

SHORT REPORT

Open Access

Transmission of the eyeworm *Thelazia callipaeda*: between fantasy and reality

Domenico Otranto^{1*} and Filipe Dantas-Torres^{1,2}

Abstract

Background: *Thelazia callipaeda* is transmitted by *Phortica variegata*, a drosophilid that feeds on lachrymal secretions of mammals. Scientific information on human thelaziosis is still relatively limited, mainly for physicians and ophthalmologists. Indeed, the literature is full of misleading information on the transmission of *T. callipaeda* to humans.

Findings: A recent paper reported a case of human intraocular infestation in a patient from Karnataka. The information presented in that article as well as in other articles in the international literature is outdated and incorrect in several instances, mostly regarding to the localization of *T. callipaeda* in the host, its biology and routes of transmission.

Conclusions: Physicians and ophthalmologists should be aware that *T. callipaeda* is larviparous and transmitted exclusively by secretophagous flies. These flies buzz around the eyes of animals and humans at the daytime, landing on the eyes and releasing the infective larvae on the host conjunctiva. That is the only possible way of transmission of *T. callipaeda*.

Keywords: *Thelazia callipaeda*, Human infection, Vector, *Phortica variegata*, Ophthalmology

Findings

Thelazia callipaeda (Spirurida, Thelazidae) has been known for a long time as the “oriental eye-worm” due to its geographical distribution in the former Soviet Republics and in many far eastern countries. However, it is now evident that *T. callipaeda* is not confined in far Eastern Asian countries (e.g., India, Thailand, China and Japan). Indeed, it has been increasingly reported in dogs, cats and wild carnivores from Europe [1]. Importantly, where the infection is well established in domestic (dogs and cats) and wild carnivores such as foxes, beech martens and wild cats [2], cases of human thelaziosis may occur (e.g., France, Italy and Spain) [3, 4], indicating a relationship between the infection in humans and other susceptible animals. The strict relationship between the biological life cycle of this parasite in humans and other animals (Fig. 1) is also demonstrated by the occurrence of a single haplotype (i.e., h1) of *T. callipaeda* among different host species in Europe [5]. Foxes play a central

role as wild hosts of the infection as indicated by the high prevalence of thelaziosis recorded in this animal species in hyperendemic areas of southern Italy (49.3 %) [2]. Since the first report in Italy [6], the infection by *T. callipaeda* has been recorded in many European countries including France [7], Switzerland [8], Spain [9], Portugal [10] and even eastern Europe [11, 12]. The growing awareness of parasitologists and veterinary practitioners has most likely contributed to the increased number of reports of thelaziosis by *T. callipaeda* in Europe. However, the rather apparent clinical presentation (mild conjunctivitis, follicular hypertrophy of the conjunctiva, foreign body sensation, epiphora, itchiness, congestion, swelling, hypersensitivity to light, and keratitis) may have rendered the diagnosis of thelaziosis not so difficult, suggesting the recent introduction of *T. callipaeda* in some areas.

The high number of reports of eyeworm infestation throughout the last few years parallels the scientific information recently acquired on the biology of this nematode in both the definitive and intermediate hosts. Indeed, *T. callipaeda* is transmitted by *Phortica variegata*, a drosophilid that feeds on lachrymal secretions of

* Correspondence: domenico.otranto@uniba.it

¹Department of Veterinary Medicine, Università degli Studi di Bari, Valenzano, Bari, Italy

Full list of author information is available at the end of the article



Fig. 1 Dog eye with *Thelazia callipaeda* worms. Nematodes in the conjunctiva of a dog with a severe conjunctivitis and follicular hypertrophy of the conjunctiva

mammals [13, 14]. Importantly, for this parasite, information gained in veterinary parasitology is as yet more refined than in human medicine, therefore emphasizing the importance of the One Health approach in medical sciences. For example, it is well known that, in southern Italy, *P. variegata* has a seasonal pattern (from March to October) and a predominately crepuscular activity that overlaps the behaviour of wild hosts [15].

Although the high prevalence of eyeworms in dogs and wildlife represents an alert for human populations, scientific information on human thelaziosis is still limited, mainly for physicians and ophthalmologists. Indeed, the literature is full of misleading information on the transmission of *T. callipaeda* to humans. For example, a recent paper attracted our attention due to its imaginative nature and misleading conclusions. The article entitled “Human ocular thelaziosis in Karnataka” [16], recently published in the open access Indian Journal of Ophthalmology, reported a case of human intraocular infestation in a patient from Karnataka. The authors attempted to put the clinical case under a broad context, describing the main epidemiological and biological features of human thelaziosis. Regrettably, the information presented in that article is outdated and incorrect in several instances. For example, China (and not India) is the country with the highest number of cases of human thelaziosis [17]. Although the infection is mostly linked to the rural areas where the insect vector perpetuates, it has never been demonstrated that “Cattle rearing, contact with stray dogs [...] make the humans vulnerable to ocular *Thelaziosis*.” In addition, *T. callipaeda* localizes on the conjunctiva under the eyelids and not inside the eye of the patients, therefore making rather awkward the meaning of the reasons why “conjunctival and corneal injuries, traumatic conjunctivitis facilitate the introduction

of the larvae into the sub-conjunctival space and vitreous cavity”.

Importantly, in spite of the large amount of data available in the international literature [13, 14] basic information on the life history of this parasite is completely ignored by the authors, who used inappropriate arguments in their attempt to explain the potential transmission routes for this parasite. The authors stated “the main mode of transmission in this case was probably injury with the cattle tail and might be through contaminated towels”. Third-stage infective larvae of *T. callipaeda* are only transmitted by secretophagous flies feeding on the human eyes; other ways of transmission for these larvae is not possible. In the past, other authors have hypothesized other fanciful ways of transmission. For example, some authors reported that the life cycle of *T. callipaeda* remains unclear and discussed the possibility of human infection through the skin or by drinking untreated water [18]. Nonetheless the level of imagination reached in the abovementioned article has never found equals in that authors stated that the infection occurred with “the towels being contaminated with cow dung containing deposited eggs/larvae of the worm and the same being used for wiping or rubbing the eyes after the injury as the possible mode of entry of eggs/larvae into the eyes”.

Conclusions

Physicians and ophthalmologists with no experience in parasitology should be aware that *T. callipaeda* is larviparous and transmitted exclusively by secretophagous flies. These flies buzz around the eyes of animals and humans at the daytime, finally landing on the eyes and releasing the infective larvae on the host conjunctiva. Therefore, the prevention of thelaziosis is difficult to manage using protective bed nets at night, as suggested

by Krishnachary and colleagues [16], unless the authors intended to prevent mosquito-transmitted diseases, such as malaria.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Both authors equally conceived this article and equally contributed to writing it. Both read and approved the final version of the manuscript.

Author details

¹Department of Veterinary Medicine, Università degli Studi di Bari, Valenzano, Bari, Italy. ²Department of Immunology, Centro de Pesquisas Aggeu Magalhães, Fundação Oswaldo Cruz, 50740465 Recife, Pernambuco, Brazil.

Received: 25 March 2015 Accepted: 1 May 2015

Published online: 14 May 2015

References

- Otranto D, Dantas-Torres F, Brianti E, Traversa D, Petrić D, Genchi C, et al. Vector-borne helminths of dogs and humans in Europe. *Parasit Vectors*. 2013;16:6–16.
- Otranto D, Dantas-Torres F, Mallia E, DiGeronimo PM, Brianti E, Testini G, et al. *Thelazia callipaeda* (Spirurida, Thelaziidae) in wild animals: report of new host species and ecological implications. *Vet Parasitol*. 2009;166:262–7.
- Otranto D, Dutto M. Human thelaziosis Europe. *Emerg Infect Dis*. 2008;14:647–9.
- Fuentes I, Montes I, Saugar JM, Gárate T, Otranto D. Thelaziosis, a zoonotic infection, Spain, 2011. *Emerg Infect Dis*. 2012;1:2073–5.
- Otranto D, Testini G, Deluca F, Hu M, Shamsi S, Gasser RB. Analysis of genetic variability within *Thelazia callipaeda* (Nematoda: Thelazioidea) from Europe and Asia by sequencing and mutation scanning of mitochondrial cytochrome c oxidase subunit 1. *Mol Cell Probes*. 2005;19:306–13.
- Rossi L, Peruccio C. Thelaziosi oculare nel Cane: aspetti clinici e terapeutici. *Veterinaria*. 1989;8:47–50.
- Dorchies P, Chaudieu G, Simeon LA, Cazalot G, Cantacessi C, Otranto D. First reports of autochthonous eyeworm infection by *Thelazia callipaeda* (Spirurida, Thelaziidae) in dogs and cat from France. *Vet Parasitol*. 2007;149:294–7.
- Malacrida F, Hegglin D, Bacciarini L, Otranto D, Nägeli F, Nägeli C, et al. Emergence of canine ocular thelaziosis caused by *Thelazia callipaeda* in southern Switzerland. *Vet Parasitol*. 2008;157:321–7.
- Miró G, Montoya A, Hernández L, Dado D, Vázquez MV, Benito M, et al. *Thelazia callipaeda* infection in dogs: a new parasite for Spain. *Parasit Vectors*. 2011;27:148.
- Vieira L, Rodrigues FT, Costa A, Diz-Lopes D, Machado J, Coutinho T, et al. First report of canine ocular thelaziosis by *Thelazia callipaeda* in Portugal. *Parasit Vectors*. 2012;21:124.
- Hodžić A, Latrofa MS, Annoscia G, Alić A, Beck R, Lia RP, et al. The spread of zoonotic *Thelazia callipaeda* in the Balkan area. *Parasit Vectors*. 2014;7:328.
- Mihalca AD, D'Amico G, Scurtu I, Chirila R, Matei IA, Ionica AM. Further spreading of canine oriental eyeworm in Europe: first report of *Thelazia callipaeda* in Romania. *Parasit Vectors*. 2015;8:48.
- Otranto D, Lia RP, Cantacessi C, Testini G, Troccoli A, Shen JL, et al. Nematode biology and larval development of *Thelazia callipaeda* (Spirurida, Thelaziidae) in the drosophilid intermediate host in Europe and China. *Parasitology*. 2005;131:847–55.
- Otranto D, Cantacessi C, Testini G, Lia RP. *Phortica variegata* as an intermediate host of *Thelazia callipaeda* under natural conditions: evidence for pathogen transmission by a male arthropod vector. *Int J Parasitol*. 2006;36:1167–73.
- Otranto D, Brianti E, Cantacessi C, Lia RP, Máca J. The zoophilic fruitfly *Phortica variegata*: morphology, ecology and biological niche. *Med Vet Entomol*. 2006;20:358–64.
- Krishnachary PS, Shankarappa VG, Rajarathnam R, Shanthappa M. Human ocular thelaziosis in Karnataka Indian. *J Ophthalmol*. 2014;62:822–4.
- Shen J, Gasser RB, Chu D, Wang Z, Yuan X, Cantacessi C, et al. Human thelaziosis—a neglected parasitic disease of the eye. *J Parasitol*. 2006;92:872–5.
- Zakir R, Zhong-Xia Z, Chioddini P, Canning CR. Intraocular infestation with the worm, *Thelazia callipaeda*. *Br J Ophthalmol*. 1999;83:1194–5.

Submit your next manuscript to BioMed Central and take full advantage of:

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit

