

DIROFILARIA REPENS – POTENTIAL DANGER TO HUMAN HEALTH

Aleksandar Tasic, Suzana Tasic, Natasa Miladinovic-Tasic, Dragan Zdravkovic and Jovana Djordjevic

Dirofilariases are zoonosis caused by the genus *Dirofilaria*. The common cause of this zoonosis is the species *Dirofilaria repens* (*D. repens*). This species is a natural parasite of dogs, but in the last years, in our country, sporadic cases of human dirofilariasis caused by *D. repens* have been described.

In dogs infected by *D. repens*, pathological and clinical changes are poorly expressed. This species of filariae resides in dogs and other canidae and felidae in the subcutaneous tissue, the space between tendons and blood vessels of legs, in kidneys and lymphatic nodes. In humans, it can be found in the eyes and subcutaneous tissue. Diagnosis of infection in dogs is based on anamnestic data, clinical signs and results of specific diagnostic tests for detection of microfilaria in peripheral blood. The therapy is aimed at destruction of adult forms and microfilariae. Mechanical or chemical methods and drugs can be used for profilactic measures for filariosis in dogs. With geographical spreading of infection in dogs caused by *D. repens*, more cases of human dirofilariasis can be expected. Therefore, continuous control and follow-up of the appearance and spreading of this infection in dogs must be priorities in public health protection. *Acta Medica Medianae* 2007;46(3):52-55.

Key words: *Dirofilaria repens*, filariasis

Public Health Institute Nis

Correspondence to: Aleksandar Tasic
Public Health Institute Nis,
50 Dr Zoran Djindjic Blvd.
18000 Nis, Serbia
Phone: 381 18 226 384;
E-mail: atasic@bankerinter.net

Introduction

Filariae of the genus *Dirofilaria*, the cause of zoonosis in nature, are frequent parasites of various animal species worldwide. For these filariae's life cycle development, two hosts are needed, a mosquito or some other transient host, as well as a man who gets infected by the infected insect's bite.

The important filaria, which can cause infection in humans, is certainly *Dirofilaria repens*. Mostly, this filaria resides in the cutaneous and subcutaneous tissue of animals, usually dogs. Infection in humans occurs sporadically, but so far, the cases of superficial and visceral forms of human dirofilariases have been described (1,2,3).

In the recent years, after systematic researches, the presence of dirofilariae in dogs at the territory of Serbia has been confirmed. The most frequent causes of this parasitosis in our country, precisely in Vojvodina, are nematodes of *Dirofilaria repens* (1,2,3).

Classification of parasites

According to systematization of parasites (4,5), the genus *Dirofilaria* is classified into phylum *Nemathelminthes*, family *Onchocercidae*, subfamily *Dirofilarinae*.

A great number of species have been classified into the genus *Dirofilaria*, the most important of which are: *D. immitis*, *D. repens*, *D. inermis* (*palpebralis*, *conjunctivae*) etc. (6,7,8).

Dirofilaria repens

This species of filariae resides in dogs and other canidae and felidae in the subcutaneous tissue, the space between tendons and blood vessels of legs, in kidneys and lymphatic nodes. In humans, it can be found in the eyes and subcutaneous tissue. Microfilariae live in the blood and skin of dogs and other carriers. It frequently parasites the dogs living in Europe, but also in Asia (excluding the northern parts), in Africa, in the South, Middle and North America (8).

Railliet and Henry were first to describe it in 1911 as a nematode living in the subcutaneous lesions in dogs in Italy (8).

The body of the parasite is white-colored, narrowed at the ends. The cuticle is clearly visible, with longitudinal and light transversal stripe. The front part of the body is round. (7,8,9). The tail is dull and slightly bent ventrally

(8). The male's body measures 5-7 cm, with maximal thickness of 320 μm (9). The female is viviparous and sheds larvae (microfilariae) carried further via blood circulation in the whole organism. According to various authors, the length of microfilaria varies and ranges from 300-360 μm and over. The thickness ranges from 6-8 μm (8,9,10,11).

Morphology of *Dirofilaria repens* is presented in Figure 1.

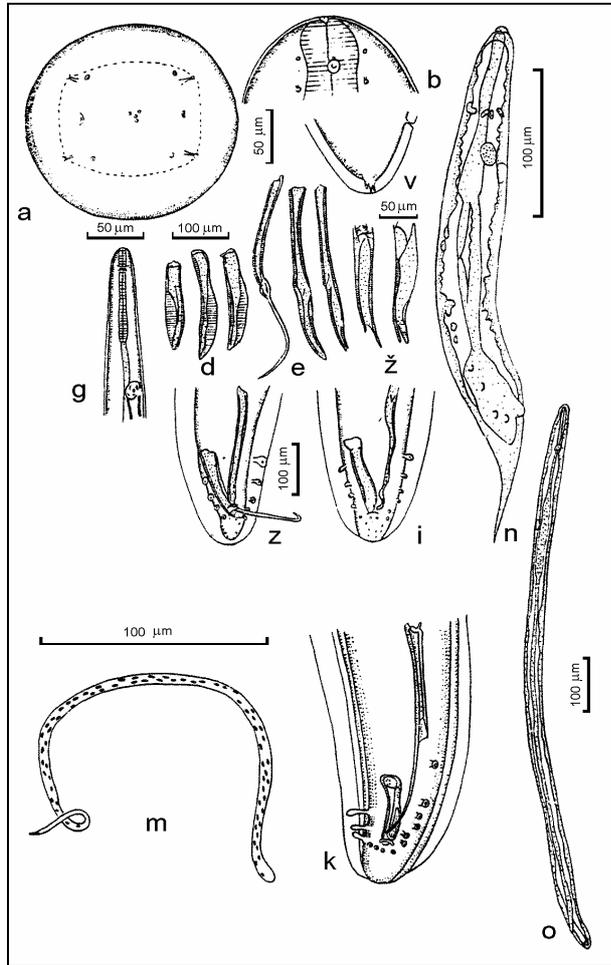


Figure 1. *D. repens* (Сонин, 1975): a) front part of the body, apically; b) front part of the body, laterally; v) tail of the female body, laterally; g) front part of the female body, laterally; d) right spicule, ventrally; e) left spicule, ventrally; ž) left spicule, distal end; z,i) tail of the male body, ventrally; k) look of the ventral tail surface in the male; m) microfilaria; n) stage II larva from mosquito; o) infective larva

Life cycle

The whole larval development of this parasite up to the infective stage III goes on in the appropriate transient host without multiplication. After being ingested with the blood meal taken from the infected host, microfilariae further migrate into the inner organs of a mosquito, where they terminate their larval development in the course of 14-21 days. Infective stage III larvae migrate into the thorax and labium, from where they are inoculated into the dog by mosquito or some other transient host (7,8,9,12,13).

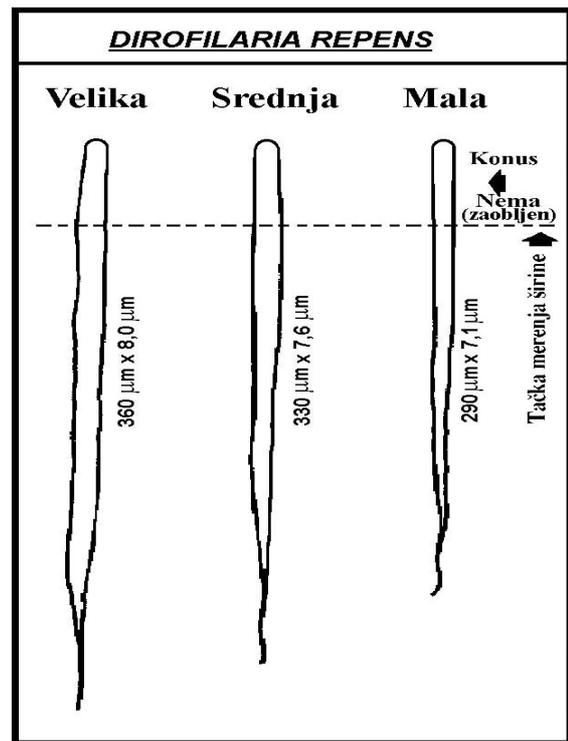


Figure 2. The presentation of morphologic and morphometric characteristics of microfilaria of the species *Dirofilaria repens*.

At the moment when the infected mosquito or some other transient host bites the dog, the labium bursts into small larvae, which reside in it, and go into the wound on the skin, made by biting. In the subcutaneous and fatty tissue, and musculature of the dog, the larvae spend 85-120 days, during which they attain the length of 5 cm, approximately. Then, they penetrate into the blood and lymphatic vessels (7,8,9,12,13).

Besides mosquitoes from the genera *Aedes*, *Anopheles*, *Culex* etc., this cycle may also develop in ticks from the genera *Ixodes*, *Rhipicephalus*, etc., as well as gadflies from the genera *Tabanus*, *Haematopota*, *Chysops* etc. (8). In addition, the existence of various organotropy of parasites has been ascertained. The adult forms reside in the subcutaneous tissue and lymphatic vessels, while microfilariae can be found in the blood and skin.

Distribution

Dirofilariasis in dogs is an endemic disease, spread in the tropics, inclining to spread into the regions with moderate climate. In certain endemic regions, the prevalence of dirofilariasis in adult dogs may range from 1-45%, or even more. According to some data, at certain farms of dogs, up to 80% of animals can be infected (12).

As mentioned before, dirofilariasis is the disease appearing mostly in warmer climate regions, but recently noticed even in the moderate as well as colder geographic areas. There are some data that dirofilariasis in dogs has been registered in the majority of our neighboring countries, as well as in our country (1,2,3,8,15,16). A group of authors (18) registered dirofilariasis in

dogs in the region of Novi Sad, caused by *D. immitis*, while another group registered this disease at the territory of Vojvodina, caused by *D. repens*, *D. immitis*, and *Dip. recondium*, with the prevalence of 47,90%.

Dirofilariasis in dogs and its importance to human medicine

Some papers (20) stress the importance of filariasis in medicine by presenting 56 cases of human ocular filariasis. Only in six cases, the extirpation, description and identification of parasites were successful. In three cases, the cause was *Dipetalonema sp.*, and in one case *Dirofilaria sp.*

The occurrence of dirofilariasis in Yugoslavia has also been reported, caused by *Acantocheilonema reconditum* (15).

At the beginning of the 70-ies in the past century, there were many papers investigating dirofilariasis in humans. Among them, there was a case of a patient from Vojvodina (Vezirac near the Danube, surrounded by swamps) in whom a formation similar to microfilariae of the genus *Dirofilaria* was discovered in the mesenteric lymphatic node (21). Infections in humans caused by dirofilariae are rare at the territory of Serbia and Montenegro, however, some sporadic cases of visceral and superficial filariases caused by *D. repens* have been described (22,23).

With geographical spreading of infection caused by *D. repens* in dogs, more frequent infections in humans caused by these species of parasites should be expected. Therefore, an appropriate importance should be attached to continuous control and follow-up of the occurrence and distribution of filariasis in dogs as a health problem.

Clinical presentation

In infections of dogs caused by *D. repens*, pathological and clinical changes are poorly expressed. This species of filariae lives in dogs and other canidae and felidae in the subcutaneous tissue, the space between tendons and blood vessels of legs, in the kidneys and lymphatic nodes. In humans, it can be found in the eyes and subcutaneous tissue. Microfilariae can be found in the blood and skin of infected dogs (8). With regard to localization of adult forms of parasites in the subcutaneous tissue and lymphatic nodes, nodes in the skin, dermatitis, itching, eczema and alopecia can be noted as clinical symptoms (6,8,12).

Diagnosis

Diagnosis of infections in dogs can be made by taking anamnesis, clinical presentation and findings obtained after special diagnostic procedures.

Clinical presentation is not much helpful in diagnostics of parasitosis in dogs caused by *D. repens*.

Special diagnostic procedures

For the proper making of diagnosis of dirofilariasis, a great importance should be attached to:

A) Detection of microfilariae in blood

Nowadays, there is a variety of tests for laboratory investigation of blood to the presence of microfilariae (12,25):

- Microscopic investigation of fresh blood smear;
- Microscopic investigation of blood serum;
- Method of concentration of microfilariae by saponin;
- Technique of capillary hematocrit;
- Modified Knott's test;
- Filter technique (DIFIL test);
- Method of concentration by histochemical staining of microfilariae, based on distribution of acid phosphatase activity.

B) Determination of microfilariae in blood

Morphologic and morphometric characteristics which can be used for determination of microfilariae of *D. repens* in dogs, according to Eckert, Kelly and Chalifoux-Hunt (6,12,26), are presented in Table 1 and Figure 2.

Curved and multiply bent shape of the body, round at the front, with curved or right tail with the length of 303,86-401,99 µm, thickness 7,05-9,52 µm – these are all morphologic and morphometric characteristics of *D. repens*. Using the method of chistochemical staining by distribution of acid phosphatase activity, in this species of microfilaria only the anal pore is stained in red.

Therapy and prevention

Modern methods for detection of dirofilariasis in dogs raise the possibility of timely and efficient treatment, and prevention of this zoonosis (12,24).

The treatment can be carried out in two directions, with the aim to destroy the adult forms of parasites and/or microfilariae. For destruction of adult forms, Natiacerarsamid is usually used. It is applied intravenously (i.v.) in the doses of 0,1 ml/kg, two times per day for 2-3 days (12,27). A month after this therapy, microfilariae are treated. Nowadays, for this procedure usually two preparations are used: Levamisol-hydrochloride (Levamisol, Nilverm) applied perorally in the dose of 7 mg/kg daily for seven days or three times per day in the dose of 5mg/kg for five days in the course of two months (August-October) and Ivermectin (Heartgard³⁰-Merck & Co.,inc, Iverctin) applied perorally in the dose of 0,05-0,5 mg/kg once.

For conducting prophylaxis of filariasis in dogs, mechanical, chemical and medicamentous methods can be applied (12).

References

- Blitva-Mihajlović G, Ralić M, Miletić B. Bolest srčane gliste. Simpozijum Male životinje – život i zdravlje. Beograd; 1995.
- Kulišić Z, Mišić Z, Milosavljević P, Popović N. Dirofilarioza pasa u Jugoslaviji. 8. Savetovanje veterinarina Srbije. Zlatibor; 1995.
- Milosavljević P, Kulišić Z. Prvi slučajevi dirofilarioze pasa u Jugoslaviji. Veterinarski glasnik 1989;43(1):71-6.
- Flynn JR. Parasites of laboratory animals. The Iowa State University Press / AMES; 1973.
- Kassa T. Veterinary helminthology. First edition. Oxford, Aucland, Boston, Johannesburg, Melbourne, New Delhi: Butterworth, Heinemann, 1999.
- Eckert J, Kutzer E, Rommel M, Bürger HJ, Körting W. Veterinärmedizinische Parasitologie. Berlin und Hamburg: Paul Parey, 1992.
- Flynn JR. Parasites of laboratory animals. The Iowa State University Press / AMES; 1973.
- Сонин МД. Основы нематодологии, том XXIV, Филяриаты животных и человека и вызываемые ими заболевания, часть третья, Филярииды, онхоцерцины. Москва:Наука, 1975.
- Brumpt E. Précis de parasitologie. Sixième édition. Paris; 1949.
- Zahler M, Glaser B, Gothe R. Imported parasites in dogs: Dirofilaria repens and Dipetalonema reconditum. Tierarztl Prax 1997;25(4):388-92.
- Zardi O, Zardi EM, Falagiani P, Zardi DM, Zardi MC, Barduagni F, Barduagni O. Subcutaneous human dirofilariasis. Pathologica 1997;89(1):31-5.
- Kelly JD. Canine Parasitology. Veterinary Review 1977;7:25-33.
- Simić Č, Petrović Z. Helmini čoveka i domaćih životinja. Beograd, 1962.
- Fox RP. Canine and Feline Cardiology. New York, Edinburgh, London, Melbourne: Churchill Livingstone, 1988.
- Kulišić Z, Kranjčić-Zec I, Mitrović S, Radojičić B. Novi slučaj dirofilarioze ljudi u Jugoslaviji. 6. Kongres mikrobiologov Jugoslavije. Maribor, 1989.
- Papazahariadou MG, Koutinas AF, Rallis TS, Haralabidis ST. Prevalence of microfilaraemia in episodic weakness and clinically normal dogs belonging to hunting breeds. J Helminthol 1994; 68(3):243-5.
- Russell RC, Geary MJ. The susceptibility of the mosquitoes Aedes notoscriptus and Culex annulirostris to infection with dog heartworm Dirofilaria immitis and their vector efficiency. Med Vet Entomol 1992;6(2):154-8.
- Savić-Jevđenić S; Vidić B, Grgić Ž, Milovanović A. Brza dijagnostika dirofilarioze pasa u regionu Novog Sada. Veterinarski glasnik 2004;58(5-6): 693-8.
- Tasić A, Katić-Radivojević S, Klun I, Mišić Z, Ilić T, Dimitrijević S. Prevalencija filarioza pasa u nekim područjima Vojvodine. 15. Savetovanje veterinarina Srbije. Zlatibor, 2003.
- Beaver PC. Intraocular filariasis: a brief review. Am J Trop Med Hyg 1989;40(1):40-5.
- Lalošević D. Parazit sličan Dirofilaria spp. Na mezenterijumu uklonjen operacijom. Med Pregl 2004;(5-6):307-8.
- Kranjčić-Zec I. Džamić A, Arsić V. Mitrović S. Human infections by the nematodes of the Dirofilaria sp. Proceeding of the scientific meeting: tissue helminthoses of man and animals. Belgrade 2001. pp. 11-20 (in Serbian).
- Džamić AM. Arsić-Arsenijević V, Radonjić I, Mitrović S, Marty P, Kranjčić-Zec IF. Subcutaneous Dirofilaria repens infection of the eyelid in Serbia. Parasite 2004;11:239-40.
- Bradford SW. Getting to the heart of the matter. Dog World 1994:48-9.
- Kulišić Z, Milosavljević P. Savremene metode dijagnostike dirofilarioze pasa. Veterinarski glasnik 1994;48(9):745-9.
- Chalifoux L, Hunt RD. Histochemical differentiation of Dirofilaria immitis and Dipetalonema reconditum. JAMA 1971;158:601-5.
- Maksimowich DS, Williams JF, Kaiser L. Thiace-tarsamide depresses relaxation of canine pulmonary artery in vitro. Vet Parasitol 1996;64(3):251-6.
- Campbell CW. Ivermectin and Abamectin. New York: Springer, 1989.
- Hawkins AJ, Seward LR. A New Approach for Prevention of Canine Heartworm Disease. Veterinary Technician 1987;8(3):151-5.

DIROFILARIA REPENS – POTENCIJALNA OPASNOST PO ZDRAVLJE LJUDI

Aleksandar Tasić, Suzana Tasić, Nataša Miladinović-Tasić, Dragan Zdravković i Jovana Đorđević

Dirofilarioze su zoonoze izazvane filarijama roda *Dirofilaria*. Najčešći izazivač ovih zoonoza je vrsta *Dirofilaria repens* (*D. repens*). Ova vrsta često inficira pse, ali su poslednjih godina u našoj zemlji zabeleženi i sporadični slučajevi humane dirofilarioze izazvane vrstom *D. repens*.

Kod infekcije pasa izazvane vrstom *D. repens*, patološke i kliničke promene su slabo izražene. Ova vrsta filarija živi kod pasa i drugih kanida i felida u potkožnom tkivu, prostoru između tetiva i krvnih sudova nogu, bubrezima i limfnim čvorovima. Kod čoveka se može naći u očima i potkožno. Dijagnoza infekcije pasa, može se postaviti na osnovu anamneze, ispoljene kliničke slike i rezultata specijalnih dijagnostičkih postupaka koji uključuju detekciju mikrofilarija u perifernoj krvi pasa. Terapija ima za cilj destrukciju adultnih oblika parazita i/ili destrukciju mikrofilarija. Za sprovođenje profilakse filarioza pasa mogu se primeniti mehanička, hemijska ili medikamentozna metoda. Sa geografskim širenjem infekcije vrstom *D. repens* kod pasa, treba očekivati još učestalije infekcije ljudi ovim vrstama parazita. Zato treba dati odgovarajući značaj kontinuiranoj kontroli i praćenju pojavljivanja i raširenosti filarioza pasa, kao zdravstvenom problemu. *Acta Medica Medianae* 2007;46(3):52-55.

Ključne reči: *Dirofilaria repens*, filarioza