# *Oslerus osleri (Filaroides osleri)* – a new or unknown lung parasite for dogs in Bulgaria?

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**Abstract**

To date, there is no known evidence of a parasitic invasion of *Oslerus osleri* in Bulgaria, in contrast to its widespread use in incidence in the United States and Canada. Globalization and the free movement of humans and animals in the world are therefore predisposing factors for the spread of infections and invasions in different latitudes. After infection with *Oslerus osleri*, dogs show signs of tracheobronchitis accompanied by permanent cough and worsening of the general condition.

The aim of the study was to determine the age groups of the infected animals, to examine the effectiveness of three specific anthelmintic therapy schemes, and to establish a clinical protocol for testing dogs for *Oslerus osleri* as part of the differential diagnosis of tracheobronchitis.

***Key words:*** *Oslerus (Filaroides) osleri*, lung parasites, dogs

# *Oslerus osleri (Filaroides osleri)* – нов или неизвестен белодробен паразит за кучета в България?

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**Резюме**

Към днешна дата няма известни доказателства за паразитна инвазия с *Oslerus osleri* в България за разлика от широкото му разпространение в САЩ и Канада. Глобализацията и сво-

бодното движение на хора и животни в света са предразполагащи фактори за разпространението на празитните инвазии в различни географски ширини. След опаразитяване с *Oslerus osleri* кучетата показват признаци на трахеобронхит, придружени от постоянна кашлица и влошаване на общото състояние.

Целта на проучването е да се определят възрастовите групи на заразените животни, да се изследва ефективността на три специфични схеми за антихелминтна терапия и да се установи клиничен протокол за тестване на кучета за *Oslerus osleri* като част от диференциалната диагноза на трахеобронхит.

***Ключови думи:*** *Oslerus (Filaroides) osleri*, белодробни паразити, кучета

**Statement of novelty:**

For the first time we diagnosed *Oslerus osleri* in Bulgaria and examined the efficacy of Milbemycin therapy in pomeranas with *Oslerus osleri* invasion.

## Introduction

Osleriosis in dogs caused by *Oslerus osleri* is a parasitic disease that causes severe respiratory distress and is characterized by a prolonged cough, with no data yet on its diagnosis in Bulgaria. Worldwide, the most common Metastronylidae nematodes that lead to respiratory diseases are *Oslerus osleri, Crenosoma vulpis, Filaroides hirthi* and *Filaroides (Andersonstrongylus) milksi* (Sherding, 2004; Nelson & Sellon, 2005; Gonboy, 2009), with the highest frequency in dogs and cats *Oslerus (Filaroides) osleri* and *Aelurostrongylus abstrusus* are diagnosed (Philip, 2011).

*Oslerus osleri*, previously named as *Filaroides osleri*, is a nematode affecting domestic and wild canids, most commonly found in animals less than two years old (Streeter, 2007; Johnson, 2008; Verocai et al., 2013).

Despite the widespread prevalence of nematodes, there is still a lack of in-depth studies on the frequency and range of their spread (Taylor et al., 2016).

*Oslerus osleri* is a nematode 9 to 15 mm in length in females and about 5 mm in males, localizing in the tracheal mucosa and major bronchi, and forming nodules 2–20 mm in size in the *carina tracheae* (Sherding, 2004; Streeter, 2007; Johnson, 2008; Barr & Bowman, 2012) representing pink-gray granulomas containing the parasite (Taylor et al., 2016). Granulomas formation is observed 2 months after infection and is more common in young dogs (Denis et al., 2010). Nodule growth can lead to airway obstruction and is more characteristic of the so-called *toy breed* (Streeter, 2007).

The infection is alimentary, with the animals ingesting the invasive larva L1. In the digestive system, the larvae pass through the intestinal wall and through the blood and lymph reach the right atrium, and through the pulmonary capillaries reach the alveoli and actively complete their migration into the tracheobronchial tissue. The prepatent period is 10–21 weeks. The excreted eggs and larvae into the environment are the main ways of direct infection and this explains the easy spread of the disease, especially in kennels. Intrauterine transmission has not been found (Johnson 2008; Taylor 2016).

The clinical signs after infection with Oslerus osleri are nonspecific, because it manifests with cough (Conboy, 2009) and secretion expectoration, which is typical of tracheobronchitis, regardless of the etiology. Cough attacks occur after exercise (Taylor et al., 2016) or in cold weather, with the disease most severe in dogs between 6–12 months of age (Barr & Bowman, 2012). In pet dogs whose movement is restricted, the presence of tracheal nodules is well tolerated and the

animals show mild respiratory distress (Taylor et al., 2016).

The diagnosis is made by the detection of larvae in bronchial secretions, but the larvae can also be detected in fecal samples, flotation methods or Baermann coprolarvoscopy, as well as the use of pharyngeal secretion swabs (Lappin & Prestwood, 1988).

So far, there are no published results regarding the spread of this parasite in Bulgaria.

The aim of the study was to determine the age groups of the infected animals, to examine the effectiveness of three specific anthelmintic therapy schemes, and to establish a clinical protocol for testing dogs for Oslerus osleri as part of the differential diagnosis of tracheobronchitis.

## Material and methods

Studies were performed on 48 Pomeranian dogs, 3.1 ± 0.7 years old, bred in a kennel. Some of the animals are imported from abroad – Canada, USA, Russia, Belgium and others. The reason for the study was rapid cough and respiratory distress, and standard treatment regimens were ineffective.

In addition to the clinical examination, morphological and biochemical blood tests, thoracic radiography, abdominal ultrasound, helminthoscopy using the Fulleborn flotation method and helmintholarvoscopy by the modified Baermann method were also performed.

## Results

During the clinical examination, we found cough attacks, without any stridors. No deviations were found in the performed ultrasound, electrocardiographic and echocardiographic examinations.

The helminthoscopy was negative, but the helmintholarvoscopy was positive on twenty-nine samples, identifying the larvae of the nematode *Oslerus osleri* (fig. 1). The larvae were differentiated on the basis of characteristic features – long esophagus, S-shaped tail (fig. 2 and 3) and sizes between 250–350 μm (fig. 4).

The X-ray examination showed increasing of the opacity in the trachea and carina area. The major bronchi were not visualized (fig. 5).

The blood test of infected animals showed leukocytosis with granulocytosis, increased bilirubin T and D levels, increased ASAT enzyme activity.

The ultrasound, echocardiography and electrocardiogram showed no abnormalities in the normal functional state of the internal organs.

The drug treatment of the diseased animals was performed in three different regimens, with the dogs being divided into three groups according to their age, physiological and clinical status.

First group: treatment regimen (n = 10) – up to 1-year-old and pregnant animals, without changes in blood tests).

Milbemycin oxime (Milprazon tabl. 12.5 mg/25 mg) at a dose of 0.5 mg/kg PO, every 28 days; Amoxicillin 20% (Alfazan) at a dose of 10 mg/kg SC, 3 times every 48 hours; Dexamethasone 0.2% (Alfazan) at a dose of 0.5 mg/kg IM, 3 times every 48 hours.

Second group: treatment regimen (n = 10) – dogs over 1 year of age with impaired hepatic and renal function.

Fenbendazole 4.8 g (Panacur PetPaste 187.5 mg in 1 g) – 50 mg/kg PO, 5 consecutive days, Amoxicillin 20% (Alfazan) – 10 mg/kg SC, 3 times in 48 hours, Dexamethasone 0.2% (Alfazan) – 0.5 mg/kg IM, 3 times in 48 hours.

Third group: treatment regimen (n = 9) – dogs over 1 year of age with no abnormal liver function).

Ivermectin (Kepromec 10 mg/ml) – 0.4 mg/kg SC, 2 times in 14 days, Amoxicillin 20% (Alphazan) – 10 mg/kg SC, 3 times in 48 hours, Dexamethasone 0.2% (Alphazan) – 0,5 mg/kg IM, 3 times in 48 hours.

The efficacy of the therapy was monitored by studying the feces by the Baermann method for

five consecutive days at 48 hours after completion of the respective therapy.

Treatment efficacy in the first and second group was very high as no larvae were detected in the control studies. A significant reduction in cough intensity was found after day 4, and 10 days after treatment the cough disappeared completely. The fastest response to therapy was found in young animals.

In the third group, control coprolarvoscopic examination showed the presence of viable larvae in two of the animals after the first treatment. No larvae were detected after the second administration of Ivermectin. Subsequent control examination showed no larvae. Clinical improvement and reduction of coughing attacks were observed after the first administration of Ivermectin, but significant calming of the animals and management of respiratory distress was detected only after the second treatment.

One month after the end of treatment, control studies were performed in all three groups, which were negative. During the paraclinical studies we found no abnormalities in liver and kidney function except in the Ivermectin treated group. In this group, increased enzyme activity of hepatic transaminases was observed in six of the dogs, regardless of normal baseline values.

## Discussion

A number of protocols have been reported for the treatment of animals infected with *Oslerus osleri*, with the use of therapeutic anti-nematode agents *Diethylcarbamazine, Levamisole, Thiacetarsamide, Thiabendazole, Fenbendazole and Albendazole* showing different efficacy (Brownlee, 1990; Brayley & Ettinger, 1994; Levitan et al., 1996).

Taylor et al. (2016) report that treatment with benzimidazoles – *Fenbendazole or Albendazole*, is effective, but clinical signs disappear within 60 days due to a decrease in nodule size. Our results confirm these results with the use of *fenbendazole*, but the period of control of respiratory distress was shorter (after day 10), possibly due to the short disease period, slight nodular changes in the trachea and young age of the animals. Levitan et al. (1996) considered that the incorporation of corticosteroids (*Prednisolone*, 0.5 mg/kg, per os) in combination with benzimidazoles over a period of 10 to 30 days is effective and leads to cough and respiratory distress reduction, as well as suppression of the non-specific inflammatory response due to irritation, which is confirmed by our study.

Our literature so far lacks data on the duration and efficacy of treating Osleriosis in dogs with the macrocyclic lactone *Milbemycin oxime*. The regimen used with Milbemycine 0.5 mg/kg p.o. showed high effectiveness.

We believe that the effectiveness of the first two regimens is due to the combination of the specific anti-strongylide agent Fenbendazole or Milbemycine, the anti-inflammatory and anti-edema effect of corticosteroids (Dexamethasone) and the antimicrobial effect of Amoxicillin, which helps to reduce irritation at the tracheal area and improve the respiratory capacity.

The use of macrocyclic lactones (Ivermectin and Doramectin) has been investigated by various authors. Outerbridge & Taylor (1998) reported positive oral treatment results for 3 months at a dose of 0.3 mg/kg, whereas, according to other authors (Yao et al., 2011; Reagan & Aronsohn, 2012), subcutaneous administration of Ivermectin at a dose of 0.2 mg/kg for 60 days has a better therapeutic effect. In our opinion, twice daily administration of Ivermectin at a dose of 0.4 mg/kg at a 14-day interval is an effective treatment regimen since we did not find positive samples on day 21.

## Conclusions

The free movement of animals, as well as climate change, create favorable conditions for the spread of new parasitoses, which have not yet been established in the respective latitudes. The present study confirms the presence of the nematode specie *Oslerus osleri* in Bulgaria in pomeranians, most likely imported through the transport of animals during the prepatent period.

**Fig 1.** L1 larvae of the nematode *Oslerus osleri*
**Фиг. 1.** Ларва в стадий L1 на нематода *Oslerus osleri*

**Fig. 2.** Anterior end of *O. osleri*
**Фиг. 2.** Преден край на *O. osleri*

**Fig. 3.** Posterior end of *O. osleri*
**Фиг. 3.** Заден край на *O. osleri*

Based on the biological development of the parasite, the earliest diagnosis of the disease is possible at least 2.5 months after infection. Milbemycin oxime at a dose of 0.5 mg/kg p.o. is an effective treatment approach and can be used in pregnant and adolescent animals.

If epizootic cough in dogs is observed, invasion with *Oslerus osleri* should always be considered

Contribution RR, GM and NZ onceived and designed the review. RR, GM and BB executed

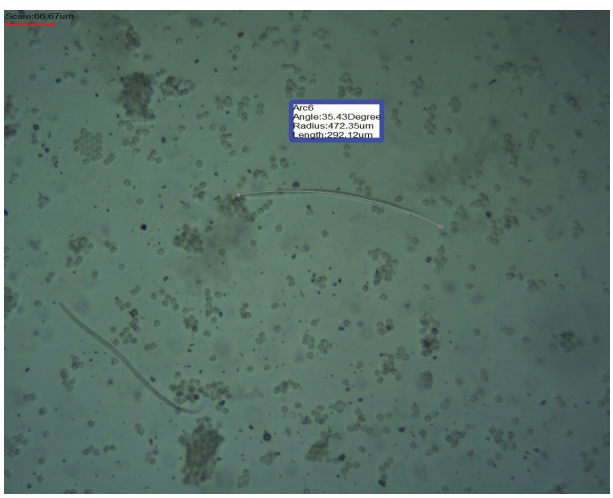


**Fig. 4.** Length of L1 larvae
**Фиг. 4.** Дължина на ларва L1

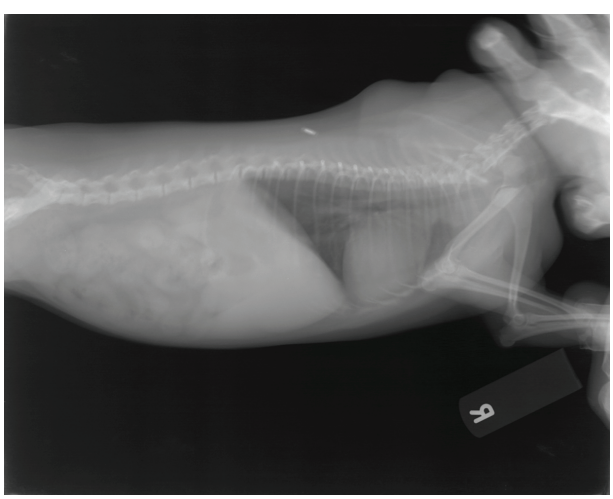

**Fig. 5.** X-ray examination of the thorax
**Фиг. 5.** Рентгенографско изследване на гръден кош

the examination and the treatment of the animals. RR and GM analyzed the samples. The X-ray examination were made by NZ and GM. All authors interpreted the data, critically revised the manuscript for important intellectual contents and approved the final version.

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