

# The Aggression of the Nemathodes from the *Protostrongylidae* Family on the Pulmonary Tissue of the Black goat (*Rupicapra rupicapra*) and the Local Reactivity

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**SUMMARY.** The research has been conducted on two cases of the Black Goat species (*Rupicapra rupicapra*). The hunt's support state was precarious, of pronounced weakening. The general necropsical examination was followed by the morphopatological examination of the lungs, from which samples of tissue were drawn and processed through specific methods for the histopathological examination. The samples were sectioned at 5 µm, colored through the HEA, MGG, PAS methods, examined and microphotographed at MC5, with 10, ob. 10, 20, 40, and 63 oc. Imm. The histopathological examination of the pulmonary tissue revealed the brutal parasitary aggression on the pulmonary cells exercised by the nemathodes from the *Protostrongylidae* family (*Muellerius* genus) both in the larval stage, and as adults taking the form of "incubation nests". The local reactivity has been distinctively striking, characterized by the haemorrhages, micronecrosis, lymphohistiocitary infiltrations, "alveolar epithelialization", hyperplasia, and hypersecretia on bronchioles, macrophagy with massive sincitia in alveoli, smooth muscle hyperplasia and fibrosis. Parasitic bronchopneumonia similar to sheep is signalized for the first time on this species.

**Key words:** Hunt, Black goat (*Rupicapra rupicapra*), lungs, *Protostrongylidae*, aggression, local reactivity.

## Introduction

The study of the parasitosis in the wild animals for hunting, it is a necessary measure due to the demographic expansion, and to the development of modern agriculture, which has determined the narrowing of the wild animals' vital space. The territorial agglomerations of the hunt lead to the apparition and the perenization, affecting the domestic animals in these areas as well. The hunt constitutes a natural reservoir for parasites, contributing to the dissemination of the invasive elements and to the parasitary pollution of the pastures during feeding and passing on these surfaces. The parasitosis of the ruminant hunt and in this case, the pulmonary nematodosis, contribute at the expansion and the perenization of these diseases and through infesting the intermediary host-gasteropodes, existent in the

pastures areas. The incidence of the pulmonary nematodosis at the ruminant hunt in our country is variable: 11,4 % at the red stag, 22,3 % at the common stag, 54,1% at the deer and of 52,0% at the black goat, recording a death rate especially in the youth (5).

The purpose of this investigation is to reveal the aggression of the pulmonary nematodosis from the *Protostrongylidae* family over the pulmonary tissue at the black goat (*Rupicapra rupicapra*) and the local reactivity towards this aggression.

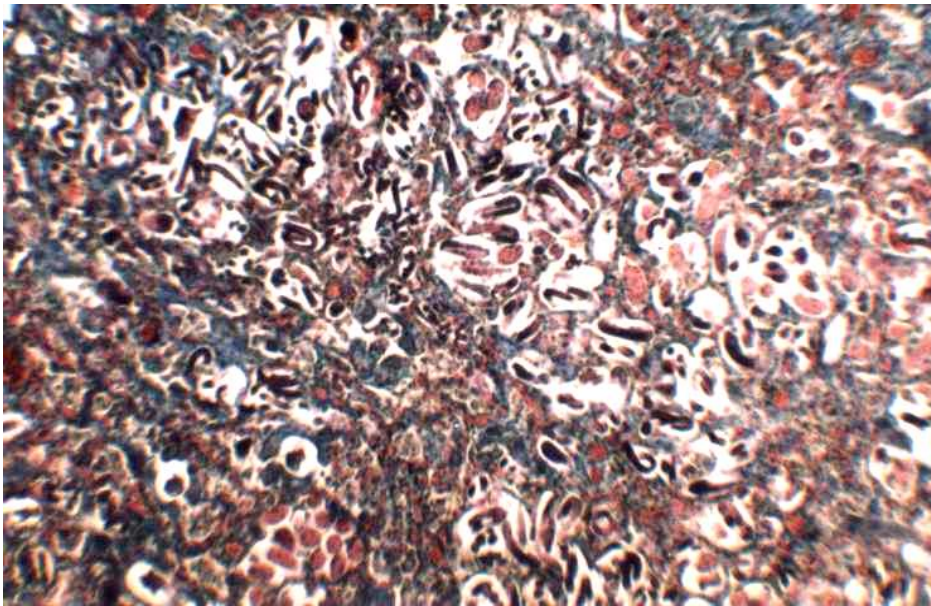
## Material and methods

There were conducted researches on two types of hunt, of the Black Goat species (*Rupicapra rupicapra*), succumbed due to the transportation stress. The maintenance state of the hunt was

precarious, with advanced weakening. After the general necropsy, it has been performed a morphopathological examination of the pulmones, of which we drawn samples of tissue and we processed them for the hystopathological examination. The samples were fixed in formol 10%, included in paraffin, sectioned at 5 µm and colored through the HEA, MGG, PAS methods. The examination and microphotography were accomplished at MC5 with oc. 10, ob. 10, 20, 40, and 63 immersion.

## Results and discussion

The aggression of the nematodes belonging to the family of *Protostrongylidae*, (*Muellerius* genus), over the pulmonary tissue hystopathologically examined, was ample and brutal, revealing a massive infestation (**fig. 1**).



**Figure 1**  
Black Goat. Lungs. Massive infestation of pulmonary alveoli.  
(MGG. col. oc. 10x ob. 6,5 )

The mechanisms of parasitary aggression were multiple and various, determined by the pre-invasive states (embrionated eggs) and invasive (hatched larvae) placed into cells (alveolar), and by the adult nematodes, placed in the lumen of the bronchioles. After the coupling, the female lays embrionated eggs in the pulmonary cells adjacent to the parasitized bronchiole (**fig. 2**).

The hatching of the stage I larvae takes place in the pulmonary tissue, constituting focuses with a circular aspect, of variable dimensions, in the center of which can be found the couple of adult nematodes. The parasitary focuses are known as "incubation nests" and are constituted of two embrionated eggs and hatched larvae

concentrically disposed around the couple of adult nematodes. To a couple of nematodes corresponds a pulmonary space around the central area of diaphragmatic lobes, so that the incubation nest is well defined and does not interfere with another (**fig. 3, 4**).

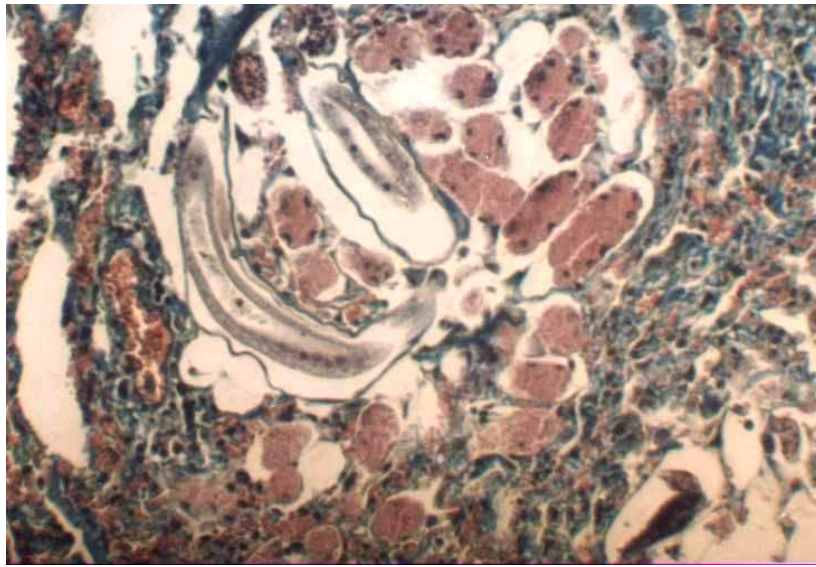
The mechanic aggressions and mostly, traumatic, irritative of the parasites over the alveolar cells and over the terminal bronchioles lead to the occlusion and the obstruction of the alveolar space, producing the destruction of the alveolar septa, hemorrhage, lymphohystocitary infiltration and edematosed (**fig. 5**). The hematophagic nematodes, induced a severe anemia to the parasitized exemplaries and a severe spoliation

of the plastic substances, vitamins, minerals, growth factors, that are necessary to the females in producing and laying the ponts.

The local reactivity was accentuated, triggering local defense mechanisms that tried to limit the parasitary aggression and its effects. There were lymphohystocitary infiltrations, hyperplasia and hypersecretion in the bronchioles induced by the

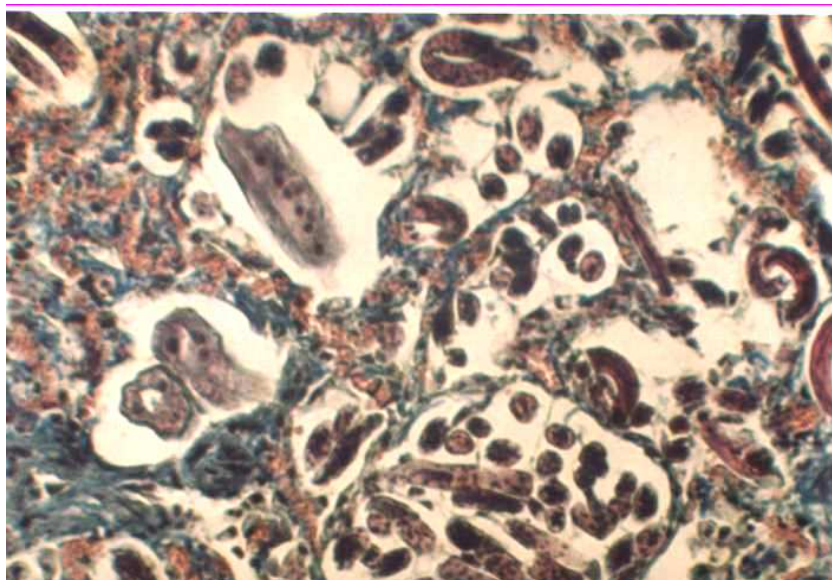
migrating larvae through the bronchic tree (**fig. 6**).

The alveolar epitelization and the prevention of gas exchanges have deteriorated the tissulary hypoxy followed by micronecrosis, hyperplasia of the flat muscles, macrophagy with massive sintia in the alveoli (**fig. 7, 8, 9**), fibrosis (**fig. 10**).



**Figure 2**

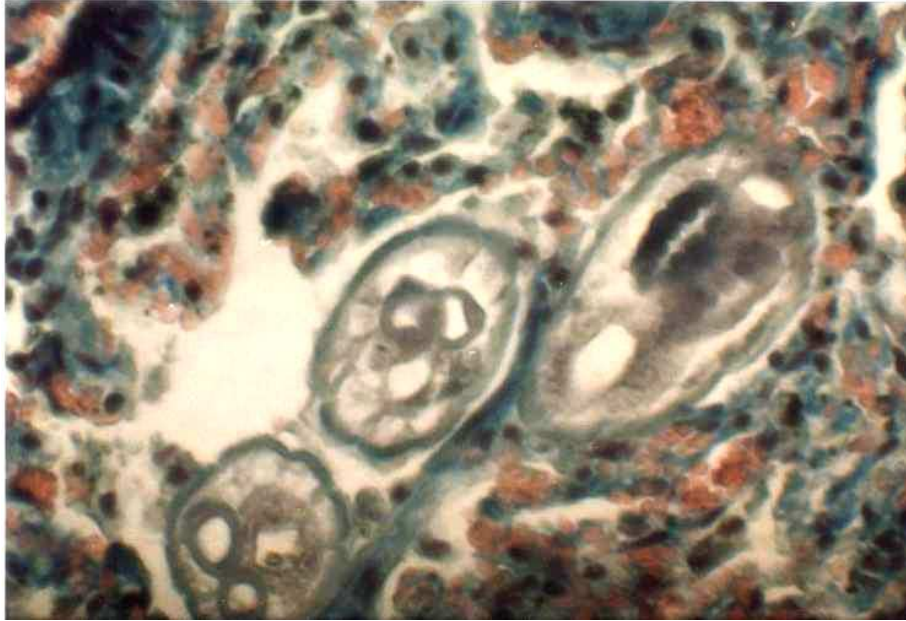
Black Goat. Lungs. „The incubation nest”. 1. Embrionated eggs. 2. Sectioned nematods (MGG. col. oc. 10x ob. 10)



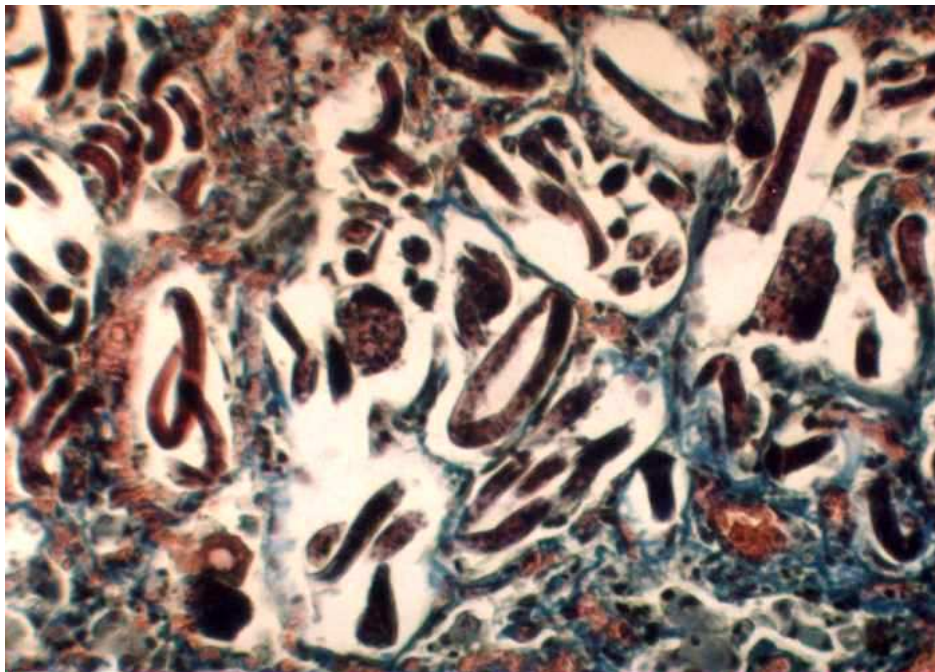
**Figure 3**

Black Goat. Lungs. Occupied and obstructed alveoli by eclosionated larvae. (MGG. col, oc. 10 x ob. 10)

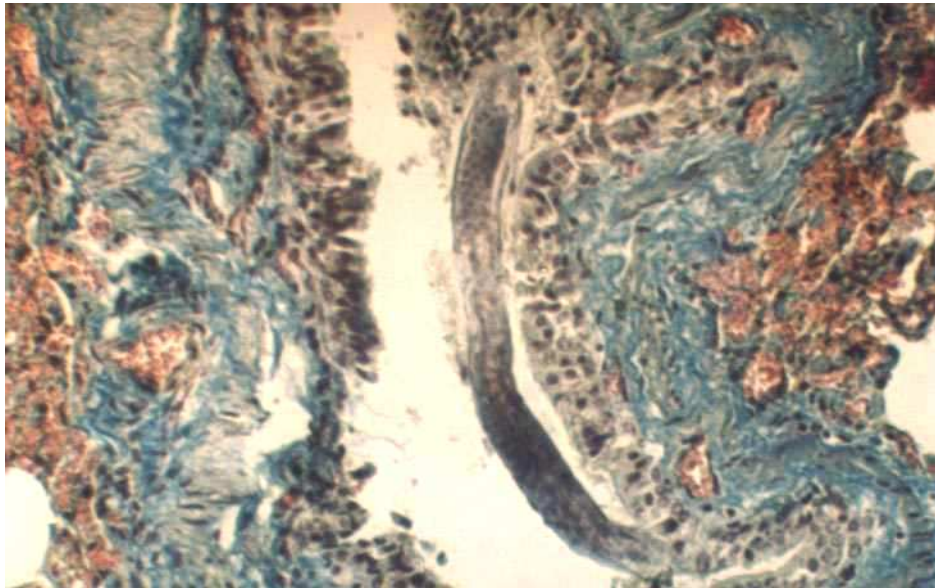




**Figure 4**  
Black Goat. Pulmonary tissue.  
1 Transversal section through body of couple adults nematods.  
(MGG. col. oc. 10 x ob. 20)

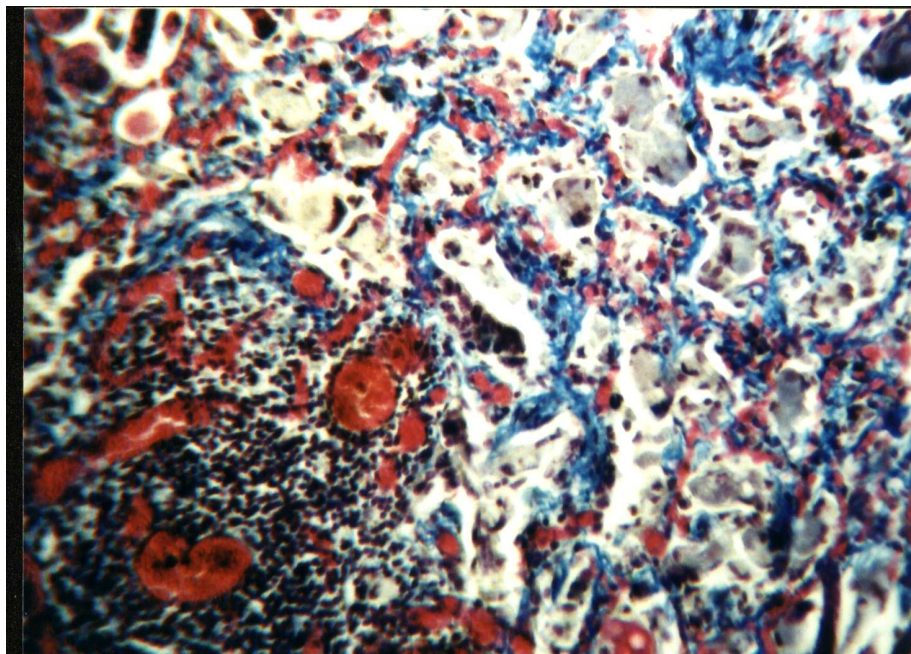


**Figure 5**  
Black Goat. Pulmonary tissue. Alveoli obstructed by crowded larvae. Alveolar septum destroyed, with haemorrhages, extravasation plasma and oedema  
(MGG. col, oc. 10 x ob. 20)



**Figure 6**

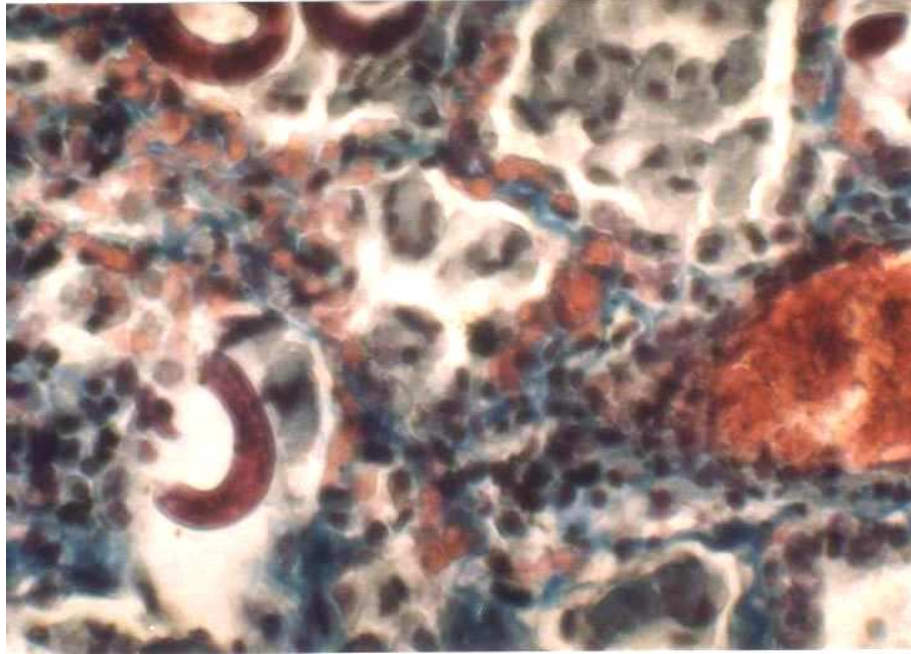
Black Goat. Pulmonary tissue 1. Bronchial lumen 2. L<sub>1</sub> larval stage by aerophore ways. 3. The atrophyies of bronchial mucsaa. 4. Hiperplasia of muscularis mucsae and conjunctif tissue. 5. Haemoragies and lymphohystiocitary infiltrate. (MGG. col. oc. 10. x ob. 20)



**Figure 7**

Black Goat. Pulmonary tissue.  
 1. The thickening and edema of alveolar septums. 2. Haemoragic infiltrate.  
 3. Lymphohystiocitar infiltrate. 4. Intraalveolar macrophages with sincitia at first. (MGG. col. oc. 10 x ob. 10.)

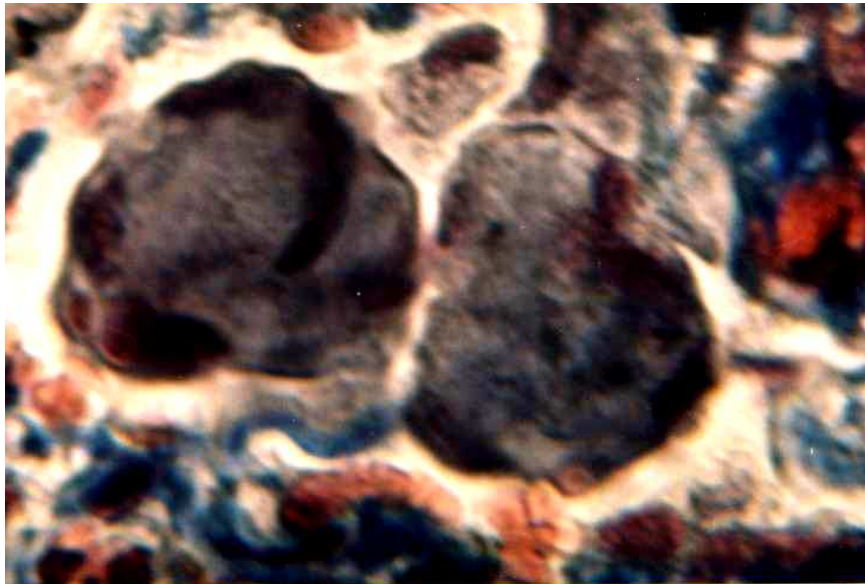




**Figure 8**

Black Goat. Pulmonary tissue.

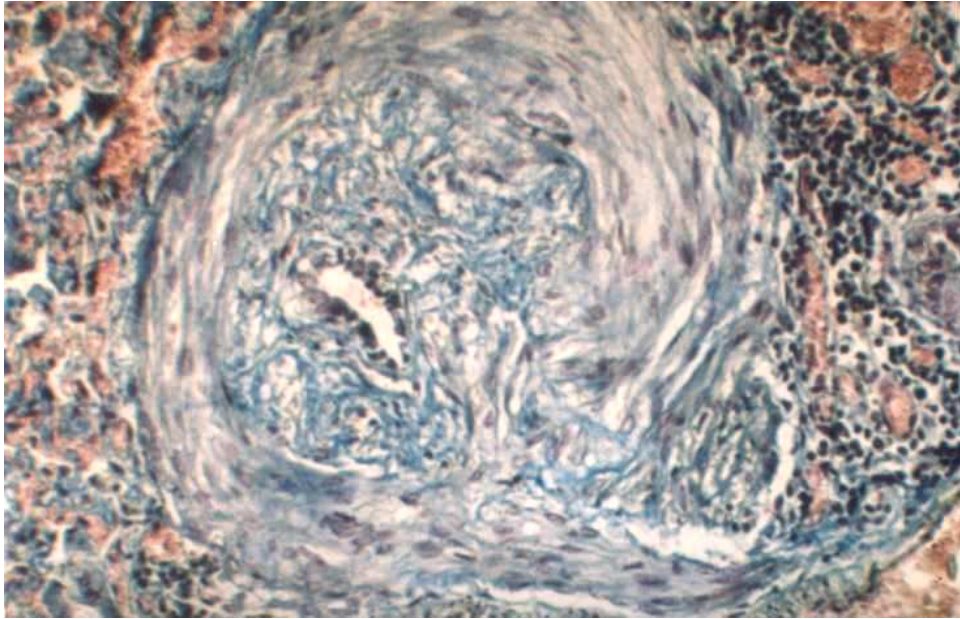
1. Alveoli in which we find crowded macrophages and syncytia .
  2. Alveoli with larvae and macrophages attached to the larval cuticula. 3.
  - Haemorrhages. 4. Lymphohistiocitar inflammatory infiltrate,
- (MGG. col. oc. 10 x ob. 20.)



**Figure 9**

Black Goat. Pulmonary tissue.

Multinuclear cells – macrophages in alveolus- Detail.  
(MGG. col  
Oc. 10x ob. 63 Imm)



**Figure 10**

Black Goat. Pulmonary tissue.

1. Peribronchiolar fibrosis
2. Bronchial occlusion.
3. Peribronchiolar lymphohistiocytary infiltrate.
4. Haemorrhagic infiltrate

(Col. MGG.

Oc. 10 x ob. 20)

The incidence of the infestation of the *Protostrongylidae* family nematodes on the Black Goat is estimated at 52%. The incriminated species are: *Protostrongylus rupicaprae* (21-41 mm x 0,21-0,25 mm), *Muellerius capillaris* (10-26 mm x 0,4-0,6 mm), *Neostrongylus linearis* (4-8 mm x 0,3-0,5 mm) *Cystocaulus ocreatus* (18-19 x 0,07-0,17 mm) (2, 3, 5, 6, 7).

The development cycle of these species is heteroxenous. The intermediary host is represented by gasteropodes of the genus: *Limax*, *Helix*, *Lymnea*, *Planorbis*, *Abida*, *Helicella*, *Monacha*, *Succinea*, that are developed on humid or dry soils (1, 5). The definitive host animals are eliminating through the faecals I stage larvae that reach the pasture and are actively getting inside the intermediary host-gasteropodes in which it grows for 22-90 days, until it reaches the infested capacity. In the body of the mollusks the larvae remain viable 1-2 years. The definitive hosts are infested digestively with the larval stages took along with the intermediary hosts or with the larvae released on the pasture (4, 5). the

migration of the larvae from the intestinal medium, through the vascular system, towards the pulmons, are bringing along bacteria and viruses with pulmonary tropism, which contributes to the appearance of the septic complications.

At the examined exemplaries, the hystopathological modifications reveal a long lasting, concertated aggression over the pulmonary tissue. The complex of the hystopathological modifications induced by the *Protostrongylidae* family nematodes, *Muellerius* genus, over the pulmonary tissue at the black goat and especially, to making evident the pulmonary reactivity, through the apparition of the giant cells with a strong sincitia character, that have been described for the first time at this species.

## Conclusions

The hystopathological examination of the black goat (*Rupicapra rupicapra*) pulmons has revealed a massive infestation of the pulmonary

tissue (terminal bronchioles and alveolar cells) with nematodes of the fam. *Protostrongylidae*.

The injuries have been characterized by concentrically assemblies of the preinvasive elements (embryonated eggs and hatched larvae) laid in the terminal bronchioles and alveolar cells, placed around a couple of adult nematodes, constituting "incubation nests" characteristic to the *Muellerius* genus.

The infestation was massive causing severe circulatory troubles, congestive, hemorrhage, edemas, tissulary destructions by regrouping the

alveolar septa, alveolitis, bronchitis, bronchiectasis and bronchopneumonia focuses.

The local reactivity has been characterized by the tissulary gathering of the eosinocytes, by limphohystocitary infiltration phenomena, tissulary hyperplasies and pre-bronchiolary fibrosis, the apparition of the macrophags in the alveolar cells with the attack of the larvary cuticulla, the formation of giant macrophagical sincitia in the alveolas, an aspect described for the first time at the Black Goat (*Rupicapra rupicapra*).

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