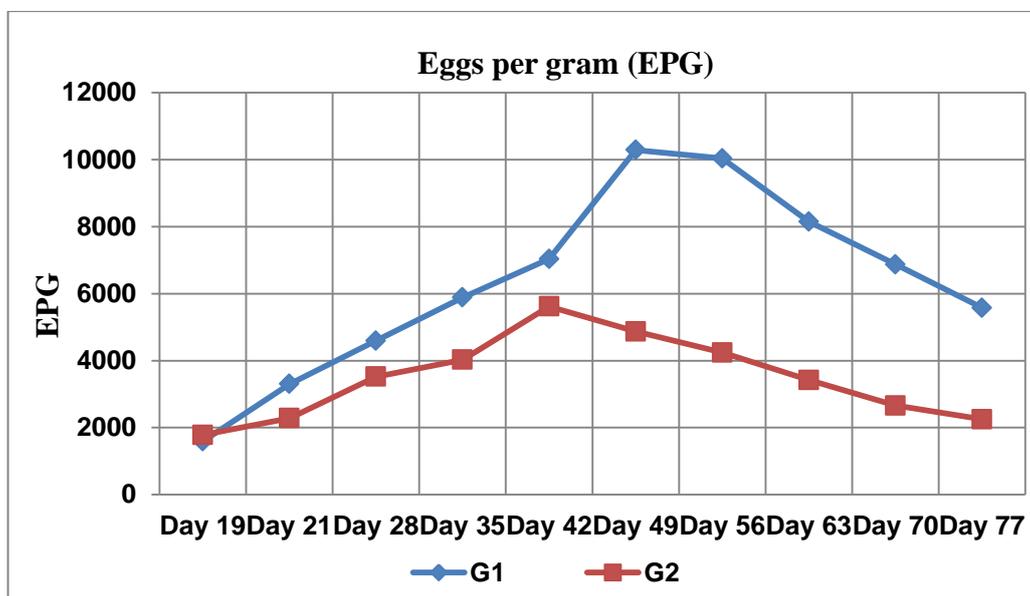


Figure 5. Dynamics in the levels of eggs per gram feces in experimental infection by *H. contortus* in lambs

DISCUSSION

The results of our study clearly showed that *H. contortus* infection in lambs causes significant variations in the homeostasis of hosts which clinically manifested mainly by signs of anemia. It is clear that infection dose plays a crucial role to clinical manifestation and

severity of clinical signs of the disease. According to Soulsby (2), the development of haemonchosis is a direct reflection of infective dose. In this study we infected the lambs with 4000 and 6000 L₃ and it caused an acute form of haemonchosis. This is in agreement with the reports of Rahman et al. (13) who found that

10 000 *H. contortus* L₃ lead to hyperacute form, and 1000 L₃ cause a chronic development of disease. Our results fully corresponds with data from studies of Georgieva et al. (9), Soulsby (2), Taylor et al. (12), Miller et al., (10), Angulo-Cubillan et al. (6), Ameen et al. (14) and Bowman (12). The authors established that the most often clinical signs of acute haemonchosis are weakness, lethargy, lack of appetite, thirst, rapid and shallow breathing, pale mucous membranes and diarrhea. According to our results, the clinical signs started at 21st day after infection and were most pronounced about 35th day in G2 and 49th day in G1, coinciding with the largest rise in egg excretion (**Figure 5**).

Infection with *H. contortus* negatively affects the growth of young animals. According to Georgieva et al. (9), the loss in bodyweight of lambs infected with 2500 and 5000 larvae leads to growth retardation and losses amounted to 4 kg and 5 kg, respectively. We noticed a delaying growth in both infected groups compared to the control which was better expressed in G1, likely due to the higher infective dose which corresponds with the results of the authors. Kelkele et al. (7) inoculated three groups of lambs with 2000, 4000 and 6000 *H. contortus* L₃ and established a loss of bodyweight amounted to 3.77 kg, 3.41 kg and 6.44 kg, respectively for a period of 91 days. Lambs received the highest dose larvae have shown the most reduction in bodyweight. According to our result, animals from G1 (6 000 larvae) showed weaker growth and difference in bodyweight at 77th DPI was 6.06 kg compared to baseline. This value in G2 was 8.04 kg. The losses in infected groups compared to the control group were 4.44 kg and 2.51 kg, respectively. Abakar et al. (15) cited several previous reports and summarized that the infection in sheep by 3000 and 20 000 larvae leads to a loss of 1.5 kg and 2 kg. Reduced productivity is likely to be due to loss of appetite and nutrients through the gastrointestinal tract, disorders in the resorption of macronutrients, vitamins, minerals and other vital elements. Small differences in the data between our investigation and results reported of the authors cited above are probably due to the breed of sheep, age, gender, reactivity of immune system, degree of infection, diet and level of feed and probably much more.

CONCLUSION

H. contortus is one of the most pathogenic helminths belonging to gastrointestinal strongylids affected sheep. Prepatent period is

short and begin at 18th – 19th after infection. Clinical signs include mainly weakness, lethargy, lack of appetite, thirst, increased heart rate and breathing, pale mucous membranes and mushy stools. Those signs starts at 21st day and are most pronounced between 35th - 49th day after infection which depends on infective dose. *H. contortus* infection negatively affects the growth of lambs and leads to loss of bodyweight. The severity of clinical signs coincides with the peak in egg shedding.

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