



University of Novi Sad - Univerzitet u Novom Sadu
Faculty of Agriculture - Poljoprivredni fakultet



CONTEMPORARY AGRICULTURE *SAVREMENA POLJOPRIVREDA*

The Serbian Journal of Agricultural Sciences
Srpski časopis za poljoprivredne nauke

NOVI SAD
Vol. 61
No. 3-4
2012.

UDC: 63(497.1)(051)-"540.2"

ISSN: 0350 - 1205





University of Novi Sad - Univerzitet u Novom Sadu
Faculty of Agriculture - Poljoprivredni fakultet



CONTEMPORARY AGRICULTURE ***SAVREMENA POLJOPRIVREDA***

The Serbian Journal of Agricultural Sciences
Srpski časopis za poljoprivredne nauke

NOVI SAD

Vol. 61

No. 3-4

2012.

UDC: 63(497.1)(051)-"540.2"

ISSN: 0350 - 1205

„CONTEMPORARY AGRICULTURE“

The Serbian Journal of Agricultural Sciences

„SAVREMENA POLJOPRIVREDA“

Srpski časopis za poljoprivredne nauke

Editor-in-Chief / Glavni i odgovorni urednik:

Prof. dr Milan Popović

Editor / Urednik:

Prof. dr Blagoje Stanić

Assistant Editors / Pomoćnici urednika:

Prof. dr Vesna Rodić

Prof. dr Đorđe Malenčić

Prof. dr Milenko Stevančević

Prof. dr Niko Milošević

Lectors for the English Language / Lektori za engleski jezik:

Bojana Šobot, dipl. filolog

Aleksandar Jagrović, dipl. filolog

Editorship / Uredništvo:

Prof. dr Petar Erić (Serbia), Prof. dr Branko Konstantinović (Serbia), Prof. dr Milenko Jovanović (Serbia), Prof. dr Zoran Keserović (Serbia), Prof. dr Milan Popović (Serbia), Prof. dr Stanimir Kovčičin (Serbia), Prof. dr Jelena Ninić-Todorović (Serbia), Prof. dr Mladen Gagrčin (Serbia), dr Doc. dr Radovan Savić (Serbia), Prof. dr Marian Bura (Romania), Prof. dr Vera Stojšin (Serbia), Robin C. Anderson, PhD (USA), Prof. dr Karaoglanidis George (Greece), Prof. dr Norbert Lukač (Slovakia).

Editorial council / Izdavački savet:

Prof. dr Radovan Pejanović (Serbia), Prof. dr Miroslav Malešević (Serbia), Dipl. ecc. Gordana Radović (Serbia), Prof. dr Vitimir Vidović (Serbia), Prof. dr Branka Gološin (Serbia), Prof. dr Saša Orlović (Serbia), Prof. dr Nedeljko Tica (Serbia), Prof. dr Nikola Đukić (Serbia), Prof. dr Dragan Glamočić (Serbia), Prof. dr Nada Korać (Serbia), Prof. dr Jovan Crnobarac (Serbia), Prof. dr Stanko Boboš (Serbia), Prof. dr Ljiljana Nešić (Serbia), Prof. dr Petar Sekulić (Novi Sad), Prof. dr Mirjana Milošević (Serbia), Prof. dr Cvijan Mekić (Serbia), Prof. MVD Juraj Pivko, DSc. (Slovakia), Prof. dr Šandor Šomodi (Hungary), Prof. dr Sava Bunčić (UK), Prof. dr Boris Stegny (Ukraine), Prof. dr Kole Popovski (Macedonia), Prof. dr Ion Pădeanu (Romania), Prof. Baruch Rubin, Ph.D. (Israel), Prof. dr habil. Imre Musci, CSc. (Hungary), Prof. dr Mark Gleason (USA), Roger B. Harvey, DVM (USA).

Publisher / Izdavač:

UNIVERSITY of NOVI SAD, FACULTY of AGRICULTURE
UNIVERZITET U NOVOM SADU, POLJOPRIVREDNI FAKULTET

Address of editorship / Adresa uredništva:

FACULTY of AGRICULTURE, 21000 Novi Sad, Trg Dositeja Obradovića 8, R. Serbia
POLJOPRIVREDNI FAKULTET, 21000 Novi Sad, Trg Dositeja Obradovića 8, R. Srbija

Phones/Telefoni:

++381 21 450-355; ++381 21 6350-711; ++381 21 485-3482; Fax: ++021/459-761.

<http://polj.uns.ac.rs/>, E-mail: blagoje.stancic@stocarstvo.edu.rs

Four issues in two volumes per year / *Četiri broja u dva volumena godišnje.*

Circulation 200 copies / *Tiraž 200 primeraka.*

Print / *Štampa:* „Atelje Delač“, Iriški put 30, Sremska Kamenica, Serbia.

REVIEWERS / RECENZENTI

- Prof. dr Sanimir Dimitrov**, Department of Genetics, Selection and Reproduction, Tracia University, Agricultural Faculty, Student Campus, 6000 Stara Zagora, Bulgaria. E-mail: dimitrov@af.uni-sz.bg
- Prof. dr Norbert Lukač**, Department of Animal Physiology, Slovak University of Agriculture, Faculty of Biotechnology and Food Sciences, Tr. A. Hlinku 2, Nitra, SK-94976, Slovak Republic. E-mail: norolukac@gmail.com
- Prof. dr Lidija Perić**, Department for Animal Sciences, University of Novi Sad, Faculty of Agriculture, Trg D. Obradovića 8, 21000 Novi Sad, Republic of Serbia. E-mail: lidija@polj.uns.ac.rs
- Prof. dr Dragan Glamočić**, Department for Animal Sciences, University of Novi Sad, Faculty of Agriculture, Trg D. Obradovića 8, 21000 Novi Sad, Republic of Serbia. E-mail: skovsin@polj.uns.ac.rs
- Prof. dr Miroslav Plavšić**, Department for Animal Sciences, University of Novi Sad, Faculty of Agriculture, Trg D. Obradovića 8, 21000 Novi Sad, Republic of Serbia. E-mail: plavsic@polj.uns.ac.rs
- Robin Anderson, PhD.**, USA Department of Agriculture, South Plains Agriculture Research Center, Food and Feed Safety Research Unit, 2882 F&B Road, College Station, TX 77845. E-mail: Robin.Anderson@ars.usda.gov
- Prof. dr Martin Wähner**, Hochschule Anhalt (FH) Fachbereich Landwirtschaft, Ökotröphologie, Landschaftsentwicklung, Strenzfelder Allee 28, 06406 Bernburg, Deutschland. E-mail: waechner@loel.hs-anhalt.de
- Roger B. Harvey**, DVM, MS, Veterinary Medicine Officer, FFSRU, SPARC, ARS, USDA, 2881 F&B Road, College Station, TX 77845. E-mail: Roger.Harvey@ars.usda.gov
- Prof. dr Branislav Lako**, Department of Veterinary Medicine, University of Novi Sad, Faculty of Agriculture, Trg D. Obradovića 8, 21000 Novi Sad, Republic of Serbia. E-mail: blako@polj.uns.ac.rs
- Prof. dr Stanko Boboš**, Department of Veterinary Medicine, University of Novi Sad, Faculty of Agriculture, Trg D. Obradovića 8, 21000 Novi Sad, Republic of Serbia. E-mail: bobos@polj.uns.ac.rs
- Prof. dr Slobodan Jovanović**, Faculty of Veterinary Medicine, University of Belgrade, Bulevar oslobođenja 18, 11000 Belgrade, R. Serbia. E-mail: stocarstvo@vet.bg.ac.rs
- Prof. dr Mirjana Vučković**, Department of Biology and Ecology, University of Novi Sad, 21000 Novi Sad, R. Serbia. E-mail: dusanka.laketic@dbe.uns.ac.rs
- Prof. dr Slobodanka Stojković**, CSIRO/Monash University, School of Biological Sciences, Building 18, Clayton Campus, VIC-3800, Australia. E-mail: Slobodanka.stojkovic@csiro.au
- Dr Rania Ahmed Abd El-Wahab Mohammed**, Plant Protect Research Institute, 7 Nadi Elasad St., Dokki, Giza, Egypt. E-mail: rania-proline@hotmail.com
- Prof. dr Margaret Loseby**, Dipartimento di Ecologia e Sviluppo Economico Sostenibile, Università Degli Studi Della Toscana, Facoltà di Agraria, 01100 Viterbo, Italy. E-mail: loseby@unitus.it
- Dr Oliver T. Neher**, Assistant Professor, Extension Plant Pathology, University of Idaho, USA, Twin Falls Research & Extension Center, CSI Evergreen Building, 315 Falls Avenue East Twin Falls ID 83303. E-mail: oneher@uidaho.edu; cellphone: (208) 320-0836; phone: (208) 736-3633; fax: (208) 736-0843.
- Doc. dr Slađana Krivokapić**, University of Montenegro, PMF, Biology, Podgorica, Montenegro. E-mail: sladjana@yahoo.com; Phone: +382 20 243 816.
- Prof. dr Radica Đedović**, University of Belgrade, Faculty of Agriculture, Beograd-Zemun. E-mail: genrad@agrif.bg.ac.rs; Phoen: + 381 11 2197 425.

PREVALENCE OF DIROLIRARIOSIS IN PET DOGS IN NOVI SAD*

LJUBICA SPASOJEVIĆ KOSIĆ, VESNA LALOŠEVIĆ, DUŠAN LALOŠEVIĆ,
STANISLAV SIMIN, IVAN VASIĆ, LJILJANA KURUCA¹

*SUMMARY: The aim of this study is to reveal the prevalence of dirofilarial infections in pet dogs. From the year 2010 to the year 2012, a total of 77 blood samples were collected from privately owned pet dogs in Novi Sad. All samples were examined by wet blood smears, the modified Knott test and heartworm antigen test. Circulating microfilariae of both *Dirofilaria (D.) immitis* and *D. repens* were found in dogs. Prevalence values for *D. immitis* and *D. repens* were 9,09% and 12,99%, respectively. Results of this study, compared with results of previous investigations, shows increase of infection with *D. immitis* and decrease of infection with *D. repens*. Further investigations are required with higher number of samples to confirm this findings.*

Key words: *D. immitis*, *D. repens*, prevalence, pet dogs.

INTRODUCTION

Nematodes of the genus *Dirofilaria (D.)* are currently considered emerging agents of parasitic zoonoses in Europe. Two main filarial infections occur in domestic and wild carnivores in Europe: *D. immitis*, the etiological agent of canine and feline heartworm disease and *D. repens*, the main etiological agent of subcutaneous filarial infections. Climate changes, the existence of animal reservoirs (domestic and wild canides), and global movement of dogs have caused an increase in the spreading of these mosquito-borne nematodes. *Dirofilaria* infections have spread from the traditionally endemic/hyperendemic region of southern Mediterranean toward northern and eastern areas during recent years in Europe (Genchi et al., 2011).

The life cycle of both parasites consists of five larval stages developing both within an intermediate mosquito host (from microfilaria L1 to infective L3 larva), that also

Original scientific paper / *Originalni naučni rad*

¹Ljubica Spasojević Kosić, PhD, assistant professor, Vesna Lalošević, PhD, associate professor, Stanislav Simin, PhD student, Ljiljana Kuruca, PhD student, University of Novi Sad, Faculty of Agriculture, Dušan Lalošević, professor, University of Novi Sad, Medical Faculty, Ivan Vasić, dipl.vet, Veterinary Ambulance, Novi Sad (Serbia).

Corresponding author: Ljubica Spasojević Kosić, e-mail: ljubicask@polj.uns.ac.rs, phone: +381 21 485-34-13.

* The presented work is part of the research done in the project TR31084 granted by the Serbian Ministry of Education and Science, from 2011. to 2014.

act as vector, and in a definitive vertebrate host (from L3 larva, through L4 and L5 larvae to the adult stage).

Dirofilaria immitis resides preferentially within the pulmonary arteries, but it may also be found in the right ventricle. As the number of heartworms increases they enter the right atrium, and eventually migrate into the caudal vena cava. Large number of parasites may obstruct the caudal vena cava and blood flow to the right atrium (caval syndrome). Adult heartworm can live up to 7 years in dogs. The presence of circulating microfilariae in blood of dogs implies the presence of adult heartworm in host. Dogs with microfilariae in their blood represent reservoirs of infection for other dogs (Ware, 2011).

Heartworm disease can be a serious and potentially fatal disease of dogs. The stage of disease depends on number of adult parasites in pulmonary arteries, the duration of infestation and host's immune response. Adult parasites damage the pulmonary arteries endothelium and induce the arterial thrombus genesis, which result in pulmonary infarction and area of consolidation around the affected vessels. Vascular and parenchymal damages increase pulmonary vascular resistance and lead to pulmonary hypertension. Pulmonary hypertension results in increased right ventricular afterload, right ventricular hypertrophy and cor pulmonale. Besides, microfilariae in blood represent circulating antigens, and may cause immune complex deposition in glomeruli or joints (Ware, 2011; Atkins, 2009; American Heartworm Society Canine Guidelines, 2010). The clinical signs of heartworm disease are mostly those of respiratory and cardiovascular system clinical signs, such as cough, haemoptysis, dyspnoea and decreased exercise intolerance.

Dirofilaria repens is a parasite of the subcutaneous connective tissues, mainly in dogs. The adult parasite resides in the subcutaneous connective tissues; females produce larvae (microfilariae) in the natural host organism and release them into the circulation. Infection with *D. repens* is generally asymptomatic. Main clinical manifestations of *D. repens* infection are nodular multifocal dermatitis and pruriginous papule (Scott and Vaughn, 1987; Haliwell and Gorman, 1989). However, in cases where dogs found to be massively infected with adult worms and with high microfilaremia in blood, gross and histopathological changes in many organs, like spleen, liver, kidney, heart, lungs and brain were reported (Kamalu, 1991). Due to all of these, *D. repens* infection of dogs is an underestimated problem in veterinary medicine (Džaja et al., 2008).

Both *Dirofilaria* species are zoonotic. Recently the case of human *D. immitis* infection was found, and confirmed by molecular analysis in Italy (Avellis et al., 2011). In Europe, human *Dirofilaria* infections are caused mostly by *D. repens* (Genchi, 2012). Though most *D. repens* infections are benign in humans and the immature worm is localized in subcutaneous tissues, the localization in the lung and in other deep tissues can mimic a tumor (Pampiglione and Rivasi, 2000). Reports suggest that full development of *D. repens* in human hosts is possible and contradict the commonly accepted belief that human dirofilariasis is caused exclusively by immature worms (Simon et al., 2012).

First cases of dirofilariosis in Serbia were found in dogs during the autopsy (Milosavljević and Kulišić, 1989). During last two decades researches on the topics of seroprevalence, diagnostic procedures, therapy and clinical cases in both dogs and humans, were performed (Lalošević et al., 2004; Tasić et al 2008; Đorđević et al., 2010; Spasojević Kosić et al 2011; Pavlović et al., 2012, Gabrielli et al., 2012). The aim of this study is to determine the prevalence of *D. immitis* and *D. repens* infections in pet dogs in Novi Sad.

MATERIAL AND METHODS

From the year 2010 to the year 2012 pet dogs from Novi Sad were tested for dirofilariasis infections. This research was done in 77 privately owned pet dogs. At the moment of testing, dogs were at least 7 months old, exposed minimally to one mosquito season and without history of treatment with macrocyclic lactones. Blood sample was collected from each dog for examining microfilariaemia and antigen testing.

Microfilariaemia

Techniques for detecting circulating microfilariae include microscopic examination of fresh blood smears and modified Knott test. Detection and enumeration of circulating microfilariae (mf) of both *D. immitis* and *D. repens* were carried out by the modified Knott test (Bazzochi et al., 2008). Sample of venous blood (1 ml) was mixed with 10 ml of 2% buffered formalin and centrifuged for 5 min at 200 x g. One hundred microliters of sediment was mixed with equal parts of a 1: 1000 methylene blue stain. An aliquot of 20 ml of stained sediment was placed on a slide, and examined under a microscope. The number of mf was multiplied by 10 and expressed as mf/ml. Morphological characteristics of microfilariae, such as length, width, cephalic and caudal ends, were assessed in order to differentiate microfilariae of two *Dirofilaria* species (Genchi et al., 2007).

Antigenemia

Detection of circulating *D. immitis* antigens was carried out by commercial kit SNAP Heartworm RT Test (Idexx Laboratories) according to manufacturer's instruction.

RESULTS AND DISCUSSION

Out of 77 dogs 7 dogs were infected with *D. immitis*, while 10 dogs were infected with *D. repens* (Table 1). No dogs were infected with both parasites.

The diagnosis of heartworm infestation in dogs is based on identifying the microfilariae of *D. immitis* in a blood sample and on finding adult heartworm antigen in blood, serum or plasma. Techniques for detecting circulating *D. immitis* microfilariae (the first stage larvae L1) include microscopic examination of fresh blood smears, the Knott concentration test and the filter test. In present study native blood smears were negative in five dogs, while Knott test revealed the existence of microfilariae. The diagnosis of adult heartworm is enabled by detecting a circulating adult heartworm antigen, or occasionally by identifying worms in the pulmonary arteries or right heart using echocardiography. The diagnosis of *D. repens* in dogs is based only on identifying the microfilariae of *D. repens* in blood, and differentiation of these microfilariae from those of *D. immitis* (Fig. 1). No antigen detection test for filarial subcutaneous dirofilariasis infection is available nowadays.

Table1. Results of microfilariaemia and antigenemia of *D. immitis* and microfilariaemia of *D. repens* in naturally infected dogs

D. immitis			D. repens	
Dog	microfilariaemia	antigenemia	Dog	microfilariaemia
			1	not counted
1	7500 mf/ml	++	2	800 mf/ml
2	1200 mf/ml	+	3	20 mf/ml
3	230 mf/ml	+	4	50 mf/ml
4	0 mf/ml	+	5	1750 mf/ml
5	1500 mf/ml	+	6	680 mf/ml
6	242 mf/ml	+	7	90 mf/ml
7	1400 mf/ml	-	8	160 mf/ml
			9	124 mf/ml
			10	160 mf /ml

(- negative antigen test; + low antigen level; ++ high antigen level)

In this study 5 dogs had positive heartworm antigen test with circulating microfilariae of *D. immitis*, in one dog the test was positive without circulating microfilariae, and in one dog circulating microfilariae of *D. immitis* was diagnosed with negative heartworm antigen test. Definitive diagnosis of heartworm disease is made by positive Knott test and positive antigen test. Heart worm is also diagnosed by negative antigen test if microfilaria of *D. immitis* are detected by Knott test. In case of very low heartworm burden antigen test could be negative. It takes only one female and one male to produce microfilariae and two worms may be below the limit of detection for an antigen test in an animal. Occult infection with *D. immitis* is established in case of positive antigen test and negative Knott test. Animals with adult worms may not have circulating microfilariae for several reasons: immature adults are present in the pulmonary arteries, there is only a single sex of parasite present, the worms are sterile or there is a immunologic destruction of microfilariae by host.

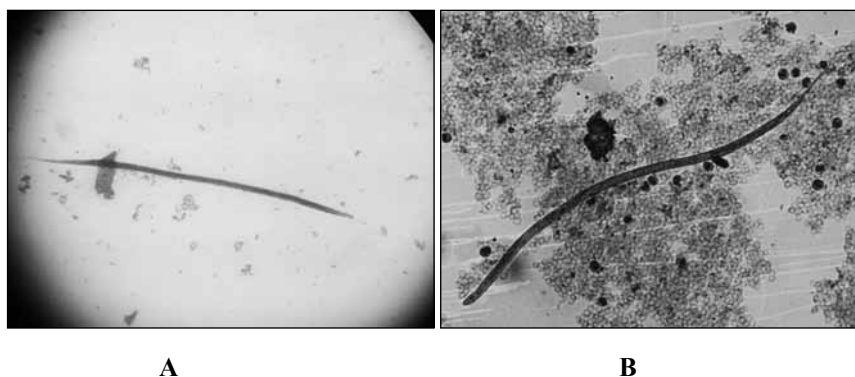


Fig. 1. Microfilariae *D. immitis* (A) and *D. repens* (B).

They can be differentiated according to their length and width, cephalic and caudal end.

By using recognized methods in the diagnosing of dirofilariosis, in this study group of dogs prevalence of *D. immitis* and *D. repens* were 9,09% (7/77) and 12,99% (10/77) respectively. The investigation covered a sensitive population of dogs, old enough to develop the adult form of the parasite, as well as dogs with clinical manifestations that may arise as a consequence of dirofilaria infections (cough, fatigue, weight loss, skin lesions and nodules).

Studies of dirofilariosis in Novi Sad at first showed an infection only with *D. repens*, while *D. immitis* was undiagnosed (Tasić et al., 2008). In time period from the year 2004 to the year 2010, the prevalence of dirofilariosis in military dogs was 14% (Pajković et al., 2010), but the authors did not differentiate microfilariae. In pet dogs in Novi Sad prevalence varies from 7% in the year 2004 to 11% in 2009 (Savić et al., 2012), but in this study antibodies against *Dirofilaria* were detected. Among pet dogs in Novi Sad, prevalence of 5% (3/60) was determined by using only heartworm antigen testing (Pavlović et al., 2012). Compare to the study of Tasić et al (2008), which has provided full diagnostic protocol for dirofilarial infections, our study shows increase of infection with *D. immitis* and decrease of infection with *D. repens*. Further investigations are required with higher number of samples to confirm this findings.

Recently in Romania (Popescu et al., 2012), Russia (Guzeeva et al., 2012), Poland (Masny et al., 2011), Slovakia (Iglódyová and Miterpáková, 2012), Czech Republic (Dobešová and Svobodová, 2011), Latvia (Stepanjana, 2011), Hungary (Kucsera et al., 2012) and Croatia (Pilat et al., 2012) are published new data about the prevalence of *D. repens* and *D. immitis* in dogs and human patients.

Because of well known zoonotic potential of dirofilarial infections, it would be interesting to investigate prevalence of dirofilarial infections in both pet dogs and their owners. Further researches, including human population and entomological investigations, are needed in order to define appropriate control programs for dirofilarial infections in our country.

CONCLUSION

This study revealed a 9,09% prevalence of *D. immitis* infection and 12,99% prevalence of *D. repens* in pet dogs in Novi Sad. Because of the serious pathological changes which dirofilarial infections may cause in dogs, veterinarians should implement in their practice the prevention, diagnosis and treatment of these diseases. Due to the risk to public health, diagnostic testing of dogs and therapy of infected animals, as well as prophylactic treatment for healthy animals, are needed in order to reduce the spread of infection to other dogs and humans.

REFERENCES

- AMERICAN HEARTWORM SOCIETY CANINE GUIDELINES <http://www.heartwormsociety.org/veterinary-resources/canine-guidelines.html#3>
- ATKINS, C.E.: Heartworm disease: an update for practitioners who do not commonly see heartworm. Proceedings of the European Veterinary Conference – Voorjaarsdagen. Amsterdam, Netherlands, 2009, pp 65- 66.
- AVELLIS F.O., KRAMER L.H, MORA P, BARTOLINO A., BENEDETTI P., RIVASI F., 2011. A case of human conjunctival dirofilariosis by *Dirofilaria immitis* in Italy. Vector Borne Zoonotic Dis., 11:451-452, 2011.
- BAZZOCCHI, C., MORTARINO, M., GRANDI, G., KRAMER, L.H., GENCHI, C., BANDI, C., GENCHI, M., SACCHI, L., MCCALL, JW.: Combined ivermectin and doxycycline treatment has microfilaricidal and adulticidal activity against *Dirofilaria immitis* in experimentally infected dogs. International J. Parasitol., 38:1401-1410, 2008.
- DOBOŠOVÁ PARAN, R., SVOBODOVA, V.: Effect of therapy by using advocate spot on combination (imidacloprid 10% and moxidectin 2,5%) on subcutaneous *Dirofilaria immitis* in dogs, Veterinary medicine International, doi 10.4061/2011/482746, 2011.
- DŽAJA, P., BECK A., KIŠ G., GUDAN KURILJ A., ŽIVIČNJAK T., ARTUKOVIĆ B, BECK R., HOHSTETER M, CONRADO ZUCKERMANN ŠOŠTARIĆ I., GRABAREVIĆ Ž: *Dirofilaria repens* infection in a dog in Croatia - a case report, Veterinarski Arhiv, 78(6)521-527, 2008.
- ĐORĐEVIĆ J., TASIĆ S., MILADINOVIĆ-TASIĆ N., TASIĆ A.: Diagnosis and clinical value of human dirofilariosis, Acta facultatis medicinae Naissensis, 27(2)81-84, 2010.
- GABRIELLI S., TASIĆ A., MILADINOVIĆ-TASIĆ N., TASIĆ-OTAŠEVIĆ S., CANCRINI G.: Seroprevalence of dirofilarioses in Serbia. Proceedings of the 3rd European *Dirofilaria* days, 21-22 June, Parma, Italy, 2012, p38.
- GENCHI C.: State of art of dirofilarial infections in Europe. Proceedings of the 3rd European *Dirofilaria* days, 21-22 June, Parma, Italy, 2012, pp 14 – 16.
- GENCHI, G., KRAMER, L. H., RIVASI, F.: *Dirofilarial* Infections in Europe. Vector Borne and Zoonotic Dis., 11(10)1307-1317, 2011.
- GENCHI, G., VENCO, L., GENCHI, M.: Guideline for the laboratory diagnosis of canine and feline *Dirofilaria* infections. Mappae Parassitologiche 8, *Dirofilaria*, 137-145, 2007.
- GUZEEVA, M., GUZEEVA, T., AFONIN, A., KARTASHEV, V., SIMON, F.: Human dirofilariasis caused by *Dirofilaria repens* in Russia (2006-2011). Proceedings of the 3rd European *Dirofilaria* days, 21-22 June, Parma, Italy, 2012, p40.
- HALLIWELL, R. E., W. N. T. GORMAN, W.N.T.: Veterinary Clinical Immunology, Philadelphia. W.B. Saunders, pp. 239, 1989.
- IGLÓDYOVÁ, A., MITERPAKOVÁ, M.: Canine dirofilaria infections in Slovakia. Proceedings of the 3rd European *Dirofilaria* days, 21-22 June, Parma, Italy, 2012, p42
- KAMALU, B. P.: Canine filariasis caused by *Dirofilaria repens* in southeastern Nigeria. Vet. Parasitol., 40, 335-338, 1991.
- KUCSERA, I., DANKA, J., SZÉNÁSI, Z., OROSZ, E., AUER, H., GENCHI, C. *Dirofilaria repens* infection in Hungary. Proceedings of the 3rd European *Dirofilaria* days, 21-22 June, Parma, Italy, 2012, p 44.
- LALOŠEVIĆ D.: *Dirofilaria* spp parasite like in mesenterium removed by surgery, Medicinski pregljed, 5-6, 307-308, 2004.
- MASNY, A., LEWIN, T., SALAMATIN, R., GOLAB, E. Autochthonous canine *Diro-*

filaria repens in the vicinity of Warsaw, Pol. J. Vet. Sci., 14(4)659 – 661, 2011.

MILOSAVLJEVIĆ P, KULIŠIĆ Z. Prvi slučajevi dirofilariaze kod pasa u Jugoslaviji. Vet. Glasnik, 43, 71 –76, 1989.

PAJKOVIĆ D., SAVIĆ S., VELJKOVIĆ P., GRGIĆ Ž.: Praćenje pojave dirofilarioze kod radnih pasa u službi Vojske Srbije, Arhiv veterinarske medicine, 3(2)53-58, 2010.

PAMPIGLIONE S, RIVASI F, GUSTINELLI A.: Dirofilarial human cases in the Old World, attributed to *Dirofilaria immitis*: a critical analysis. Histopathol., 54:192-204, 2009.

PAVLOVIĆ I., MILOJKOVIĆ N., ĆURČIN L., KOVACEVIC M., NOVAK N., IVANOVIC O.: Prrevalence of *Dirofilaria immitis* in Serbia. Proceedings of the 3rd European Dirofilaria days, 21-22 June, Parma, Italy, 2012, p53.

PILAT, M., KOBAŠ, M., BECK, R., MIHALJEVIĆ, Ž., MARINCULIĆ, A.: Study on the prevalence of *Dirofilaria repens* in native dogs from a previously unknown foci in Slavonia, Croatia. Proceedings of the 3rd European Dirofilaria days, 21-22 June, Parma, Italy, 2012, p54.

POPESCU I., TUDOSE I., RACZ P., MUNTAN B., GIURCANEANU C., POPPERT S.: Human *Dirofilaria repens* infection in Romania: a case report. Case report in infectious diseases, doi:10.1155/2012/472976, 2012,

SAVIĆ S., VIDIĆ B.1, GRGIC Z.1, MEDIĆ S. , FENJAC I., PAJKOVIC D.: Dirofilariosis in pet dogs and working dogs - diagnostics and seroprevalence in urban regions of Serbia. Proceedings of the 3rd European Dirofilaria days, 21-22 June, Parma, Italy, 2012, p57.

SCOTT, D. W., VAUGHN, T.C.: Papulonodular dermatitis in a dog with occult filariasis. Comp. Anim. Pract. 1, 32-34, 1987.

SIMÓN F, GONZÁLEZ-MIGUEL J, KARTASHEV V. V., MORCHÓN R, CARRETÓN E, ALBERTO MONTOYA-ALONSO A.: Human dirofilariosis: What is changing? Proceedings of the 3rd European Dirofilaria days, 21-22 June, Parma, Italy, 2012, pp 22-23.

SPASOJEVIĆ KOSIĆ LJ., LALOŠEVIĆ V., LALOŠEVIĆ D., NAGLIĆ A.: Bolest srčanog crva: prikaz slučaja kod psa, Veterinarski glasnik, 65(3-4)257-267, 2011.

STEPANJANA, L.: Occurrence of *Dirofilaria* spp. in dogs in Latvia. Proceeding 3rd international conference “Laboratory diagnostics in veterinary medicine, food and environmental safety”, 15-16 september, Riga, Latvia, 2011, 22.

TASIĆ A, ROSSI L, TASIĆ S, MILADINOVIĆ – TASIĆ N, ILIĆ T, DIMITRIJEVIĆ S. Survey of canine dirofilariasis in Vojvodina, Serbia. Parasitol. Res., 103:1297-302, 2008.

WARE, W.: Heartworm diseases. In: Wandy W (editor) Cardiovascular disease in small animal disease. Manson Publishing/ The veterinary press, London, UK, pp. 351-371, 2011.

PREVALENCA DIROFILARIOZE KOD PASA KUĆNIH LJUBIMACA U NOVOM SADU

LJUBICA SPASOJEVIĆ KOSIĆ, VESNA LALOŠEVIĆ, DUŠAN LALOŠEVIĆ,
STANISLAV SIMIN, IVAN VASIĆ, LJILJANA KURUCA

Izvod

Cilj ovog rada je da pokaže prevalencu infekcije dirofilarijama kod pasa kućnih ljubimaca. Od 2010. do 2012. godine pregledano je 77 uzoraka krvi prikupljenih od pasa iz Novog Sada. Uzorci krvi od svakog psa su pregledani nativnim krvnim razmazom, modifikovanim Knotovim testom i dokazivanjem postojanja antigena odraslog parazita. U krvi pasa su dijagnostikovane mikrofilarije i *D. immitis* i *D. repens*. Prevalenca infekcije *D. immitis* iznosila je 9,09%, dok je za *D. repens* prevalenca bila 12,99%. Rezultati ovog istraživanja, u odnosu na prethodna istraživanja, pokazuju povećanje infekcije pasa sa *D. immitis* i smanjenje infekcije sa *D. repens*. Dalja ispitivanja, na većem broju pasa, su potrebna kako bi se potvrdile procene ovog istraživanja.

Ključne reči: *D. immitis*, *D. repens*, prevalenca, psi kućni ljubimci.

Received / *Primljen*: 16.11.2012.

Accepted / *Prihvaćen*: 26.11.2012.