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***Thelazia Callipaeda* and Eye Infections**

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SUMMARY

Eye infections can be caused by metazoans - helminths and for long this parasitosis was believed to spread only in tropical regions of the world. Lately, mostly subconjunctival infections of adults or immature forms of *D. repens*, which is nematoda-filaria of canids, have been described and the man is just an accidental host. The genus *Thelazia* (*Spirurida*, *Thelaziidae*) comprises a cosmopolitan group of eye worm spirurids responsible for eye infections of domestic and wild animals and humans, carried by different kinds of flies. Nematodes localized in the conjunctival space, lacrimal canals and surrounding ocular tissues of humans can cause symptoms from mild to very serious and severe ones if not treated. The chief aim of this paper was to describe the morphological characteristics, life cycle, prevalence and clinical significance of *Thelazia spp.* as a parasite of the eye. To ensure the diagnosis of thelasirosis and appropriate treatment, it is necessary to have continuing medical reports and increase the awareness of this infection.

Key words: *Thelazia spp.*, vector-born zoonosis, eye infections

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INTRODUCTION

Blindness and other eye diseases represent one of the most traumatic events for people, because they seriously impair their quality of life and their psychological balance. Evaluation of the quality of life of patients suffering from certain diseases that cause blindness (e. g. age-related macular degeneration) gave results similar to those existing in diseases such as AIDS, chronic obstructive pulmonary diseases, cardiac disorders and leukemia. In addition, blindness has profound psychological and socio-economic implications of the high cost of life of individuals and society. There are many causes of blindness including parasitosis which are of great importance to public health worldwide, especially in developing countries.

Eye infections can be caused by metazoans - helminths and for long this parasitosis was believed to spread only in tropical regions of the world. Now, it is known that many of these infections have become unexpectedly important in recent years, drawing more attention, which has resulted in more published data. Global warming and migration of vector - transient hosts of these parasites, completely changed the epizootic and epidemiological characteristics of vector-born zoonosis (1). Helminthic infections of the eye may result from a specific helminths tropism, such as the case with tropical species filaria *Onchocerca volvulus*, which infects about 17.7 million people, and is caused by infection of microfilariae which are migrating from the subcutaneous tissue to the eye and can cause iritis, keratitis, chorioretinitis, optic nerve atrophy (2). *Loa loa*, the tropical filaria too may also damage the eye. In our region, due to migration of the larvae and their presence in the circulation, species *Ascaris lumbricoides*, *Toxocara canis*, *Trichinella spiralis* can parasite in the eye (3). Lately, mostly subconjunctival infections of adults or immature forms of *D. repens*, which is nematoda - filaria of canids, have been described and the man is just an accidental host (4, 5).

Thelazia callipaeda (*T. callipaeda*) is also present in our region, however, it has not been reported so far. For this nematode, the parasites of mammals, man can be a definitive host, and in the human organism *T. callipaeda* develops to adult forms (males and females). Unfortunately, there are still few data on the parasitism of the eye caused by this species. Many ophthalmologists and general practitioners do not consider the possibility of this infection. Even if they diagnosed thelaziosis they did not publish those data, and it is very difficult to estimate the prevalence and incidence of this parasitic infections of the eye, because the data in the reference literature are scarce and mostly limited to individual case reports from various countries (2).

Due to the fact that in the City of Niš thelaziosis was diagnosed in dogs, the chief aim of this paper was to describe the morphological characteristics of the gen-

der, life cycle, prevalence and clinical significance of this zoonotic agent.

Morphological characteristics and life cycle

The genus *Thelazia* (*Spirurida*, *Thelaziidae*) comprises a cosmopolitan group of eye worm spirurids responsible for eye infections of domestic and wild animals and humans. Vectors - transient hosts are different species of flies. Morphologically adult worms are creamy white, tread-like, up to 2 cm (6, 7).

Male adults are 4.5-13 mm in length and 0.25 to 0.75 mm in diameter, while the females are longer, from 6.2 to 17 mm and from 0.3 to 0.85 mm in diameter. Nematode species *T. callipaeda* has a ridged cuticle. *T. callipaeda* has non-segmented body with strong oral and anal part. Male adult worm can be identified based on the body bent posteriorly. In both males and females, the corners of the mouth are without the lips and hexagonal consisting of two concentric rings of flattened papilla around a central aperture. They do not have sharp spines or hooks in the mouth or elsewhere on the body. The adult female vulva is characteristically positioned forward with the esophagus, whereas male worms have 5 pairs of postcloacal papillae (8) (Figure 1).

The infective third - stage larvae of the eye worm is transmitted by a non-bite insect vectors that feed on the tears, e.g. ocular secretions from infected animals and humans, comprising the first - stage larvae of *Thelazia* spp. In the vector, the larvae develops to the infectious third - stage larvae, that lasts for 14-21 days, and as a third - stage infective larvae may be transferred to the host where it can develop to the adult form in the eye cavity for 35 days. This parasite usually lives under the conjunctiva, where the adult females release first-stage larvae into the lachrymal secretions (9).

It has been shown that the flies of the order *Diptera*, *Drosophilidae* family, genus *Phortica* are vectors and transient hosts for species *T. callipaeda* (10, 11). It has been suggested that more than one species of *Diptera*, namely *Musca domestica* Linnaeus (*Diptera*: *Muscidae*) and *Amiot okadai* Maca (*Diptera*: *Drosophilidae*), may be involved in the transmission of *T. callipaeda*; however, so far, this was not proved in research conducted in experimental and natural conditions (12).

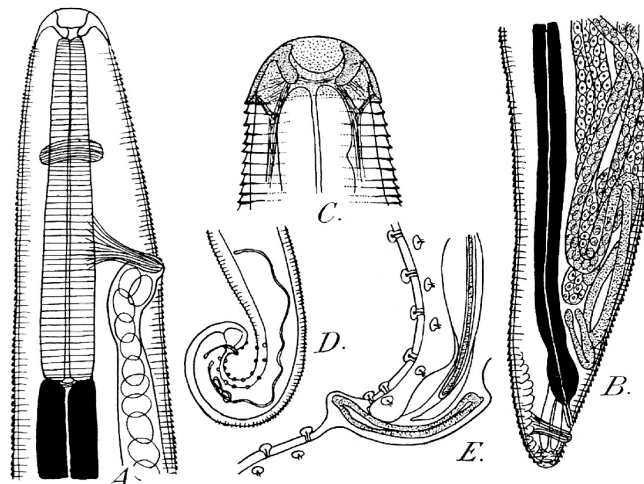


Figure 1. Schematic diagram of adult type *Thelazia callipaeda*: A - front end of the female (X 140); B - back end of the female (X 140); C - ventral side of the buccal region (X 300); D - back end of the male (X 45); E - perianal region of the male (X 150). (Adapted from E. Brumpt. *Precis de parasitologie*. Masson et Cie, editeurs, Libraires de l'Academie de Medicine, Paris, 1949).

Epidemiological aspects

The incidence of parasites in animals is 5-42%, depending on the countries and territories (6). *T. callipaeda* was first registered in Europe in 1989 (11). In France, ocular infections of carnivorous *T. callipaeda* have been reported (9). This infection is also common in dogs and cats in Italy (12-14). Several studies have shown that the disease is endemic throughout Italy (13, 14). Imported thelaziosis infections of carnivores in Germany, Holland, Switzerland (11), have highlighted the spread of the disease in Europe (15). Indigenous cases of the *T. callipaeda* infections in the dogs have been reported in Spain, in the western part of the country (La Vera, Caceres); the prevalence in some municipalities reached 39.9% of the tested dogs (16). In the Department of Parasitology, Public Health Institute, this species have been identified as a cause of pet dog conjunctivitis in the urban area of the City of Niš (Figure 2 and 3).

In thelaziosis-endemic area there is a risk of this parasitosis in humans (10, 17, 18). Therefore, in the Eu-

ropean countries in which this zoonosis has been described, also the cases of human infection of *T. callipaeda* have been reported. Most often it is in Italy and France (9, 12-14).

Species of the genus *Thelazia* are commonly referred to as the eye worms. They infect the conjunctival sac of the upper and lower fornix, tear ducts and other surrounding tissues of humans, mammals (cows, sheep, goats), carnivores (dogs, cats, foxes) and rabbits (6). The causes of the human infections are: *T. callipaeda* and *T. californiensis* (6). Due to *T. callipaeda* large presence in the republics of the former Soviet Union and countries of the Far East, in the East and Southeast Asia, including the People's Republic of China, South Korea, Japan, Indonesia, Thailand, Taiwan and India, it is known as the orient eye worm (9). Infection due to *T. callipaeda* is endemic in animals and humans (10), usually in the poorer rural areas and mainly among children and the elderly population in Asia, particularly in China (9, 19). Another species, *T. californiensis* is responsible for human infection in the United States.

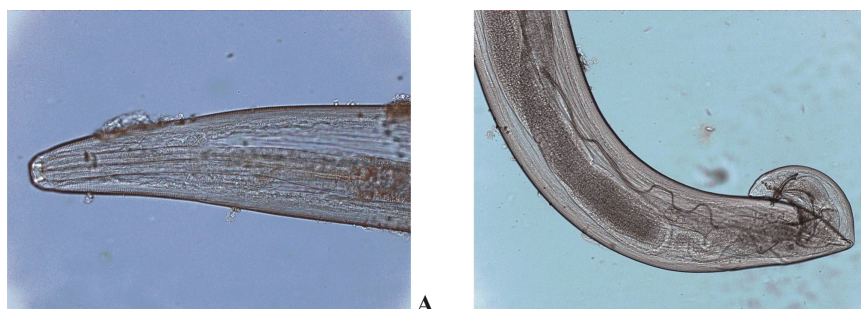


Figure 2. *Thelazia callipaeda*: A - front end of the male (X 20), B - rear end of the male (X 10)

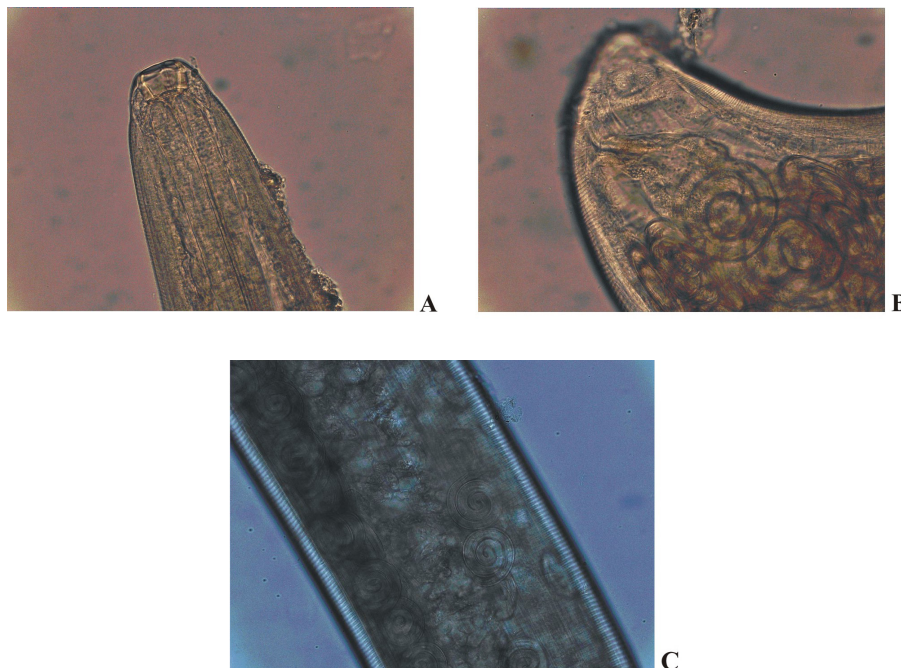


Figure 3. *Telazia callipaeda*: A - anterior end of the female (X 20), B - back end of the female (X 40), C - the female body with plenty of larvae (X 40).

Clinical picture

Nematode localized in the conjunctival space, lacrimal canals and surrounding ocular tissues of humans or animals can cause the symptoms from mild (increased tearing, itching, foreign body sensation, pain, swelling, blurred vision, exudative conjunctivitis) to the very serious and severe ones (clouding and scarring of the conjunctiva and cornea, corneal ulceration and keratitis) if not treated. The worm can cause paralytic ectropion because of its presence in the lower fornix (6, 20, 21).

Human thelasirosis may be subclinical or symptomatic (9). In most reported cases the infected patients had 5-6 worms in the conjunctival bag (22, 23). Mainly, it was an extraocular infection. So far, in the literature there has been only one case of infection due to *T. callipaeda* in the vitreous without a concrete explanation for the occurrence of these infections (8).

These infections highlight the importance of considering these nematodes in the differential diagnosis of bacterial and allergic conjunctivitis. All the cases of human thelasirosis have been reported to occur during the summer months (June - August). It is a period of vector activity of the *T. callipaeda* in southern Europe (late spring to autumn) (9, 16). The seasonal character of human thelasirosis may jeopardize the correct diagnosis of conjunctivitis, because spring and summer are the seasons when allergic conjunctivitis are common (e.g. pollen). This is particularly important when an infection is caused by small larvae which are more difficult to detect and identify. In addition, the clinical diagnosis of the human thelasirosis is difficult due to the

presence of the small number of nematodes and the clinical signs represent the inflammatory response that is similar to allergic conjunctivitis. Late or inadequate treatment of infection can lead to delays in the recovery, mainly in children and the elderly, who are most exposed to flies, transmitters of infection (24).

Although infection due to *Thelazia callipaeda* is rare, it may be a reason for discomfort in the eyes or conjunctivitis. *T. callipaeda* usually lies in conjunctival bag or parts of the lacrimal apparatus, causing ocular surface disease. Detailed history disease and a careful examination are the most important for a correct diagnosis. Parasitological diagnosis of human thelasirosis is possible only after their complete extraction from the eye and identification is based on morphological and morphometric characteristics of the worms (25).

Although humans, as other mammals, can be the definitive carriers of these parasites, they are generally random hosts, in which the third - stage larvae can develop into adult, but without affecting the epidemiological transmission of the parasite. Explanation of this fact can be that humans, unlike animals, report their symptoms, undergo the treatment and removing of the parasites, which causes further interruption of transmission of the parasite.

CONCLUSION

Today, many parasitoses are neglected infections. To avoid false diagnosis and inadequate treatment of patients infected by *T. callipaeda*, parasitologists and

public health authorities should consider this zoonosis more seriously.

To ensure the diagnosis of thelaziosis and appropriate treatment, it is necessary to have continuing me-

dical reports and increase the awareness of this infection.

References

1. Cancrini G, Yanchang S, Della Torre A, Coluzzi M. Influenza della temperatura sullo sviluppo larvale di *Dirofilaria repens* in diverse specie di zanzare. *Parassitologia* 1988; 30:38 (Italian).
2. Otranto D, Eberhard ML. Zoonotic helminths affecting the human eye. *Parasit Vectors* 2011; 4: 1-21. <http://dx.doi.org/10.1186/1756-3305-4-41>
3. Otašević S, Miladinović Tasić N, Tasić A: „Medicinska parazitologija“ sa CD-om, udžbenik, Medicinski fakultet, Niš, 2011; ISBN 978-86-80599-97-7.
4. Tasić S, Stojković N, Miladinović-Tasić N et al. Subcutaneous Dirofilariasis in South-East Serbia - Case Report. *Zoonoses and Public Health* 2011; 5: 318-22. <http://dx.doi.org/10.1111/j.1863-2378.2010.01379.x>
5. Trenkić-Božinović M, Tomašević B, Veselinović A et al. The first case of human ocular dirofilariasis in the city of Niš. *International Congress-XLVII Dani preventivne medicine, Niš, 2013.* (elektronska forma <http://www.iziz-nis.org.rs/index.html>)
6. Mahanta J, Alger J, Bordoloi P. Eye infestation with *Thelazia* species. *Indian J Ophthalmol* 1996; 44: 99-101.
7. Cheung WK, Lu HJ, Liang CH et al. Conjunctivitis caused by *Thelazia callipaeda* infestation in a woman. *J Formos Med Assoc* 1998; 97: 425-7.
8. Zakir R, Zhong-Xia Z, Chioddini P, Canning CR. Intraocular infestation with the worm, *Thelazia callipaeda*. *Br J Ophthalmol* 1999; 83: 1194-5. <http://dx.doi.org/10.1136/bjo.83.10.1194a>
9. Shen J, Gasser RB, Chu D et al. Human thelaziosis-a neglected parasitic disease of the eye. *J Parasitol* 2006; 92: 872-5. <http://dx.doi.org/10.1645/GE-823R.1>
10. Yang YJ, Liag TH, Lin SH et al. Human Thelaziasis occurrence in Taiwan. *Clin Exp Optom* 2006; 89: 40-4. <http://dx.doi.org/10.1111/j.1444-0938.2006.00008.x>
11. Roggero C, Schaffner F, Bächli G et al. Survey of Phortica drosophilid flies within and outside of a recently identified transmission area of the eye worm *Thelazia callipaeda* in Switzerland. *Vet Parasitol* 2010; 171: 58-67. <http://dx.doi.org/10.1016/j.vetpar.2010.03.012>
12. Otranto D, Lia RP, Testini G et al. *Musca domestica* is not a vector of *Thelazia callipaeda* in experimental or natural conditions. *Med Vet Entomol* 2005; 19: 135-9. <http://dx.doi.org/10.1111/j.0269-283X.2005.00554.x>
13. Otranto D, Lia RP, Buono V et al. Biology of *Thelazia callipaeda* (Spirurida, Thelaziidae) eyeworms in naturally infected definitive hosts. *Parasitology* 2004; 129: 627-33. <http://dx.doi.org/10.1017/S0031182004006018>
14. Otranto D, Lia RP, Traversa D, Giannetto S. *Thelazia callipaeda* (Spirurida, Thelaziidae) of carnivores and humans: morphological study by light and scanning electron microscopy. *Parassitologia* 2003; 45: 125-33.
15. Miró G, Montoya A, Hernández L et al. *Thelazia callipaeda*: infection in dogs: a new parasite for Spain. *Parasites & Vectors* 2011; 4:148-53. <http://dx.doi.org/10.1186/1756-3305-4-148>
16. Isabel Fuentes I, Montes I, Saugar JM et al. Thelaziosis in Humans, a Zoonotic Infection, Spain, 2011. *Emerging Infectious Diseases* 2012; 18): 2073-75.
17. Youn H. Review of Zoonotic Parasites in Medical and Veterinary Fields in the Republic of Korea. *Korean J Parasitol* 2009; 47: 133-141. <http://dx.doi.org/10.3347/kjp.2009.47.S.S133>
18. Kim JH, Lee SJ, Kim M. *Thelazia callipaeda* discovered by chance during cataract surgery. *BMJ Case Rep* 2013: 1-2. <http://dx.doi.org/10.1136/bcr-2013-201214>
19. Otranto D, Dutto M. Human Thelaziasis, Europe. *Emerging Infectious Diseases* 2008; 14: 647-49. <http://dx.doi.org/10.3201/eid1404.071205>
20. Magnis J, Naucke TJ, Mathis A et al. Local transmission of the eye worm *Thelazia callipaeda* in southern Germany. *Parasitol Res* 2010; 106: 715-7. <http://dx.doi.org/10.1007/s00436-009-1678-4>
21. Akhanda AH, Akonjee AR, Hossain MM et al. *Thelazia callipaeda* infestation in Bangladesh: case report. *Myensingh Med J* 2013; 22: 581-4.
22. Viriyavejakul P, Krudsood S, Monkhonmu S et al. *Thelazia callipaeda*: a human case report. *Southeast Asian J Trop Med Public Health* 2012; 43: 851-6.
23. Yagi T, Sasoh M, Kawano T et al. Removal of *Thelazia callipaeda* from the subconjunctival space. *Eur J Ophthalmol* 2007; 17: 266-8.
24. Otranto D, Dantas-Torres F, Brianti E et al. Vector-borne helminths of dogs and humans in Europe. *Parasites & Vectors* 2013; 6: 1-16. <http://dx.doi.org/10.1186/1756-3305-6-16>
25. Sohn WM, Na BK, Yoo JM. Two Cases of Human Thelaziasis and Brief Review of Korean cases. *Korean J Parasitol* 2011; 49: 265-71. <http://dx.doi.org/10.3347/kjp.2011.49.3.265>

THELAZIA CALLIPAEDA I INFEKCIJE OKA

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Sažetak

Infekcije oka mogu da izazovu metazoe-helmini. Dugo se za ove parazitoze verovalo da su rasprostranjene samo u tropskim krajevima sveta. U poslednje vreme najčešće su opisane subkonjunktivalne infekcije adultima ili nezrelim formama vrste *D. repens*, koje su filarije kanida i za koje je čovek samo slučajni nosilac. S obzirom na činjenicu da se na teritoriji grada Niša dijagnostikuje telazioza (theliasiosis) kod pasa, opis morfoloških karakteristika roda, životnog ciklusa, rasprostranjenosti i kliničkog značaja ovog uzročnika zoonoza prvenstveno je bio cilj ovog rada. Rod *Thelazia* (*Spirurida*, *Thelaziidae*) obuhvata kosmopolitsku grupu očnih crva spirurids, odgovornih za očne infekcije domaćih i divljih životinja i ljudi koje se prenose različitim vrstama mušica. Morfološki odrasli crvi su kremasto bele boje, končastog izgleda, dužine do 2 cm. Dokazano je da su muve reda *Diptera*, porodice *Drosophilidae*, roda *Phortica*, vektori i prelazni domaćini vrste *T. callipaeda*. Nematode lokalizovane u konjunktivalnom prostoru, suznim putevima i okolnim okularnim tkivima kanida, felida, glodara i ljudi, mogu izazvati blage simptome (pojačano suzenje, svrab, osećaj stranog tela, bol, otok, zamagljen vid, eksudativni konjunktivitis) do onih jako ozbiljnih i teških (zamućenje i ožiljavanje konjunktive i rožnjače, ulceracije rožnjače i keratitis) ukoliko se ne leče. Kako bi se obezbedila sigurna dijagnoza telazioze i sprovođenje odgovarajućeg tretmana primarnih problema i komplikacija, neophodno je kontinuirano medicinsko obaveštavanje i svest o ovoj infekciji.

Ključne reči: *Thelazia callipaeda*, vektorski prenosive zoonoze, infekcije oka