The Bronchopulmonary Strongylats in Goats of Elbasan District

Veterinary Medicine

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Abstract

The coprological examinations for the prevalence, identification of lungworm species and determinant factors associated with lungworm infection in goats at Elbasani district, were carried out from October 2011 to May 2013. The number of investigated animals was 109 goats and 37 remote goats. In our study we have recorded five lungworm species which are: Dictyocaulus filaria, Muellerius capillaris, Cystocaulus ocreatus, Protostrongylus rufescens and Neostrongylus linearis. The parasitological profile of protostrongylid species in the areas was represented by Muellerius (11.92 - 13.5%), Cystocaulus (9.2 - 2.7%), Protostrongylus (6.42 - 8.1%) and the Neostrongylus was about non-existent (less than 1%) in the region. The Dictyocaulus filaria infection does not appear to be a serious problem in goats of Elbasan region. The infestation rates of Cerrik and Elbasan areaa for worm burdens in goats were three to five, recorded in autumn, and the average was 30% and 50%, this in contrast compare with the larvae of these lungworms in Librazhd and Gramsh districts (low). This infestation is not widespread to levels likely to be considered as an economic significance. For researchers interested in the diagnosis of lungworm infestation the method of fecal examination is simple, rapid, economical and feasible for the results. The heaviest infection by adult worms, crossinfections and the highest larval excretion were observed in autumn and spring when mollusks were heavily infected. In this region the output of first stage larvae (L1) of lungworms were significantly higher in sheep than in goats, thus goats may play a greater role in pasture contamination.

1. Introduction

The bronchopulmonary strongyliosis is among the main causes that affect reduction of goats' productivity. Based on the data from the Directory of Agriculture in the district of Elbasan the number of goat head was an important indicator in livestock products. Considering the geophysical characteristics of the area it is of great important in the districts of Librazhdi and Gramshi, however it is to be taken into consideration even for the districts of Elbasan and Cerrik. The samples were gathered and examined during autumn and spring when parasitism of *Bronchopulmonary strongyliosis* culminates in goats. Parasitological examinations were carried out at the Veterinary Laboratory of Elbasan with the assistance and collaboration of the laboratory of parasitology, Faculty of Veterinary Medicine, Tirana/ Albania. The control included 8 goats females, 2 for district. Farm was considered any community of goats with a minimum of 50 animals. All the females included in the study were categorized as hilly-mountainous. This was due to the fact that goats of this district are bred in hilly mountainous regions for geophysical

reasons. The total number included 146 goats which underwent the parasitological differentiating diagnosis, out of which 109 goats and 37 remote goats to be substituted 6 months old up to 1 year old.

The highest level of infestation in goat flocks with *Dictyocaulus filarial* is reached at the end of spring by preserving a certain level depending on dehelmyntic treatments which are preserved at the same level even during autumn. Related with protostrongylus have highest level of infestation during autumn and winter (Bradford. P, 2002). The lambs and remote goats born at the beginning of the year result copropositive for *Dictyocaulus filaria* at the end of spring, whereas for protostrongylids at the end of summer and beginning of autumn. Thus we are of the opinion that the best period for parasitological diagnosis to have the highest indices and be closer to the reality of copropositivity for all the nematodes of the lungs is the end of October and the beginning of November (Kassai T, 1999). Fecal examination was performed while fresh, thus they were directly extracted from the rectum (Zajac. A.M, 1994). The feces were taken and kept in plastic boxes whose lids were well isolated (Kassai. T, 1999; Gjoni N, *et al*., 2012). The autumn dehelminth treatment had not been performed yet in the herds where the samples were taken (Bizhga B, *et al*., 2011). The qualitative and quantitative examinations for each individual were carried out through Baerman technique. Prevalence of the epidemiological model was estimated 10%, the margin of error 5% and the credibility coefficient 95%. The study took into consideration the fact that the degree and intensity of infestation might be defined, were we controlled more than 10% of the animals representatives (Kassai. T, 1999).

2. Method of the study

Area of Study: The district of Elbasan lies in the central area of Albania (20°05'24,0"E, 41°06' 16,6"N). The study area is made up of the districts of Elbasan, Cerrik, Gramsh and Librazhd. The district of Elbasan has an area of 1481 km^2. It lies in the center of Albania and is bordered as follows: in the northwest by the district of Tirana, in northeast and east by the district of Librazhdi, in southeast by the district Gramshi, in the south by the districts of Berati and Kuçova and in southwest by the district of Lushnja. It lies in the field with the same name on the right side of the middle stream of the Shkumbini River, at an altitude of 120m. It is a field district, partly hilly mountainous. The average altitude is 440m and the highest peak is the mountain of Jeronishti (1883m). The mountains are in northeast, east and southeast (such as Labinot and Shpati).

The district of Librazhd has an area of 1013 km^2. It lies on the eastern part of Middle Albania and is bordered as follows: in the east with Macedonia at an altitude of 42 km, in the southeast by the district of Pogradec; in the south by the district of Gramsh, in the north by the district of Peshkopi and Bulqize and in the west by the district of Elbasan. It is a mountainous district. Average altitude above the sea level is 1049 m. Its relief highlights the valley of upper Shkumbini that goes across the district from southeast to northwest. On the right lies the Shebenik ridge and parallel to it on the east Jablanice-Belice ridge. On the left of the valley there is the mountain of Polis and on the north Çermenika highland. The mountains occupy 54.1% of the

surface. Maximal altitude is the mountain of Shebeniku (2253 m).

The district of Peqin has an area of 140 km^2 and a population of 36.897 inhabitants. It lies in the center of Middle Albania and is bordered by the district of Tirana in the north, the district of Lushnja in the south, the district of Elbasan in the east and the district of Kavaja in the west. It is crossed by the Shkumbin and is situated along this river thus dividing it in two parts: the northern part and the southern one. Height above the sea level varies from 50-200 m, whereas a higher peak might be Galushi at a height 756 m above the sea level.

The district of Gramsh has an area of 695 km2. It lien on the southwest of the district of Elbasan and is bordered by it on the northern part, by Librazhd in northeast, Pogradec in the east, Korça in the southeast, Skrapari on the south, Kuçova and Berati in the west and southwest. It is a hilly mountainous district. There is no altitude up to 100 m. the average altitude of the district is 804 m.

The climate in Elbasan County is Mediterranean with mild winter and hot summer. Rainfall mainly occurs in winter and autumn with an average of 1490 mm per year. Average annual temperature is 15.4°C. As far as the relive is concerned 38% is made up by mountains, 28% fields and 34% hills.

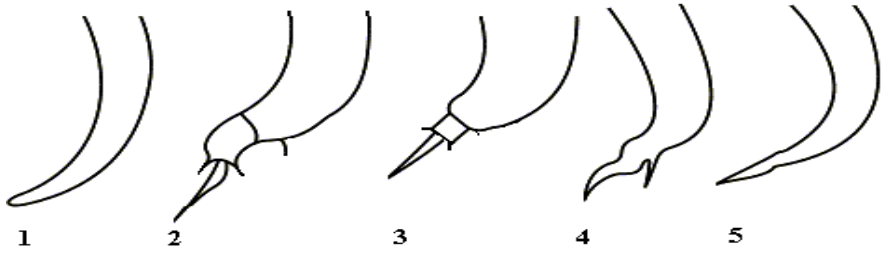
Animals that underwent the study and their management: For each district were controlled two goat herds. The coprological examinations were carried out in autumn and spring while it is the highest level of infestation from *Bronchopulmonary strongylats*. All the goat herds that are bred in this county are kept under an extensive regime (Gjoni. N, *et al.*, 2012).

Study Design and Sampling Method: Qualitative and quantitative examinations for each individual were performed through the Baerman technique. This method was used to collect the larvae of the nematodes found in the feces (Zajac. A.M, 1994). The following larvae are identified in this way: *Dictyocaulus* spp., *Muellerius* spp., *Cystocaulus* spp., *Protostrongylus* spp., (Bizhga. B, 2013). To find the larvae of dyctiocaulus and protostrongylus the fecal material was examined while fresh and no later than 5-6 hours after being taken from the rectum. This was done to avoid the birth of larvae by the eggs of gastro-intestinal strongilates which would hinder their differentiation.

Using the method (Zajak. A.M, 1994; Sloss. M, *et al*., 1994; Kassai. T, 1999; Bowman. D.D, 1999) - the basis of the technique is the larvae that like waters and due to their gravity they go at the end of liquids. In this way, the Baermann method is used with different modifications (Urquhart, G.M, 1996; Gjoni N, *et al.*, 2012), 10 gr feces were put on the sieve of the funnel where lukewarm water was added until the sample was covered totally and left undisturbed for 24 hours. The pin sealing the plastic tube was carefully opened keeping 10 ml per each sample from the end of the test tube, as it contained the larvae found in the feces. This 10 ml sediment was added 2-3 drops of iodine solution (10 gr methyl iodine dissolved in 100 ml solution 50 % of potassium iodine) which not only fixed the larvae but made them more visible because of the brown color. This method might also discover the presence of single larvae in the fecal material. This sediment was observed differently - in petri plates, directly spread on the slide etc. In case 1-2 drops were put in the slide and then covered with another slide and then observed in the microscope magnified

12.5 x 10 and 12.5 x 40. To enable counting 10 ml sediment after centrifuging 6 ml were taken by the end of the sediment. Then 0.15cc was taken to count the larvae. Simple calculation shows that the number ***n*** of the larvae found on the slide corresponds to 1/40 part of the total volume of the sediment by 6 cc (6; 0.15 = 40). Total quantity of larvae in 6 cc sediment was found by multiplying the number obtained from 0.15 x 40. To calculate the larvae found in 1 gr feces this number was divided by 10.

Identification of species of bronchopulmonary strongylats was done through morphological differentiating key. Differentiation between the larvae *Dictyocaulus filaria* and protostrongilides was done under a microscope (Tasan. E, *et al*., 1997; Taylor. M.A, *et al*., 2007).). They may simultaneously parasitize the same individual and this differentiation was not difficult when the larvae of protostrongilides are small, clear and without the apical tip. Differentiation among different kinds of protostrongilides was carried out based on the peculiarities of the distal part of larvae tail. (Van Wyk *et al*., 2004; Gjoni N, *et al.*, 2012).



1: *Dictyocaulus filaria* 2: *Cystocaulus ocreatus* 3: *Neostrongylus linearis*
4: *Muellerius capillaris* 5: *Protostrongylus rufescence*

Figure nr.1: Larvae tag during the first stage (L1) of the bronchopulmonary strongylats.

1. Examination results and their discussion

Area	Farm	nr. head	sampled	Protostrongylus		Muellerius		Cysto caulus		Neostro ngylus		Total Protostrongyl		Dictyo caulus	
				nr	%	nr	%	nr	%	nr	%	nr	%	nr	%
Elbasan	1	103	11	1	9.1	2	18.2	1	9.1	0	0	4	36.3	3	27.2
Elbasan	2	141	15	1	6.7	3	20	1	6.7	0	0	5	33.3	5	33.3
Cerrik	1	156	16	1	6.25	3	18.75	1	6.3	0	0	5	31.25	6	37.5
Cerrik	2	98	10	1	10	2	20	1	10	1	10	5	50	5	26.3
Gramsh	1	92	10	1	10	1	10	2	20	0	0	4	40	3	30
Gramsh	2	121	13	0	0	0	0	1	10	0	0	1	10	4	40
Librazhd	1	176	18	1	5.55	1	5.55	2	11	0	0	4	22.2	5	27.8
Librazhd	2	151	16	1	6.25	1	6.25	1	6.3	0	0	3	18.7	5	31.3
	Total	1038	109	7	6.42	13	11.9	10	9.2	1	1	31	28.4	36	33

Table Nr. 1. Results of coprological examinations in goats.

Results showed that a total of 100% of the goat herds and the ones to be substituted resulted infested by bronchopulmonary strongilats. Comparative values resulted higher than sheep of the same area. From 1038 goats were checked 109 animals and 31 of them or 28.44 % resulted positive for the representatives of Prostrongyloidea family. Specifically *Muellerius capillaris* 13

animals positive (11.92%), *Cystocaulus nigrescens* 10 animals positive (9.2%), *Protostrongylus rufescens* 7 goats positive (6.42%) and *Neostrongylus linearis* 1 animal positive (0.9 %). The *Dictyocaulus filaria* had 36 goats positive (33%). The 100% of the controlled herds resulted positive for both families of bronchopulmonary strongylats. From 36 goats, 18 of them resulted positive (50%) were identified simultaneously with parasite representatives of both families of bronchopulmonary strongylats. There are a lot of distinct variations among districts of the county. The district of Cerrik results with the highest level of infestation for both categories of bronchopulmonary strongylats, followed by the district of Elbasan, while the lowest level of infestation is observed at the district of Librazhd and Gramsh. Climatic conditions which directly influence the biology of parasites are the main cause of the variations of infestation prevalence among districts (Schneider. T, 2000). The 100% of the controlled herds resulted positive for both families of bronchopulmonary strongylats (Gjoni N, *et al*., 2012). From 27 goats, were identified positive 11 goats or 40.7% in simultaneously for both families of parasitic representatives of bronchopulmonary strongylats. The *Muellerius capillaris* results the most widespread representative of the Prostrongyloidae family in goats of Elbasan county. *Neostrongylus linearis* was observed only in 0.9% of the examined goats.

Area	Farm	nr. animals	sampled	Protostrongylus		Muellerius		Cystocaulus		Neostrongylus		Protostrongylidae		Dictyocaulidae	
				nr	%	nr	%	nr	%	nr	%	nr	%	nr	%
Elbasan	1	29	4	1	25	1	25	0	0	0	0	2	50	1	25
Elbasan	2	44	6	0	0	1	16.7	0	0	0	0	1	16.7	2	33.4
Cerrik	1	48	5	0	0	1	20	0	0	0	0	1	20	1	20
Cerrik	2	21	4	0	0	0	0	1	25	0	0	1	25	1	25
Gramsh	1	18	3	0	0	0	0	0	0	0	0	0	0	1	25
Gramsh	2	24	5	0	0	1	20	0	0	0	0	1	20	2	40
Librazhd	1	37	4	1	25	0	0	0	0	0	0	1	25	1	25
Librazhd	2	36	6	1	16.7	1	16.7	0	0	0	0	2	33.4	1	16.7
	Total	**257**	**37**	**3**	**8.1**	**5**	**13.5**	**1**	**2.7**	**0**	**0**	**9**	**24.3**	**11**	**29.7**

Table Nr. 2. Results of coprological examinations in goats to be substituted.

In the goat premises (6 months up to 1 year old) in Elbasan district there was a low level of infestation by bronchopulmonary strongilats compared to adult animals, even in the cases when this infestation appeared in autumn because in spring the examined animals resulted negative. In 7 out of herds to be substituted (87.5%) had strongylats representatives Prostongyloidae family. The positive herds identified 5 cases of *Muellerius capillaris* (13.5%), in 3 samples *Protostrongylus rufescens* (13.5%) and only one sample (2.7%) resulted infested by *Cystocaulus nigrescens*. *Neostrongylus linearis* was never found in these herds. A total of 9 individuals (24.3%) resulted infested by the family of Prostrongyloidea. During the spring of the first year of life, goat premises resulted 100% free from infestation by representatives of Protostrongylidae family. *Dictyocaulus filarial* was found present in 8 herds (100%) of goats to be substituted in the whole county. This infestation was during autumn. However infestation hints started since May- June (5-6 months old). A total of 11 head resulted positive (29.7% of the total of examined head). Remote goats resulted infested by dyctocaulides compared with prostrongylides and presents the same trend for both families and with the adult animals. The composition of gastrointestinal strongylats species despite the quantitative variations resulted to be diverse in the area of study. The highest frequency in goats resulted *Muellerius capillaris* with 11.92. The same parasite was the most widespread

representative in goats to be substituted. In the second place for goats infestation with 9.2% resulted protostrongyli *Cystocaulus nigrescens*, while at a lower value (2.7%) it does not preserve the same place for the infestation level of the protostrongylides in goat premises (Khajuria JK, *et al*., 2003).

The *Protostrongylus rufescens* with 6.42% in goats ranks in the third place. This ratio is not broken in goats to be substituted where *Protostrongylus rufescens* results the second most widespread protostrongyli with 8.1%. *Dictyocaulus filaria* with 33% in goats results the most widespread bronchopulmonary strongylat, but the number of larvae per gram feces resulted generally low (Addis M, *et al*., 2011). Only in autumn resulted maximally 4-5 larvae-g-f a number which needs to be taken into consideration, however as per authors of the field does not influence the product that derives from goats. In the goats were found five kinds of bronchopulmonary strongylates. Four kinds were identified in the premises of goats to be substituted, but there was no sign of *Neostrongylus linearis* (Tab. nr. 2). In our opinion the low prevalence of *Neostrongylus linearis* is mostly related to the presence or insufficient population of snails that serve as specific intermediary hosts for this species. The considerable height above sea level does not allow for sufficient conditions of growth for the intermediary hosts.

It must be noted that identification of protostrongyloid species in goats especially in their premises is of great importance only for the identification of parasite species, because the peculiarities and values that they cause they are less harmful than compared to *Dictyocaulus filaria*. It is also difficult to talk about sensitivity of the representatives of the Prostongyloidae family to different antihelminthic medicaments.

Making a comparative assessment with the level of infestation in sheep in these areas the level of goats' infestation resulted to be considerably lower.

The reasons that cause the changes are several among which it is worth mentioning the field and hilly area where sheep of this area are mainly bred favors the best conditions for the biology of bronchopulmonary strongylats and intermediary hosts. There are a lot of places with humidity and shadow which are enabled by the oak area and a lot of plains which are beaten down by the sun thus favoring the ideal conditions for the intermediary hosts especially in spring and autumn (Dawit W, *et al*., 2012). Compared to goats, sheep are bred only in mountainous areas where the atmospheric conditions do not offer optimal conditions especially for the representatives of the Prostongyloidae family. By evaluating the data on the members of the Prostrongyloidae family we notice that *Muellerius capillaries* is on top of the list with 13 head positive (11.92%) of the controlled head, ranking second is *Cystocaulus nigrescens* 10 head positive (9.2% of the controlled head), ranking third was *Protostrongylus rufescens* 7 head positive (6.42% of the controlled head). From the members of Prostrongyloidae family *Neostrongylus linearis* resulted less prevailed as it was found only in 1 goat or 0.9 % of the controlled head. There were 4 kinds of the representatives of the Prostongyloidae family in kids: *Muellerius capillaries, Protstrongylus rufescens,Cystocaulus nigrescens*, and *Neostrongylus linearis* was not typical. From the representatives of the *Cystocaulus* genus based on the morphological evaluation we identified only the species *Cystocaulus nigrescens*. The total of this region shows that even lambs result infested

by representatives of the Prostongyloidae family compared to kids. The reason for this lack of equality in infestation relies on nutrition habits. Goats and kids are fed with leaves and this significantly reduces the potential for infestation. In the meantime sheep are fed with grass and the possibility of them being infested by bronchopulmonary strongylats is increased. The result showed an inherent difference which was really evident ($p<0.05$) between the category of goats (more than 1 year old) and the category of goats to be substituted (less than 1 year old).

The general level of infestation with Prostongyloidae family in goats, almost in any case resulted lower than the level of infestation by the representatives of the Dictyocaulidae family. This raises the interest to put into practice schemes of regular controls, dehelmintisation and profilaxy as the representatives of the Dictyocaulidae family might severely damage health and productivity in goats in case they are forgotten (Weldesenebet D, *et al*., 2012). This is worth particularly when summer and autumn have high temperatures and are accompanied by humidity.

The results obtained in ratios among species and the level of infestation is at the same level that studies from authors of the field offer. *Muellerius capillaris* and *Cystocaulus nigrescens* were found more often. *Protostrongylus rufescens* was found more rarely and really rarely, almost unimportant in goats was found *Neostrongylus linearis*.

In practically the differentiation of representatives among Prostongyloidae family and *Dictyocaulus filaria* is really important. Distinctions among these are really inherent and belong to biology, pathogenicity and sensitivity to antihelminth preparations (Borecka A, Gawor J, 1999). These changes are considerable and not only of veterinary interes, but also of great interest for goat productivity (Gjoni N, *et al*., 2012).

3. Conclusions

The 100% of the goat herds resulted infested by bronchopulmonary strongylats. The prevalence of infestation by protstrongylides in goats resulted 28.44%, whereas by dyctiocaulides 33%. In goats of Elbasan district parasitized 5 kinds of bronchopulmonary strongylats, specifically: *Dictyocaulus filaria, Muellerius capillaris, Cystocaulus nigrescens, Protostrongylus rufescens* and *Neostrongylus linearis.* Species composition in goats resulted based on the level of infestation. The results were as follows: 11.92% with *Muellerius capillaries,* 9.2%, with *Cystocaulus nigrescens*, 6.42% with *Protostrongylus rufescens* and 0.9 % with *Neostrongylus linearis*. The prevalence of infestation by Protstrongylides in goats to be substituted resulted 24.3% whereas by Dyctiocaulides 29.7%.

The highest frequency of protstrongylides in goats to be substituted was *Muellerius capillari*s with 13.5%, *Protostrongylus rufescens* 8.1%, *Cystocaulus nigrescens* with 2.7%, while there was no *Neostrongylus linearis.*

The results of the study evidenced the presence of a huge biological reserve of parasites in pasture and in animals serving as hosts, which under certain conditions might be transformed into a dangerous factor for the health and productivity of animals. The routine control in spring and

autumn and the application of routine dehelminthics schemes, especially when environmental conditions favor the increase of infestation level, might keep infestation at levels that do not damage productivity by goats.

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