Angiostrongilosi cardiopolmonare

Strongilosi broncopolmonari

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http://www.parasitesandvectors.com/content/3/1/62

Parasites &Vectors

REVIEW Open Access

Canine and feline cardiopulmonary parasitic nematodes in Europe: emerging and underestimated

Donato Traversa[1*], Angela Di Cesare[1], Gary Conboy[2]

The reasons for the apparent emergence of cardiopulmonary parasitoses in pets are unknown but several factors such as global warming, changes in vector seasonal population dynamics and movements in animal populations, may play a role in the recent rise in reports of infection in the various countries of Europe. Most of

frontiers in
VETERINARY SCIENCE

REVIEW ARTICLE
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Cardio-pulmonary parasitic nematodes affecting cats in Europe: unraveling the past, depicting the present, and predicting the future

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Various cardio-pulmonary parasitic nematodes infecting cats have recently been fascinating and stimulating the attention of the Academia, pharma companies, and veterinary practitioners. This is the case of the metastrongyloids: *Aelurostrongylus abstrusus* and *Troglostrongylus brevior*, the trichuroid: *Capillaria aerophila* (syn. *Eucoleus aerophilus*), and the filarioid: *Dirofilaria immitis*. Apparently, these parasites have been emerging in several European countries, thus, gaining an important role in feline parasitology and clinical practice. Under a practical standpoint, a sound knowledge of the biological, epidemiological, and clinical impact of cardio-respiratory parasitoses affecting cats, in addition to a potential risk of introduction, establishment, and spreading of "new" parasites in Europe is mandatory in order to understand the present and future impact for feline medicine and to address new strategies of control and treatment. The purpose of the present article is to review the current knowledge of heartworm and lungworm infections in cats, discussing and comparing past and present issues, and predicting possible future scenarios.

Keywords: *Aelurostrongylus abstrusus, Troglostrongylus brevior, Capillaria aerophila, Dirofilaria immitis,* cat, epidemiology

Dirofilaria immitis

Capillaria aerophila

Angiostrongylus vasorum

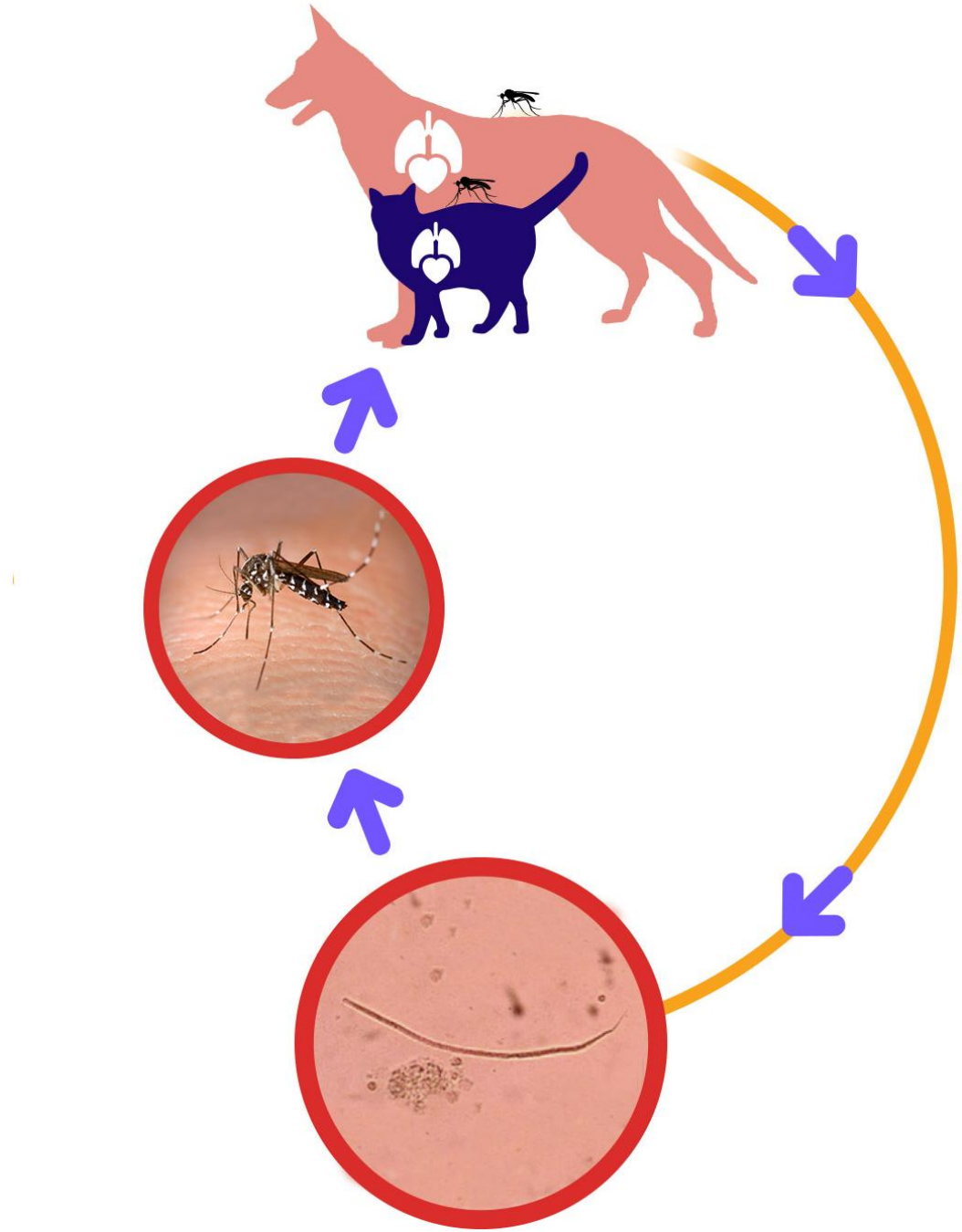
Aelurostrongylus abstrusus

***Troglostrongylus* spp.**

Arteria polmonare e diramazioni

Cuore destro

Trachea, bronchi, bronchioli e dotti alveolari



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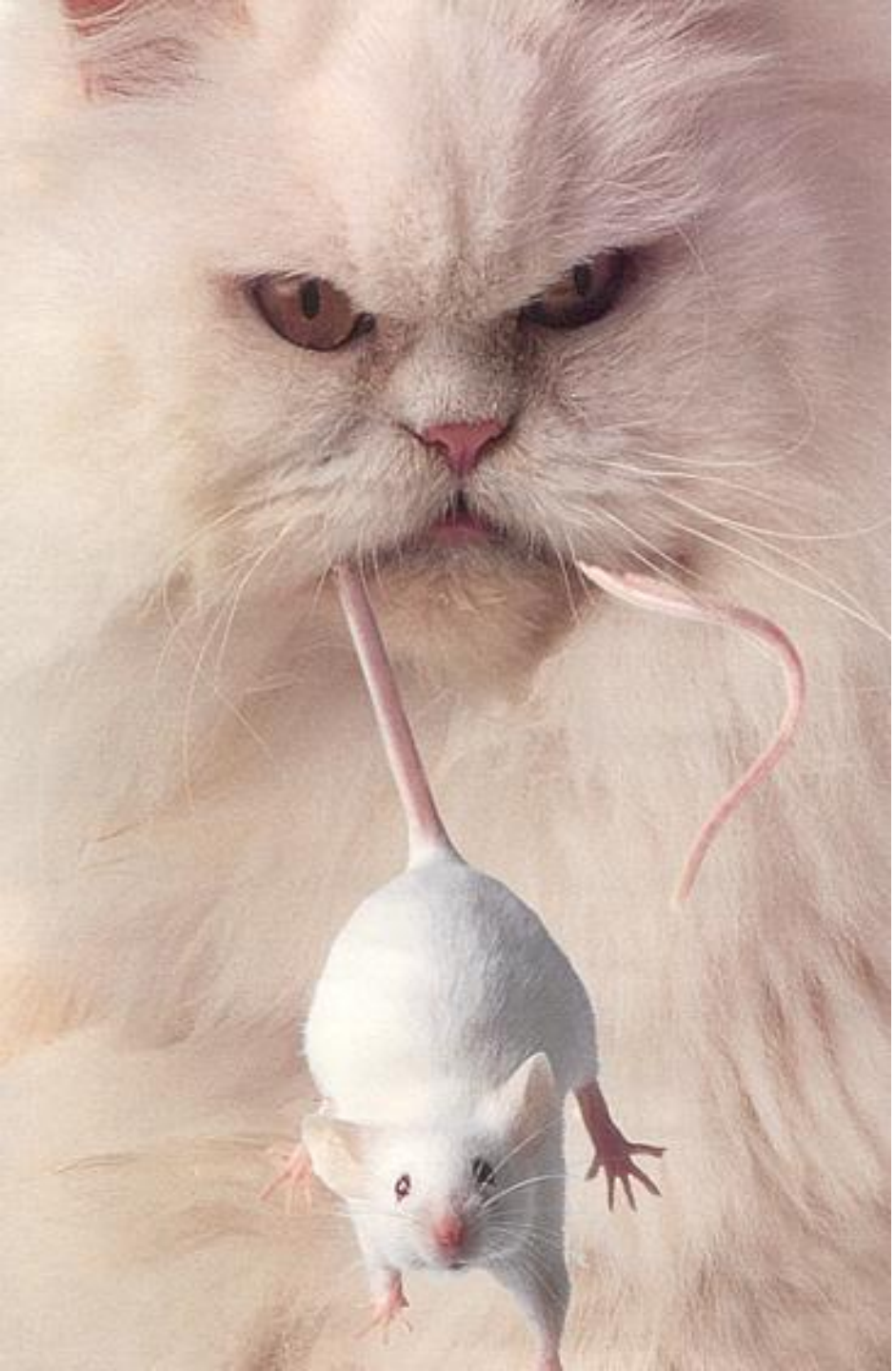

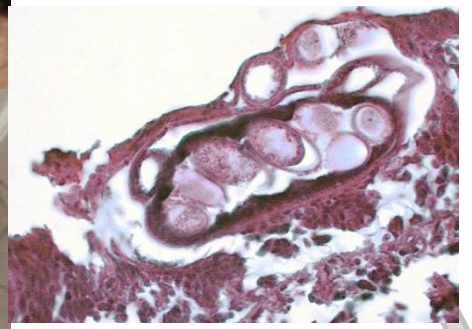

a

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b

c

Veterinary Parasitology 163 (2009) 263

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Editorial

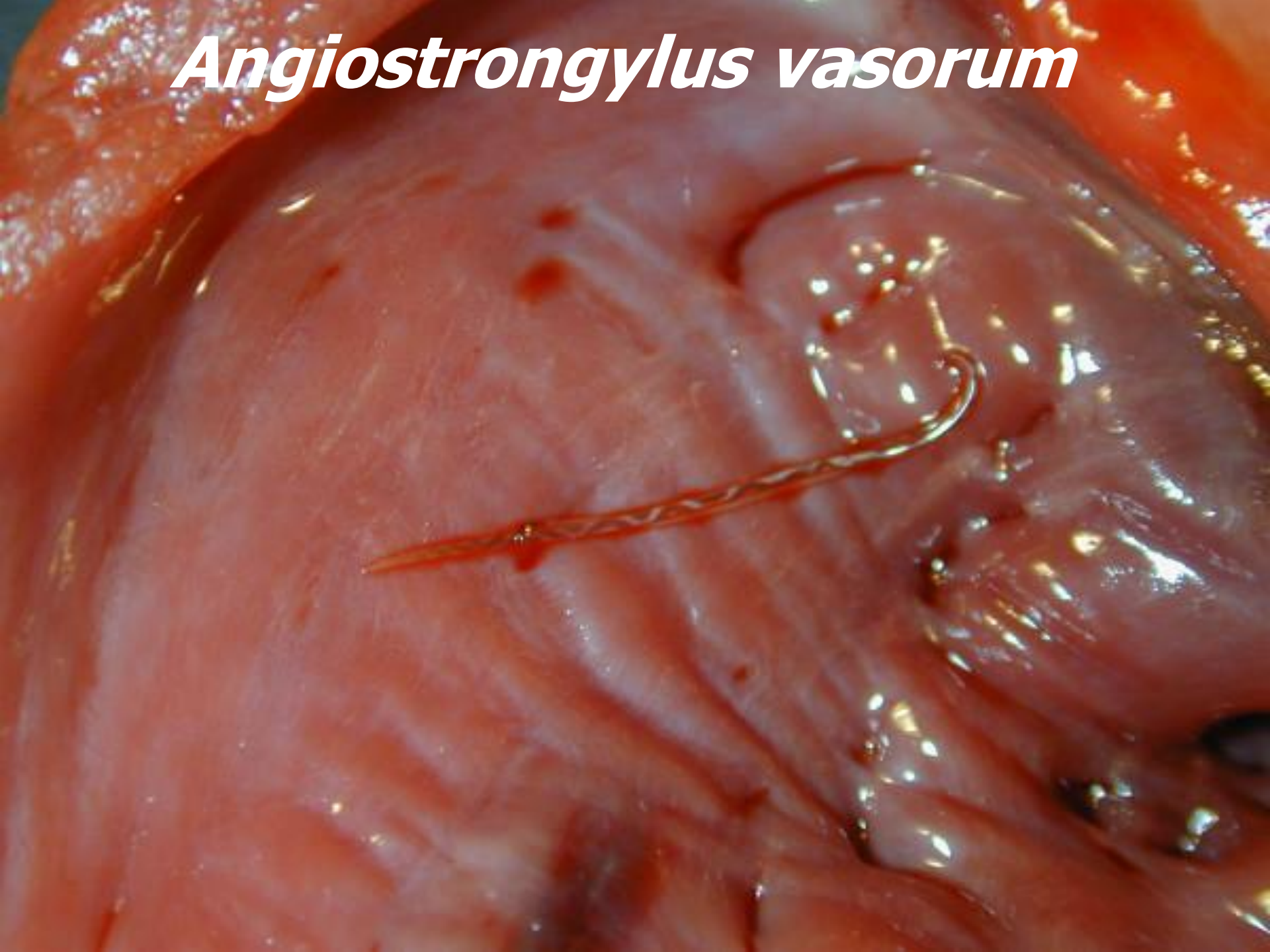
Veterinary parasitology and climate change

Richard Wall*
Eric Morgan
Veterinary Parasitology & Ecology Group, School of Biological Sciences, University of Bristol, Woodland Road, Bristol BS8 1UG, United Kingdom

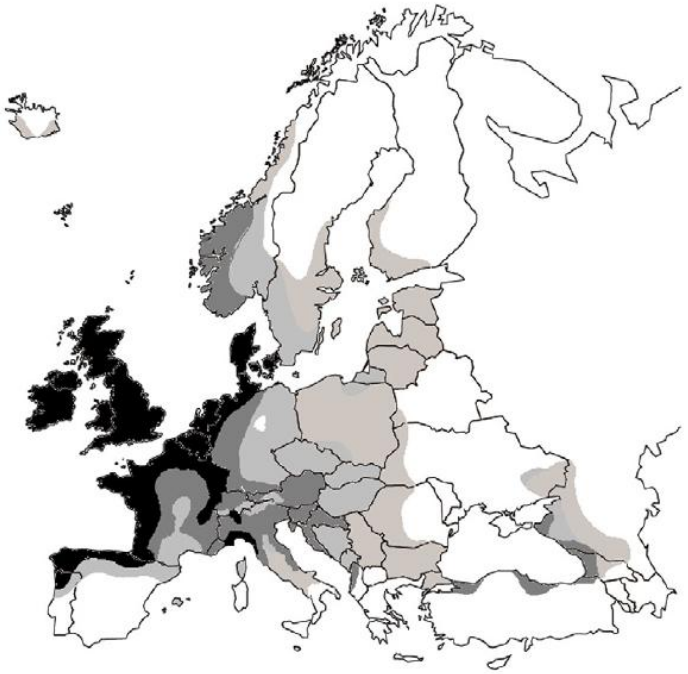
(Apparente?) emergenza dei parassiti cardiopolmonari dei cani e gatti sia in aree endemiche sia in regioni in precedenza indenni

-global warming
-modifiche nella dinamica stagionale dei vettori
-movimentazioni degli animali
-alterazioni dell'habitat della fauna selvatica
-incremento dell'attenzione da parte dei medici veterinari

Angiostrongylus vasorum



Review in Traversa *et al.*, 2010



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journal homepage: www.elsevier.com/locate/parint

Canine pulmonary angiostrongylosis: The influence of climate on parasite distribution

Eric R. Morgan [a,b,*], Ryan Jefferies [a,b], Madeleine Krajewski [a], Peter Ward [a], Susan E. Shaw [b]

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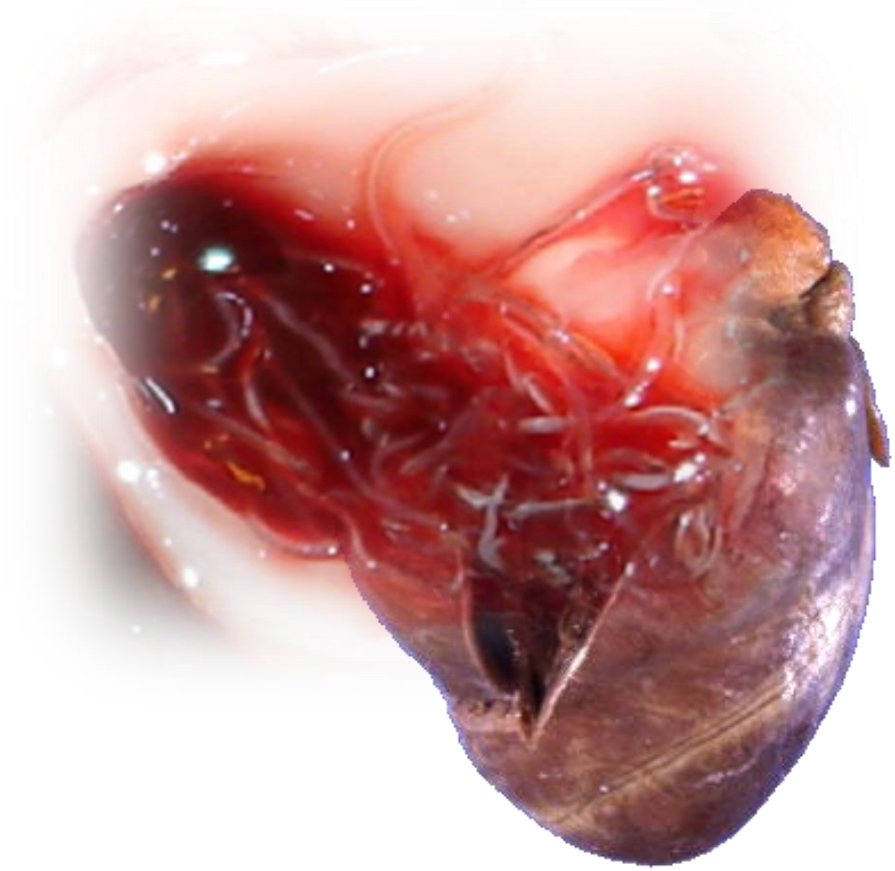
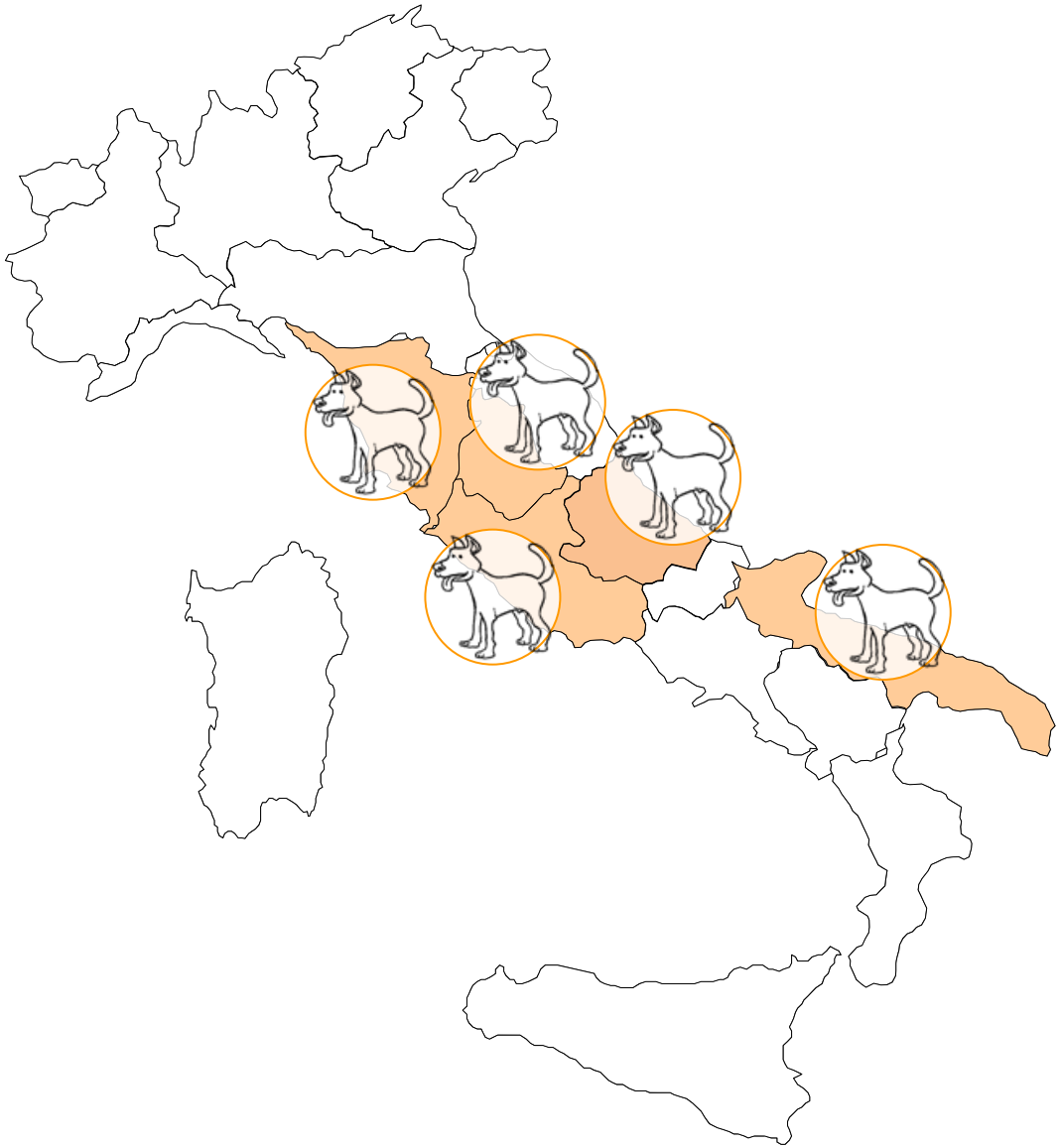
[b] School of Clinical Veterinary Science, University of Bristol, Langford House, Langford, North Somerset, BS40 5DU, UK



Angiostrongylus vasorum – Diffusione anni '80

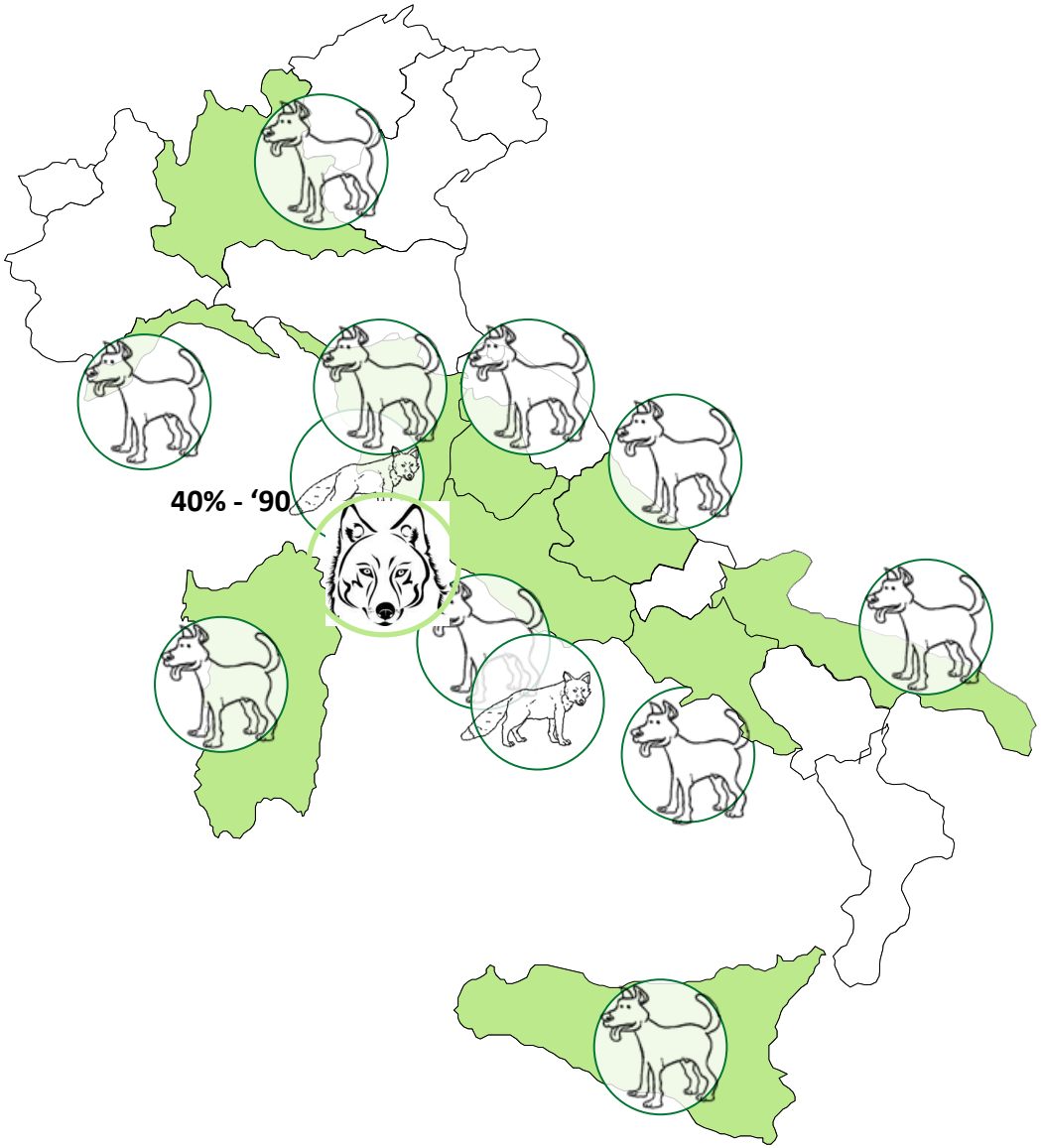
Angiostrongylus vasorum – Diffusione 2002/2010



→ **No dati prevalenza**

Della Santa et al., 2002; Scaramozzino et al., 2007; Traversa et al., 2008; Sasanelli et al., 2008; Di Cesare et al., 2010; Veronesi et al., com. pers

Angiostrongylus vasorum – Diffusione 2011/2014



2011-2013: 3,75-9,9% Abruzzo

2012: 12% Campania

2013: 2% Lazio

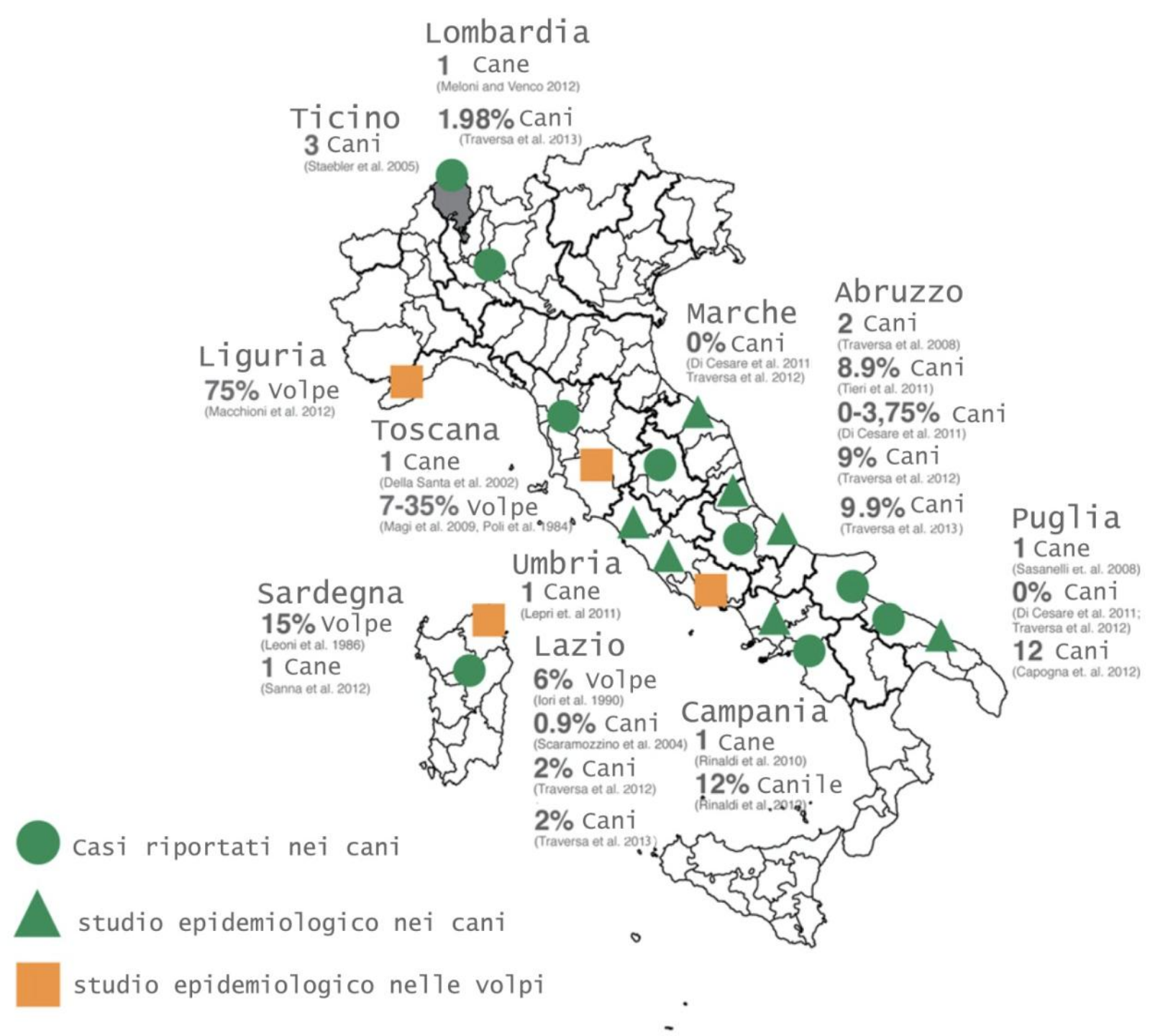
2013: 0,4% (2008-2010) Toscana

2013: 16,7% Abruzzo

2014: 3,4% Sardegna

2007-2013: 43.5 %

Della Santa et al., 2002; Scaramozzino et al., 2007; Traversa et al., 2008, 2010; Sasanelli et al., 2008; Di Cesare et al., 2010; Paradies et al., 2010; Lepri et al., 2011; Tieri et al., 2011; Rinaldi et al., 2012; Riggio et al., 2013 ; Eleni et al., 2014; Brianti com pers.



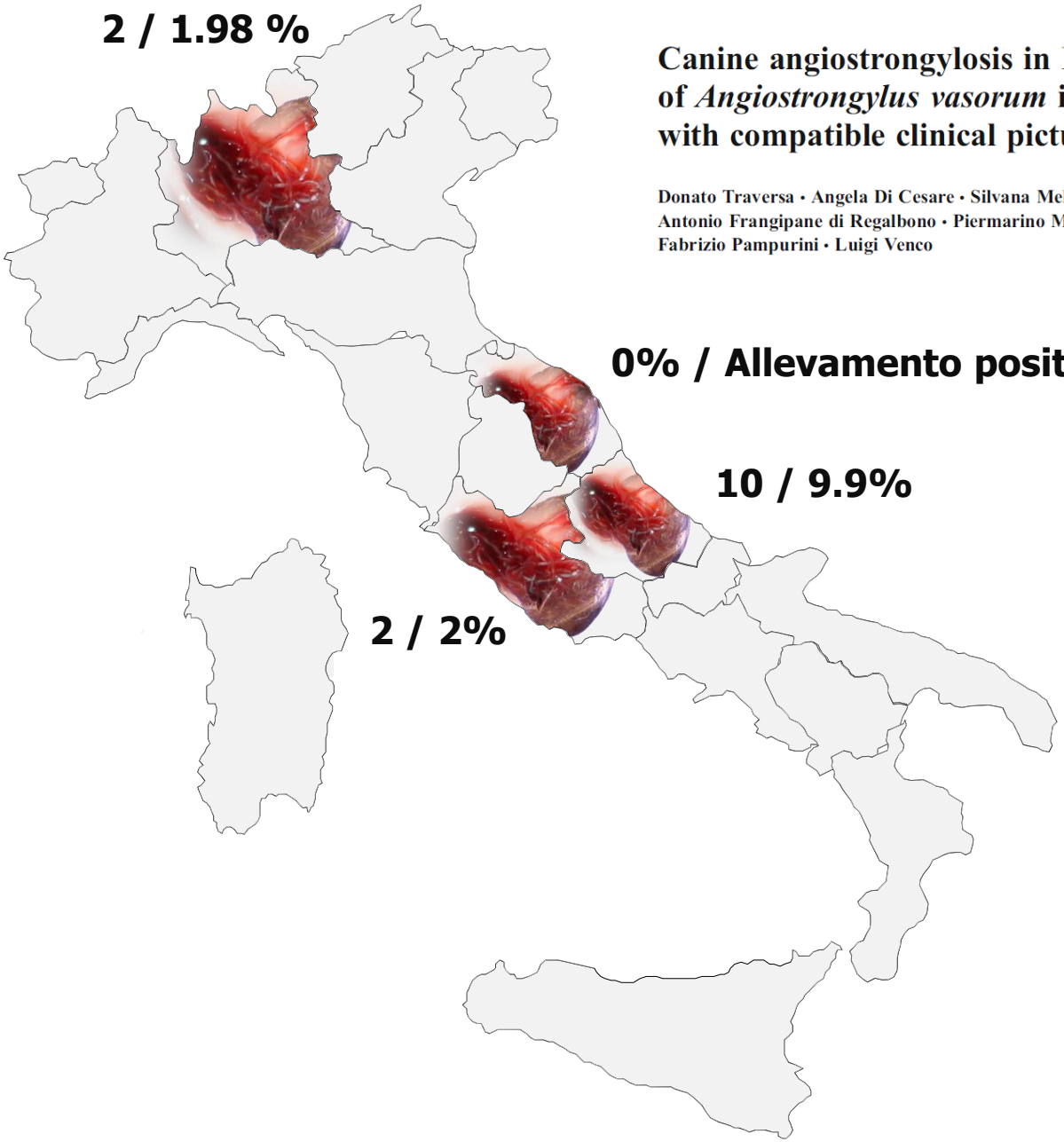
Guardone et al., 2013

Parasitol Res
DOI 10.1007/s00436-013-3412-5

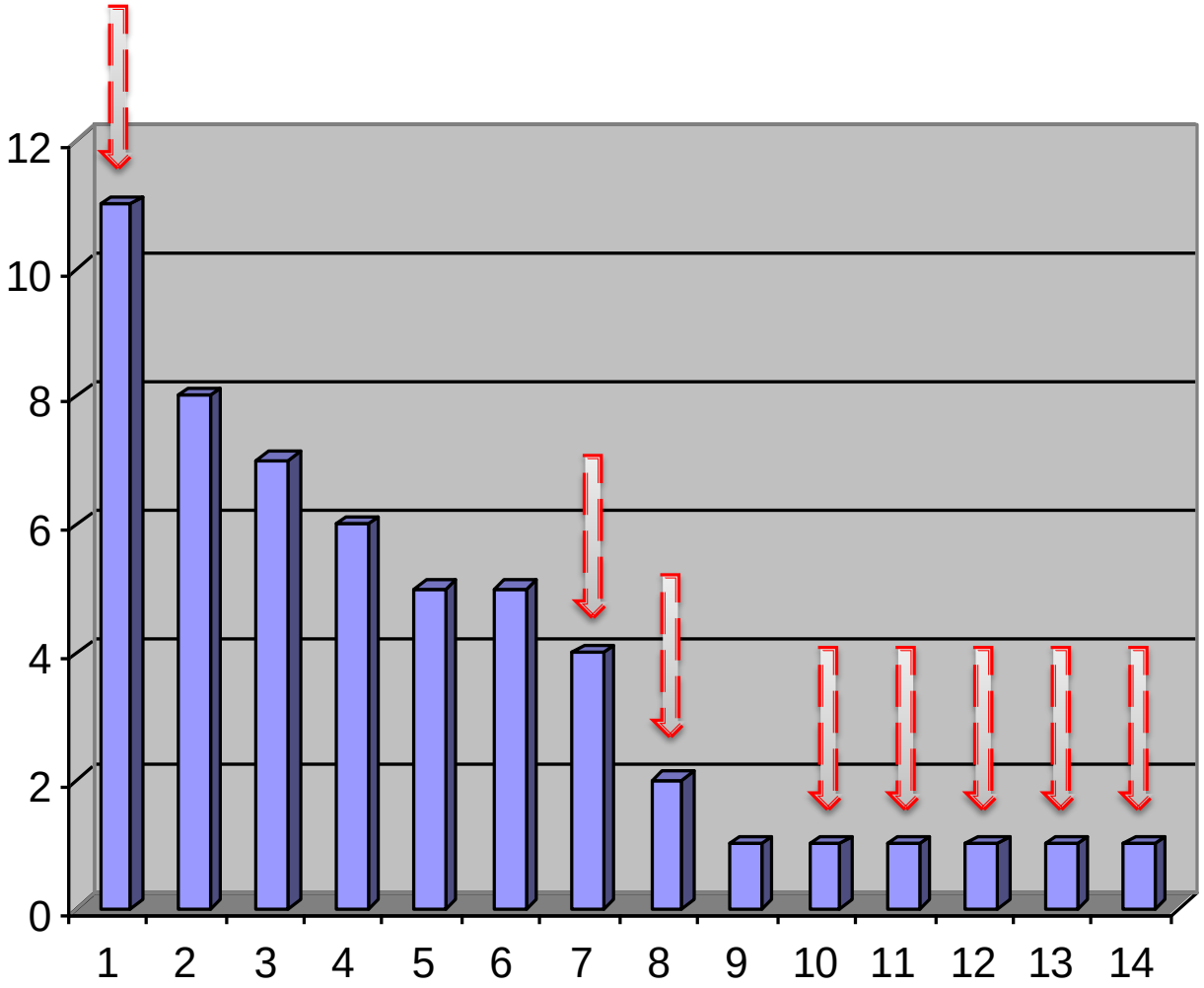
ORIGINAL PAPER

Canine angiostrongylosis in Italy: occurrence of *Angiostrongylus vasorum* in dogs with compatible clinical pictures

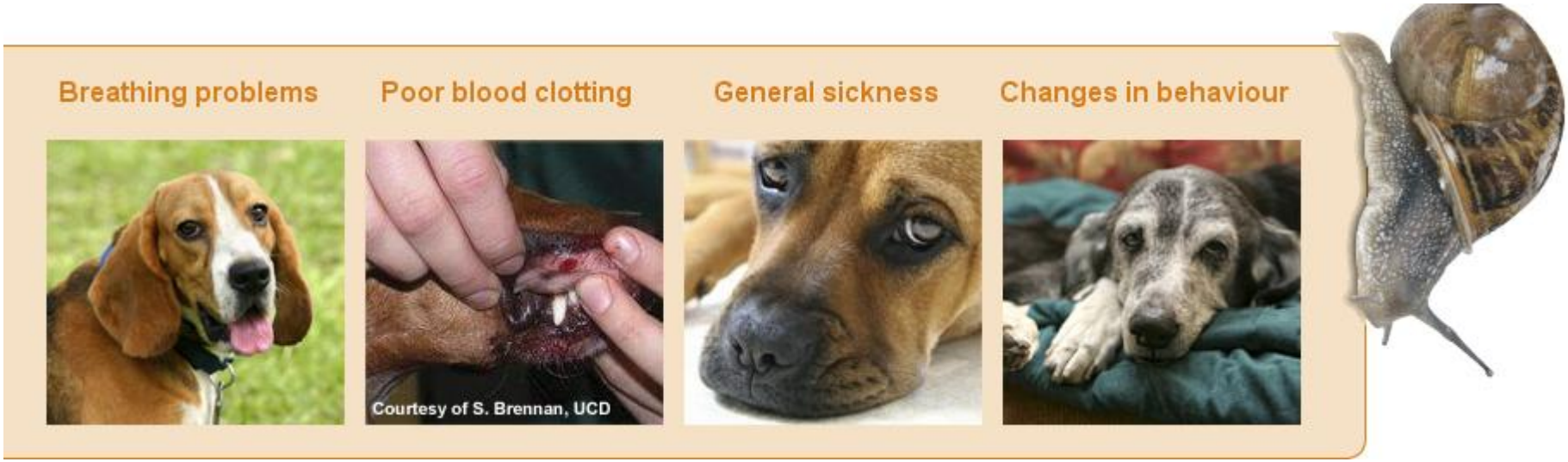
Donato Traversa · Angela Di Cesare · Silvana Meloni · Antonio Frangipane di Regalbono · Piermarino Milillo · Fabrizio Pampurini · Luigi Venco



1. **Tosse**
2. **Cattive condizioni generali**
3. **Intolleranza all'esercizio**
4. **Scarso rendimento**
5. **Letargia**
6. **Perdita di peso**
7. **Dispnea**
8. **Rumori respiratori**
9. **Vomito**
10. **Murmure rinforzato**
11. **Tachipnea**
12. **Disturbi della coagulazione**
13. **Pallore delle mucose**
14. **Diarrea emorragica**



La grande imitatrice....



Tosse

Affaticabilità

Sanguinamento eccessivo anche da piccole ferite

Epistassi

Sanguinamento oculare

Anemia

Perdita di peso

Anoressia

Vomito

Diarrea

Depressione

Facile affaticabilità

Crisi epilettiche

SINTOMI CARDIOPOLMONARI + COAGULOPATIE

I sintomi respiratori più comuni sono TOSSE, DISPNEA E TACHIPNEA *(Flogosi , Trombosi dei vasi polmonari, Ipertrofia della muscolatura dei vasi)*

IPERTENSIONE POLMONARE E INSUFFICIENZA CARDIACA DESTRA

Intolleranza all'esercizio, Ascite, Tachicardia, Mucose pallide , Dispnea, Sincope

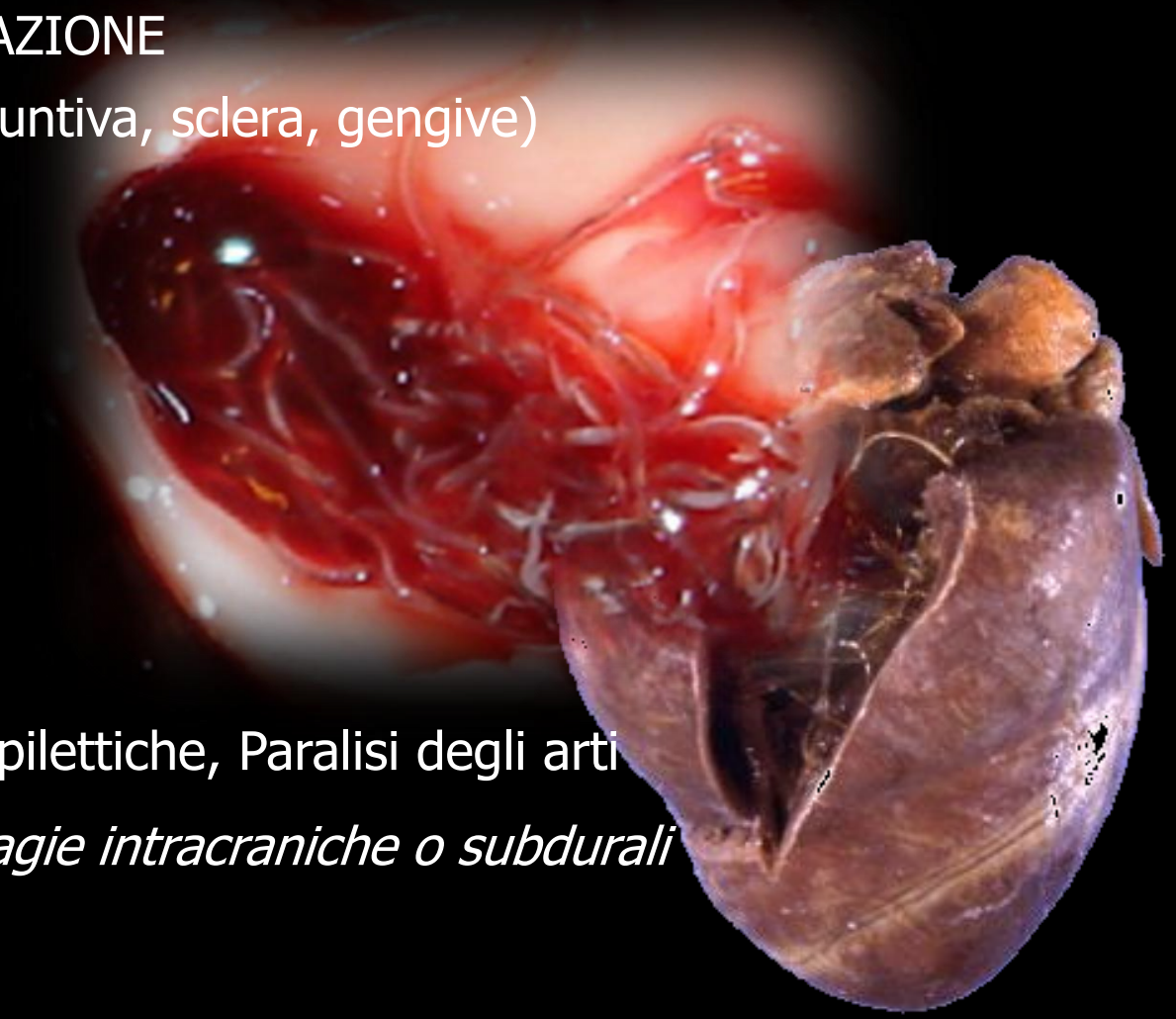
DISORDINI DELLA COAGULAZIONE

Emorragie petecchiali (congiuntiva, sclera, gengive)

Coagulopatie

Epistassi, Emottisi, Ematomi

Melena , Ematuria , Anemia



SINTOMI NEUROLOGICI

Atassia, Depressione, Crisi Epilettiche, Paralisi degli arti

Embolia uova/larve – emorragie intracraniche o subdurali

UVEITE

SINTOMI GASTROINTESTINALI

vomito, diarrea, anoressia, perdita di peso

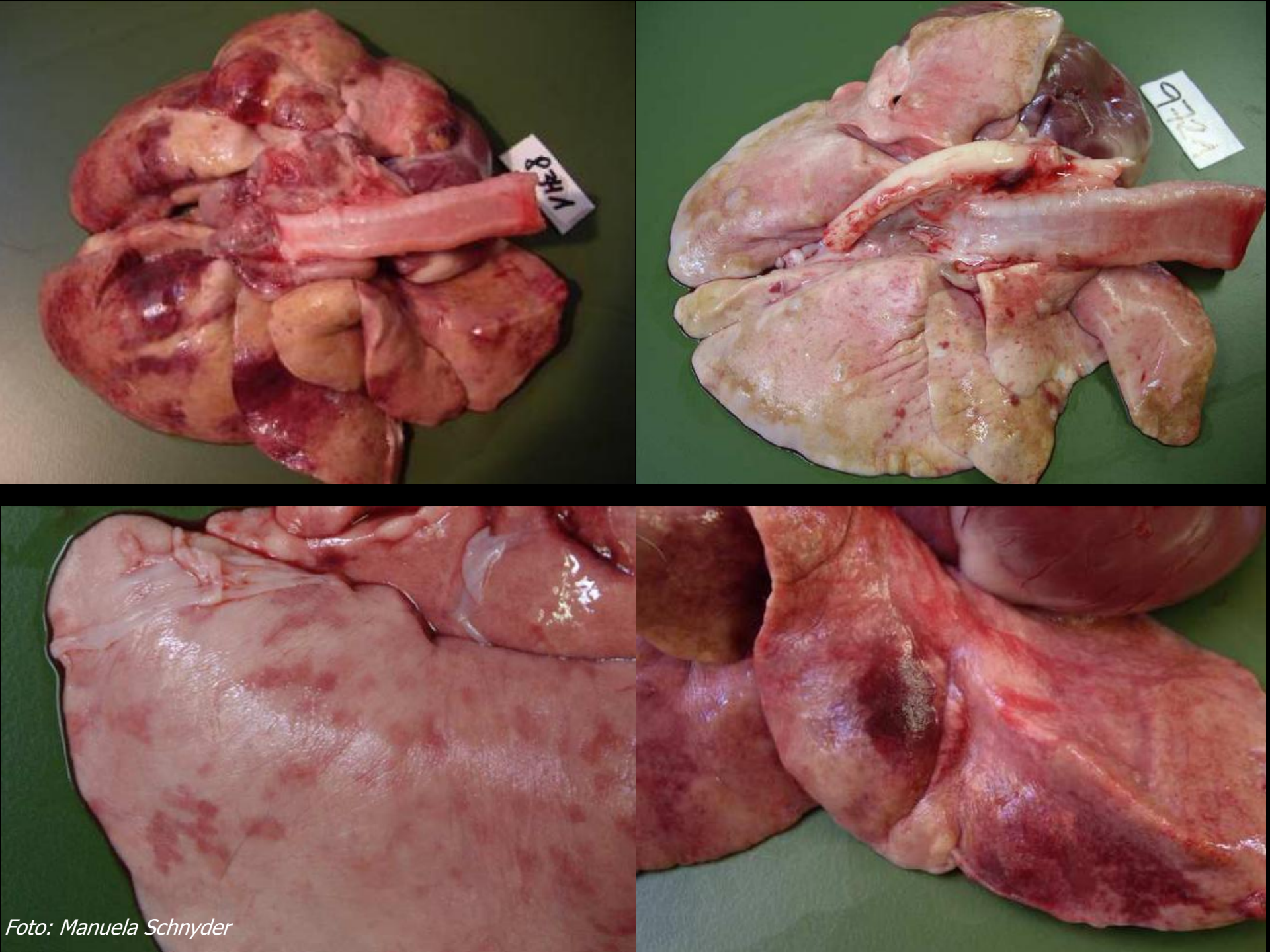


Foto: Manuela Schnyder

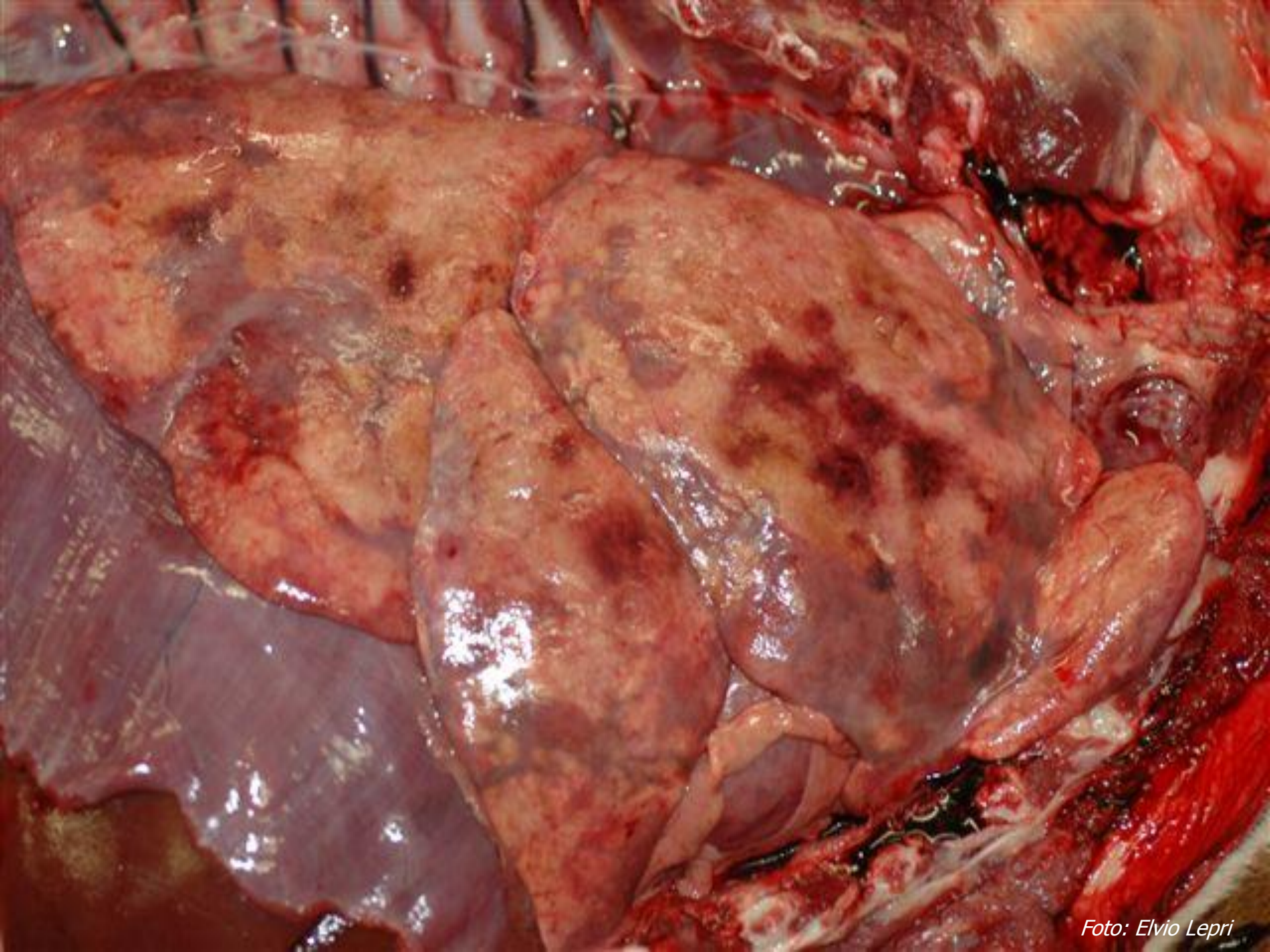


Foto: Elvio Lepri

Foto: Elvio Lepri

Foto: Elvio Lepri

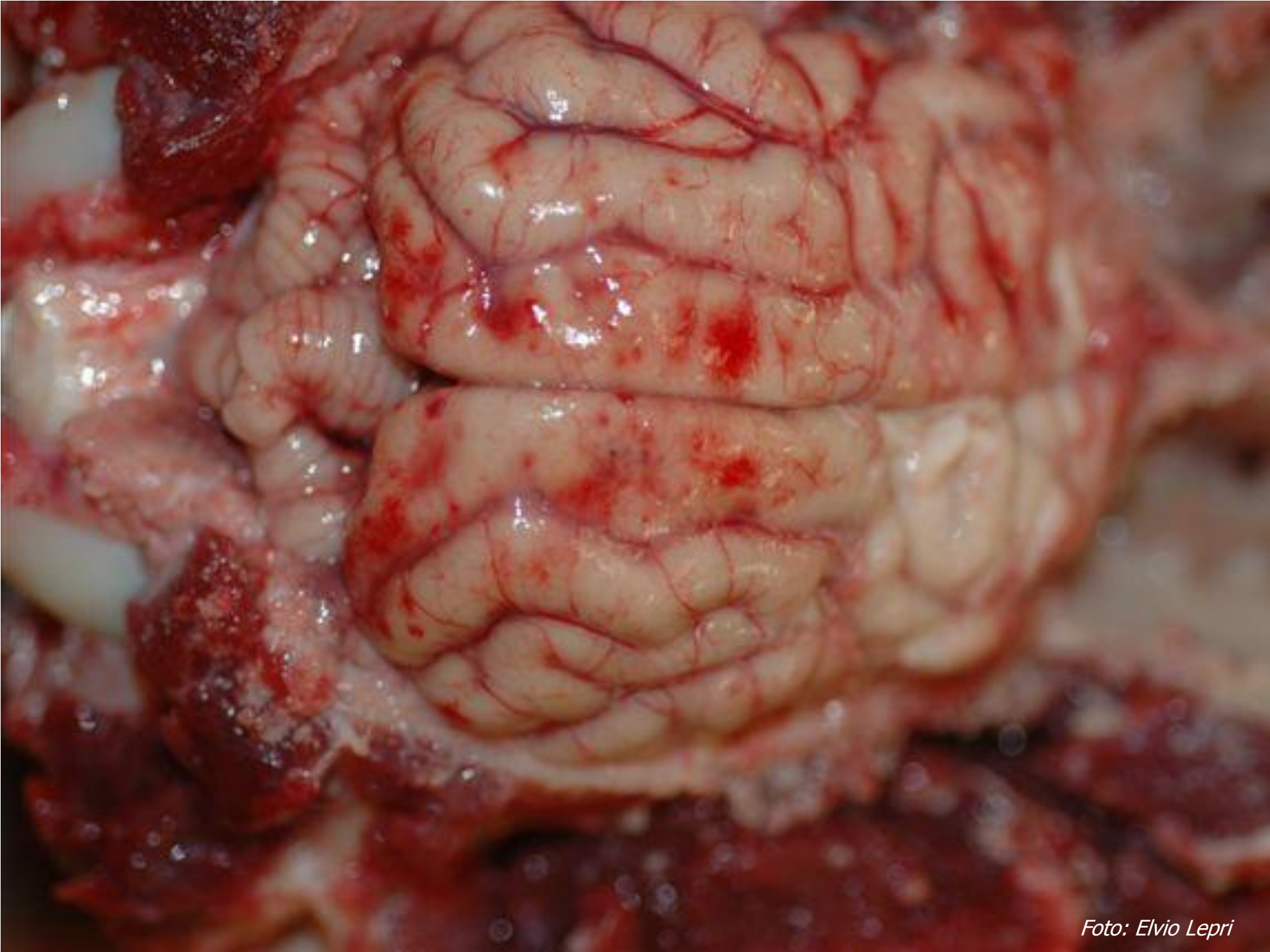


Foto: Elvio Lepri

Diagnosi differenziali

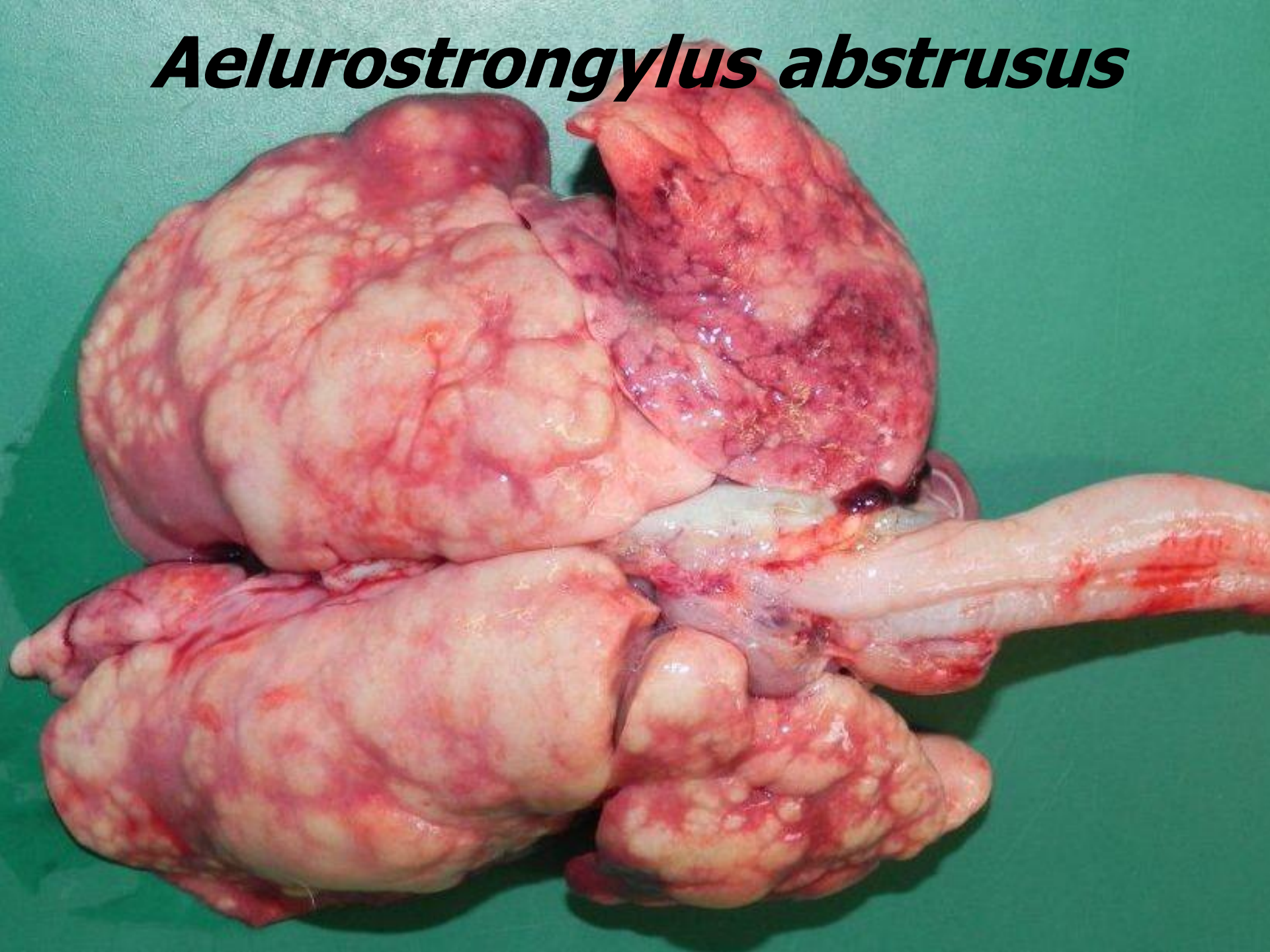
Tromboembolismo
(FCP, Ipercorticosurrenalismo, Anemie emolitiche, neoplasie)

Broncopatie

Intossicazione da rodenticidi

Neoplasie primarie (carcinomi bronchiali) o metastatiche

Aelurostrongylus abstrusus

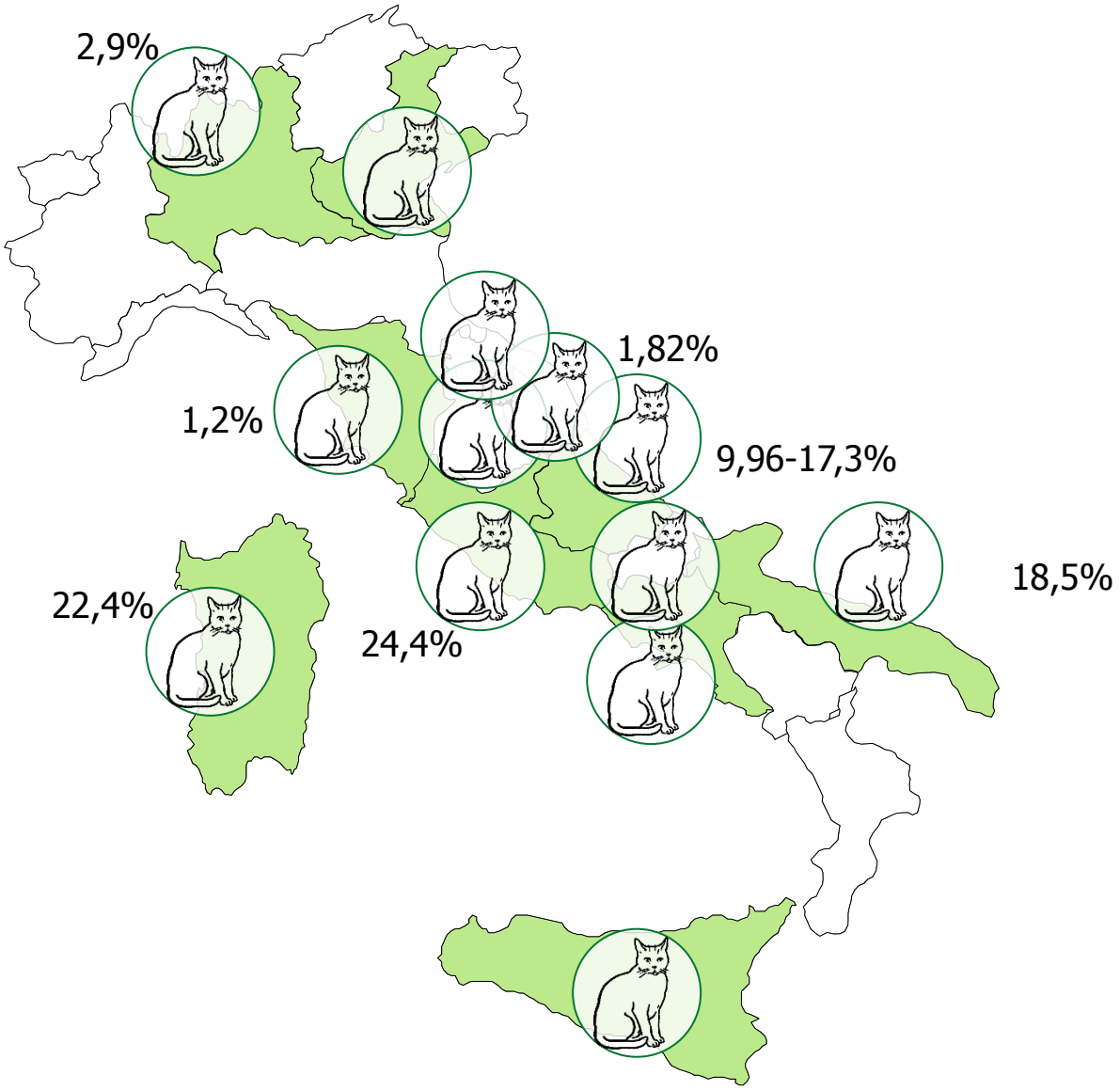


Review in Traversa *et al.*, 2010

2014

Singoli casi clinici

Prevalenza variabile



Macchioni *et al., 1979;* Gravino *et al., 1983;* Scala *et al., 2003;* Grandi *et al., 2005;* Traversa *et al., 2008, 2010;* Brianti *et al., 2008; Di Cesare et al., 2011; Riggio et al., 2013; Spada et al., 2013; Tamponi et al., 2014*

2015

Sintomatologia

- **Forme**
  - Asintomatiche
  - Subcliniche
  - Clinicamente manifeste
- **Sintomi respiratori variabili**
  - Autolimitanti
  - Lievi
  - Gravi
- **Forma cronica più comune**
- **Talvolta morte**

- Difficoltà respiratoria (91,6%)
- Tosse (79,1%)
- Sibili (66,6%)
- Starnuti (62,5%)
- Scolo nasale (41,6%)
- Dispnea (25%)
- Respirazione a bocca aperta (12,5%)
- Letargia (20,8%)
- Depressione (16,6%)
- Anoressia (16,6%)

Traversa *et al.*, 2008

- Affaticabilità
- Vomito
- Ipertermia
- Diarrea
- Disidratazione
- Perdita di peso
- Complicazioni cardiache
- Ipertensione polmonare

Poco comuni

Forme ad esito fatale

- Pneumotorace
- Accessi parossistici di tosse
- Paresi del treno posteriore
- Crisi simil-asmatiche

Foto: Dr. Elvio Lepri

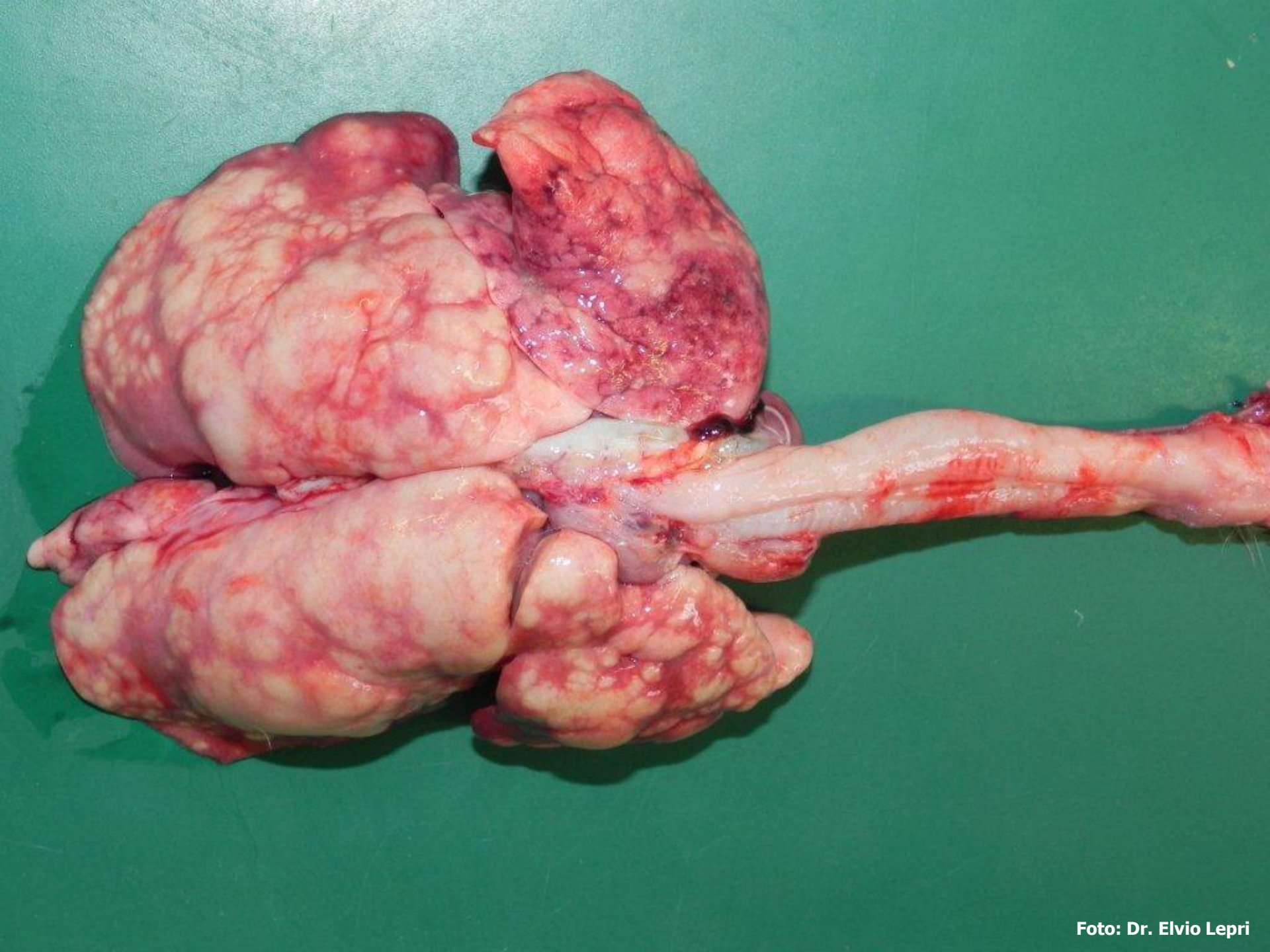


Foto: Dr. Elvio Lepri

STUDIES ON THE NEMATODES PARASITIC IN THE LUNGS OF FELIDAE IN PALESTINE

By Ch. B. Gerichter, M.Sc., Ph.D., *Government Central Laboratories, Jerusalem* *

(With 27 Figures in the Text)

Six species of metastrongyloid nematodes have been recorded from the respiratory organs of Felidae: (1) *Aelurostrongylus abstrusus* (Railliet, 1898) Cameron, 1927, from *Felis catus*; (2) *Broncho-strongylus subcrenatus* (Railliet & Henry, 1913) Cameron, 1931, from *Felis pardus* and *F. tigris*; (3) *Metathelazia californica* Skinker, 1931, from *Puma concolor hippolestes*; (4) *Metathelazia felis* (Vogel, 1928) Dougherty, 1943, from *Felis pardalis*; (5) *Metathelazia massino* (Davtian, 1933) Dougherty, 1943, from *Felis catus*; (6) *Troglostrongylus troglostrongylus* Vevers, 1923, from *Felis bengalensis*. In the course of investigations on Palestinian Felidae one of these species, *Aelurostrongylus abstrusus*, was found in addition to two new species, *Troglostrongylus brevior* n.sp., and *Anafilaroides rostratus* n.g., n.sp.

Aelurostrongylus abstrusus (Railliet, 1898) Cameron, 1927

(Figs. 1–10)

Mueller (1890) described this species, from the lungs of a cat, under the name of *Strongylus pusillus*. Railliet (1898) proposed a new name, *Strongylus abstrusus*, as *pusillus* proved to be preoccupied. Kamensky (1905) transferred it to his newly proposed genus *Protostrongylus*. Railliet & Henry (1907), ignoring the latter genus, transferred the species to the genus *Synthetocaulus*. Cameron (1927 *a*) found it necessary to create a new genus, *Aelurostrongylus*, for it and this status has been accepted by modern helminthologists.

Autopsy of seventy-three stray cats caught in Jerusalem showed that nineteen of them (i.e. 26 %) were infected with *A. abstrusus*. Cameron (1928) states that the adults are localized in the blood vessels of the lungs. He used to collect the specimens by ligating the vessels and subsequently opening them into a container. Hobmaier & Hobmaier (1935) did not succeed, however, in finding the worms in the blood vessels, but always found them in the parenchyma. The present author made several attempts to follow the technique of Cameron, but always with negative results. In all cases the worms were embedded in the parenchyma of the lungs. The diseased foci, whitish and swollen, reach 1–2 cm. in diameter, and are conspicuous by their state of hepatization. In addition to adult worms the tissue of these foci contains eggs in all stages of development, as well as first stage larvae. The adult worms are fragile and are so intimately embedded in the tissue that they usually break during extraction. The author was, however, successful in removing several score of unbroken specimens.

The worms are minute, thin, and enclosed in a teguminal sheath.† The oral opening is central in position and triangular in shape. There is no oral capsule. Around the oral opening (Fig. 1) there are six low perityls.‡ There is a minute papilla situated on the top of each perityl, and the six papillae constitute the internal circle of circumoral papillae. The external circle of papillae consists of four pairs of sublateral papillae and of two ventro-lateral papillae. All papillae are small, and in each of the sublateral pairs, the ventro-ventrals and the dorso-dorsals are smaller than the corresponding latero-dorsals and latero-ventrals. The ventro-laterals are so small that they may often be seen only with difficulty. Thus, there are a total of sixteen papillae in addition to two small amphids. The oesophagus is club-shaped. The excretory pore opens at the beginning of the last third of the oesophagus. The excretory gland is long.

Male. Length, 5·2–6·0 mm.; maximum width, 0·054–0·064 mm. Oesophagus, 0·24–0·27 mm. long

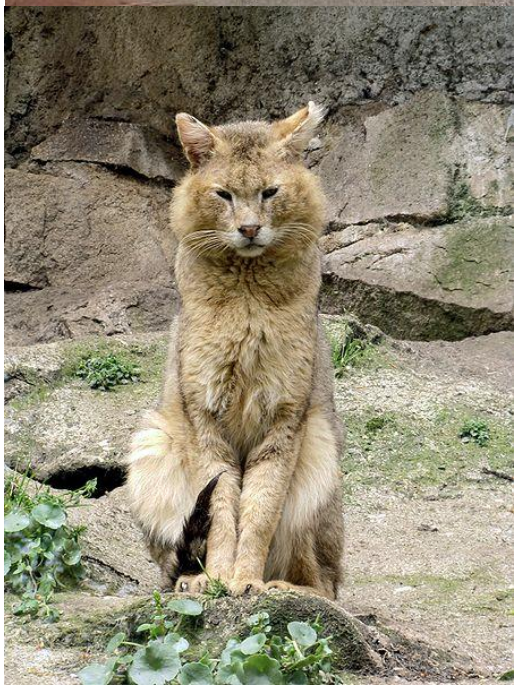
* This study was carried out in the Department of Parasitology, Hebrew University, Jerusalem. The author wishes to express his appreciation to Dr G. G. Witenberg for helpful advice and criticism.

† This term denotes a loose membranous sheath enveloping the whole body of the worm, firmly attached to it only around the oral, excretory and genital openings. The teguminal sheath occurs in all Metastrongyloidea, and, although not discussed by other authors, has been reproduced in accurately prepared drawings of several species.

‡ The author is indebted to Dr G. Witenberg for the suggestion of this term. It denotes immobile lip-like projections surrounding the oral aperture of nematodes, which take no part in the closing or opening of the oral aperture or in the process of taking food, and may, indeed, be situated at some distance from the oral aperture. It would therefore be misleading to call such projections 'lips'. In some nematodes they are developed in addition to true lips. They are not homologues of *pseudolabia* or *myolabia*. They occur in many Metastrongyloidea.

Troglostrongylus brevior

1949



Troglostrongylus subcrenatus

1961

THE VETERINARY RECORD February 4th, 1961 Vol. 73 No. 5

Bronchostrongylus subcrenatus (Railliet & Henry, 1913) a new Parasite Recorded from the Domestic Cat

BY

W. M. FITZSIMMONS

Commonwealth Bureau of Helminthology, St. Albans, Herts.

SUMMARY.—This paper places on record for the first time the occurrence in the cat of the lungworm Bronchostrongylus subcrenatus hitherto only recorded from leopards and tigers. A brief account of what is known of its systematics and life-history is followed by a short description and a note on its differentiation from a similar lungworm of the domestic cat. The lungworms were collected from a cat in Blantyre, Nyasaland.

History

THIS species was first recorded by Railliet and Henry in 1913 as *Haemostrongylus subcrenatus* and the type host was given as *Felis pardus*, a leopard from the Belgian Congo. It was recorded a second time by Cameron, in 1931 from a Malayan tiger in the Edinburgh Zoological Gardens. He named a new genus, *Bronchostrongylus* Cameron, 1931, for its reception.

Life-history

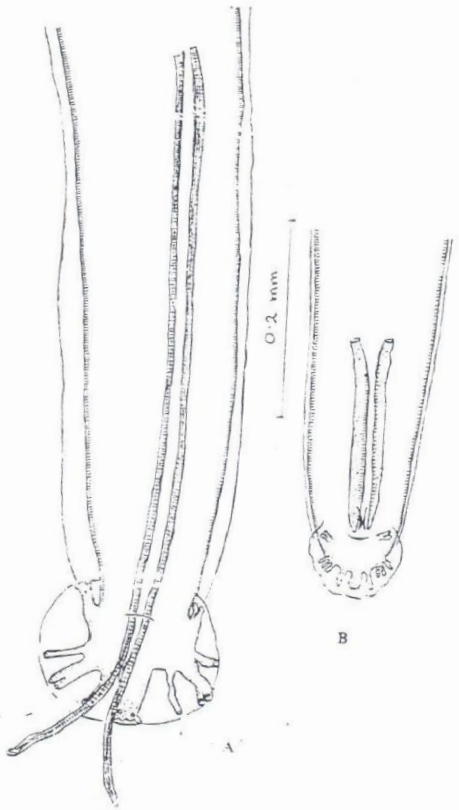
The life-cycle for the genus has been worked out by Gerichter for *Bronchostrongylus brevior* (Gerichter, 1948) a parasite of *Felis ocreata* and *Caracal caracal*. First-stage larvae appear in the faeces of the host and are able to survive in water for 3 to 4 weeks at 16° to 20° C. They enter a molluscan intermediate host and, at optimum temperatures of 22° to 27° C. and in a suitable mollusc, infective larvae appear on the eighth day. First-stage larvae appeared in the faeces of an experimental kitten 28 days after it had been fed snails containing infective larvae. The following molluscs were used by Gerichter: *Cleopatra septemdentata*, *Helicella candidula*, *H. vestalis joppensis*, *Monacha syriaca*, *Retinella nitellina*, *Theba pisana*, and *Limax flavus*. Gerichter also demonstrated that mice may act as an auxiliary or transport host for infective larvae by eating an infected snail and then carrying encysted infected larvae on the surface of the lungs for at least 120 days.

Short Description

Buccal capsule absent, mouth surrounded by 6 small lips, 4 larger sublateral and 2 smaller lateral. Oesophagus club-shaped, from 290 to 335μ long. Cuticle conspicuously inflated at anterior end of body, a ventral transverse cuticular groove present at about the level of the middle of the oesophagus.

Male 10 to 12.5 mm. long. Spicules finely striated, slender and flanged, 780 to 940μ long. Gubernaculum absent. Bursa inconspicuous and supported by short stumpy rays.

Female 20 to 23 mm. long. Tail conical and bluntly pointed, 190 to 250μ long. Vulva slightly behind the middle of the long axis of the body. Embryonated eggs measure 75 to 85μ by 45 to 54μ.



A.—*Bronchostrongylus subcrenatus*.
B.—*Aelurostrongylus abstrusus*. Posterior extremity of male, ventral view, showing bursa and spicules.

Bronchostrongylus subcrenatus bears a superficial resemblance to another lungworm of cats, *Aelurostrongylus abstrusus* (Railliet, 1898). The most

1959

SEGNALAZIONE, IN ITALIA CENTRALE, DI *TROGLOSTRONGYLUS* SP. PARASSITA DEI POLMONI DI FELIDI

LIA PAGGI

(*Istituto di Parassitologia dell'Università di Roma - Direttore E. Biocca*)

Nei bronchi di due gatti, catturati rispettivamente nella zona di Riano (Prov. di Roma) e nelle vicinanze di Grosseto (Prov. di Grosseto), di cui uno certamente selvatico (*Felis silvestris*), l'altro con caratteri non tipici di *Felis silvestris* (quindi probabilmente gatto domestico inselvatichito) abbiamo rinvenuto nematodi borsati che, per la posizione della vulva, per la disposizione dei raggi della borsa e per la forma degli spicoli sono stati attribuiti al genere *Troglostrongylus* Vevers, 1923. La posizione sistematica del genere *Troglostrongylus* è stata oggetto, proprio in questi ultimi anni, di alcune controversie. Infatti i generi *Bronchostrongylus*, *Crenosoma*, *Dictyocaulus*, *Heterostrongylus*, *Otostrongylus*, *Skrjabingylus* e *Troglostrongylus* sono stati separati dagli altri generi della famiglia *Metastrongylidae* in base alla posizione della vulva, situata in questi a circa la metà del corpo mentre in tutti gli altri essa si trova in prossimità dell'estremità caudale. Questi generi venivano pertanto riuniti nella sottofamiglia *Skrjabingylinae* Skrjabin, 1933.

Dougherty nel 1945 e poi nel 1949 criticava la posizione sistematica in cui erano stati collocati questi sette generi e proponeva di trasferirli dalla famiglia *Metastrongylidae* alla famiglia *Trichostrongylidae*. Egli proponeva ciò in base alla struttura della vagina, nella quale l'Autore vedeva delle omologie con quella dei Trichostrongili e in base alla posizione equatoriale della vulva. Gerichter nel 1949 non ritenne sufficienti gli argomenti portati dal Dougherty per giustificare il trasferimento di questi generi alla famiglia *Trichostrongylidae* soprattutto per i seguenti caratteri che, secondo lui, dimostravano invece l'affinità di questi generi con la famiglia *Metastrongylidae:* 1) somiglianza morfologica tra le larve; 2) somiglianza dei cicli biologici; 3) disposizione delle papille circumorali; 4) riduzione del raggio dorsale. Lo stesso Dougherty nel 1951 accettava gli argomenti portati dal Gerichter e ammetteva che questi generi fossero più esattamente attribuibili alla famiglia *Metastrongylidae*.

Il genere *Troglostrongylus* si distingue dagli altri soprattutto per la disposizione dei raggi della borsa e per la natura degli spicoli. A questo genere appartengono solo quattro specie e precisamente *Troglostrongylus troglostrongylus* Vevers, 1923, *T. delicatus* Travassos, 1946, *T. brevior* Gerichter, 1949 e *T. wilsoni* (Stough, 1953). Queste specie si distinguono tra di loro soprattutto per la disposizione dei raggi della borsa.

I parassiti da noi trovati e precisamente 1 ♂ e 1 ♀ in un gatto e 2 ♂ e 2 ♀ interi e alcuni frammenti nell'altro, avevano i caratteri morfologici fondamentali descritti da Gerichter (1949) per la specie *Troglostrongylus brevior*, la cui descrizione originale del Gerichter qui riportiamo:

«Maschio. Lunghezza 6,6-7,2 mm; larghezza massima 0,20-0,23 mm. Lunghezza dell'esofago 0,24-0,27 mm. L'intestino è rettilineo e decorre parallelamente al tubo genitale. La borsa è ben sviluppata e presenta un raggio dorsale allungato-ovale con quattro papille alla sua estremità, due delle quali sono ventrali e due laterali. I raggi esterno-dorsali sono separati mentre i postero e medio laterali sono uniti, eccetto che nella parte distale. Gli antero-laterali sono separati e i ventrali sono fusi eccetto che per il loro terzo distale.

PARASSITOLOGIA, VOLUME 1 NUMERO 1
APRILE 1959

2010

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Short communication

Aelurostrongylus abstrusus and *Troglostrongylus* sp. (Nematoda: Metastrongyloidea) infections in cats inhabiting Ibiza, Spain

Ryan Jefferies[a,*], Majda Globokar Vrhovec[b], Nicole Wallner[c], David Roman Catalan[c]

[a] School of Biological Sciences, University of Bristol, Woodland Road, Bristol, BS8 1UG, United Kingdom
[b] Vet Med Labor GmbH, Division of IDEXX Laboratories, Mörikestr. 28/3, D-71636 Ludwigsburg, Germany
[c] Ibican Clinica Veterinaria, Av de la paz/Rotonda de Can Misses, 07800 Ibiza, Baleares, Spain

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Spain
Ibiza

ABSTRACT

Multiple species of metastrongylid lungworm (Nematoda: Metastrongyloidea) have been reported to infect members of the Felidae. This study describes two metastrongylid species infecting cats in Ibiza, Spain, including clinical features of infection and diagnosis via morphological and molecular characterisation of larval stages. Cats ($n = 7$) presented with suspect lungworm infection, exhibiting coughing and other respiratory signs of infection. Faecal samples were collected from each cat and were subjected to the Baermann method for the detection of first stage larvae. In four cats, two different species of larvae were observed on the basis of morphology and were further molecularly characterised by PCR and sequencing of the 18S rRNA gene. Sequence data confirmed the presence of *Aelurostrongylus abstrusus* and an unknown species of *Troglostrongylus*. Molecular characterisation of *Oslerus rostratus* is also reported for the first time. Given the diversity of metastrongylid species capable of infecting cats, and morphological similarity of larval stages, an emphasis should be placed on the use of molecular characterisation for accurate diagnosis of infection.

Brianti *et al. Parasites & Vectors* 2012, **5**:178
http://www.parasitesandvectors.com/content/5/1/178

Parasite & Vecto

RESEARCH **Open Acce**

Troglostrongylus brevior and *Troglostrongylus subcrenatus* (Strongylida: Crenosomatidae) as agents of broncho-pulmonary infestation in domestic cats

Emanuele Brianti[1*], Gabriella Gaglio[1], Salvatore Giannetto[1], Giada Annoscia[2], Maria Stefania Latrofa[2], Filipe Dantas-Torres[2,3], Donato Traversa[4] and Domenico Otranto[2]

Abstract

Background: *Aelurostrongylus abstrusus* is currently regarded as the main metastrongyloid infesting domestic cats whereas the reports of *Troglostrongylus* spp. in domestic and wild felids largely remain anecdotic. This paper repo on pulmonary infestation caused by *Troglostrongylus brevior* and *Troglostrongylus subcrenatus* in two kittens and describes, for the first time, associated clinical presentations and pathological features. Morphometrical, molecular and phylogenetic analyses have also been conducted to differentiate here the examined *Troglostrongylus* species from *A. abstrusus*, towards a clearer delineation of metastrongyloids affecting cats.

Methods: Two kittens were referred for respiratory distress and hospitalized with a diagnosis of severe aelurostrongylosis, based on the presence of metastrongyloid larvae in the faeces. Despite prompt treatment, kittens died within 48 hours. Both kittens were submitted to necropsy to determine the cause of death.

Results: At necropsy, nematode specimens were found in the trachea, bronchi and bronchioles and were associated with respiratory signs (i.e., dyspnoea, polypnea, severe coughing and nasal discharge). Morphology and measurements of adult parasites found allowed the unequivocal identification of *T. brevior* and *T. subcrenatus*, eve if first stage larvae were rather similar to those of *A. abstrusus*. Briefly, *T. brevior* and *T. subcrenatus* larvae were shorter in length and lacking the typical knob-like terminal end of *A. abstrusus*. Molecular and phylogenetic analys corroborated morphological identification and provided data on mitochondrial and ribosomal DNA genes of *T. brevior*.

Conclusions: Data presented here indicate that *T. brevior* and *T. subcrenatus* may cause major respiratory distress domestic cats. Consequently, these two species should be included, along with *A. abstrusus*, in the differential diagnosis of cat bronchopulmonary affections and treatment protocols need to be evaluated. Through research o the biology, epidemiology and control of *Troglostrongylus* spp. infestations in domestic cats are advisable to implement current knowledge on these neglected metastrongyloids.

Keywords: *Aelurostrongylus abstrusus*, Cat, Diagnosis, Italy, Metastrongyloidea, Molecular biology, *Troglostrongylus brevior*, *Troglostrongylus subcrenatus*

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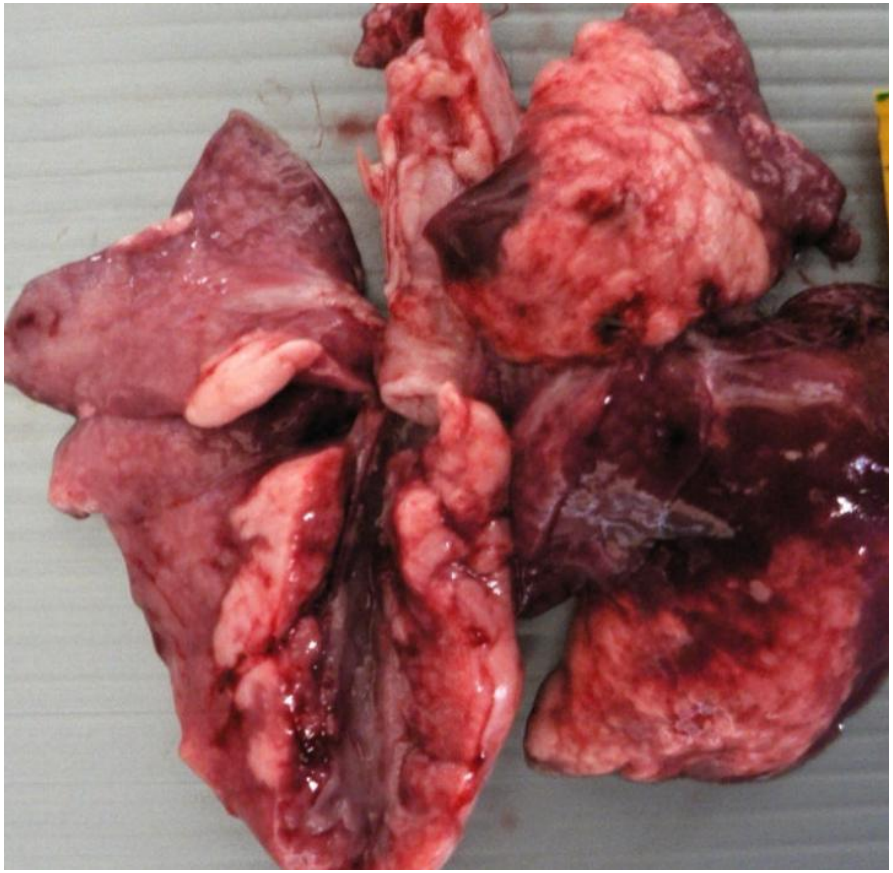
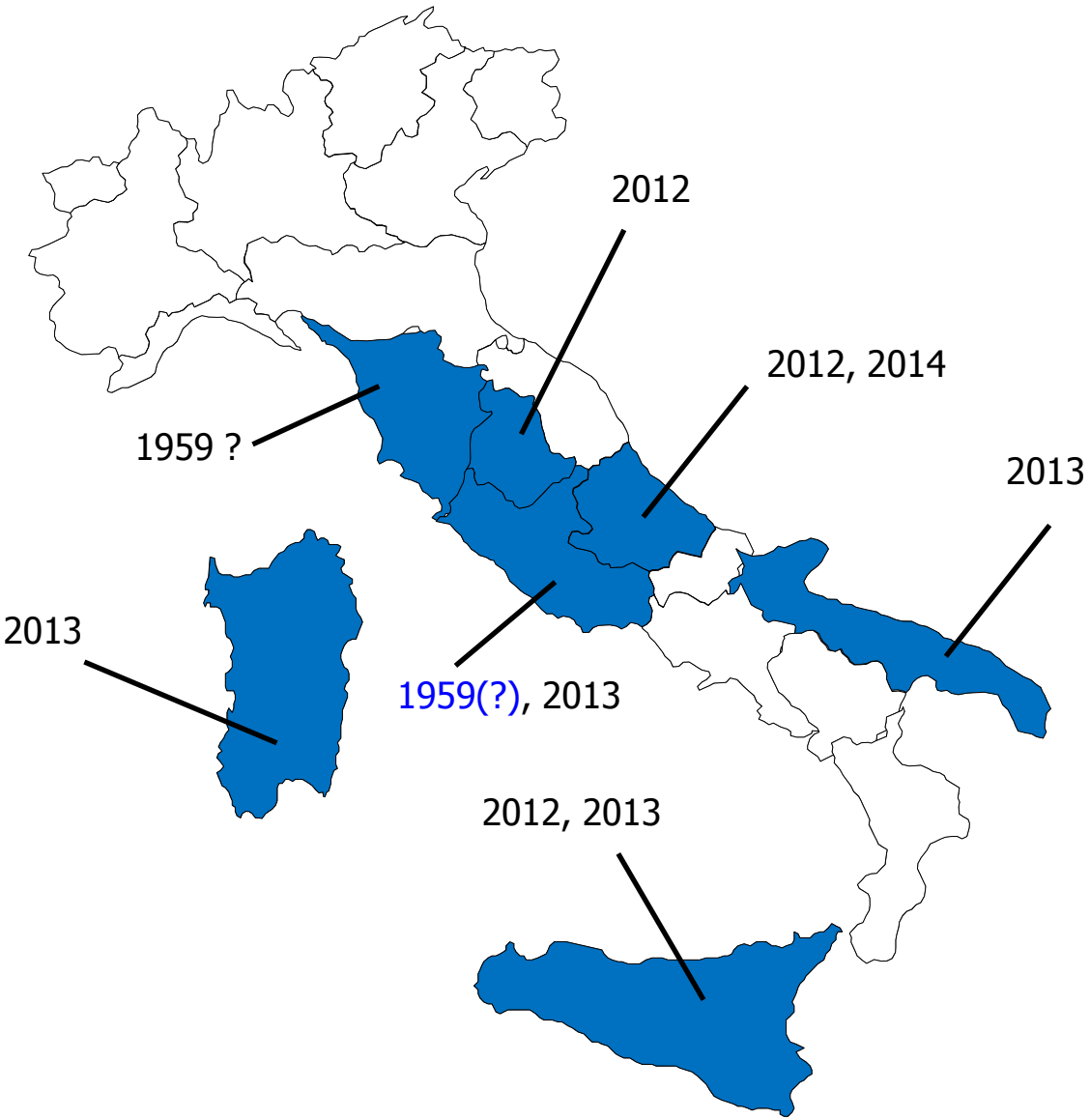
[1]Dipartimento di Sanità Pubblica Veterinaria, Facoltà di Medicina Veterinaria, Università degli Studi di Messina, Messina, Italy
Full list of author information is available at the end of the article



Troglostrongylus brevior



Paggi, 1959
Brianti et al., 2012, 2013
Di Cesare et al., 2013, 2014
Traversa and Veronesi, 2012, unp.
Tamponi et al., 2014
Traversa, 2012, unp.

Segnalazioni 2010-2014

2 gatti ~1.5-2 anni (*T. brevior*): infestazione subclinica con esito ignoto (Jefferies et al., 2010; Brianti et al., 2013)

1 gatto ~1 anno (*T. brevior-A. abstrusus*): **sintomatico,** trattamento efficace (Varcasia, 2013, com. pers.)

1 gattino ~6 mesi (*T. brevior*): **sintomatico,** esito ignoto (Jefferies et al., 2010)

2 gattini ~3 mesi (*T. brevior* e *T. subcrenatus*): **segni clinici severi e fatali** nonostante il trattamento (Brianti et al., 2012)

1 gattino ~1 mese (*T. brevior*): **segni clinici severi e fatali** (Brianti et al., 2013)

1 gattino ~1 mese (*T. brevior*): asintomatico, trattamento efficace (Brianti et al., 2013)

1 gattino ~1 mese (*T. brevior*): **segni clinici severi** , trattamento efficace (Brianti et al., 2013)

1 gattino ~8 mesi (*T. brevior-A. abstrusus*): asintomatico, trattamento efficace (Varcasia, 2013, com. pers.)

1 gattino ~2.5 mesi (*T. brevior-A. abstrusus*): **segni clinici severi e fatali** nonostante il trattamento (Di Cesare et al., 2014a)

1 gattino ~2.5 mesi (*T. brevior-A. abstrusus*): infestazione subclinica, trattamento efficace (Di Cesare et al., 2014a)

1 gattino ~2 mesi (*T. brevior-A. abstrusus*): **segni clinici severi**, trattamento efficace (Di Cesare et al., 2014b)

1 gattino ~2 mesi (*T. brevior-C. aerophila*): **segni clinici severi**, trattamento efficace (Di Cesare et al., 2014b)

Troglostrongylus brevior

Troglostrongylus brevior

Friuli Venezia Giulia: 47,1%
Beraldo et al., 2014

Centro-Sud Italia: 50%
Veronesi et al., 2015

Puglia/Sicilia: 71.4%
Falsone et al., 2014

Friuli Venezia Giulia: 1%
Di Cesare et al., 2015

Umbria: 8.6%
Di Cesare et al., 2015

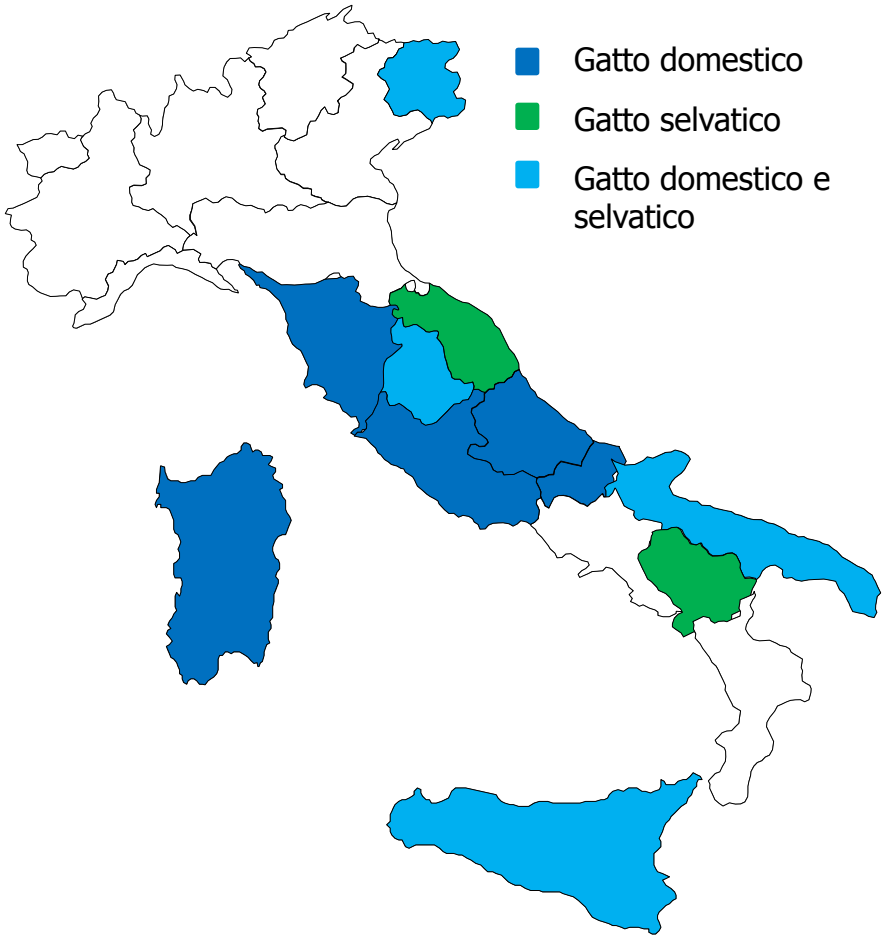
Lazio 5.4%
Di Cesare et al., 2015

Abruzzo-Molise: 8.2%
Di Cesare et al., 2015

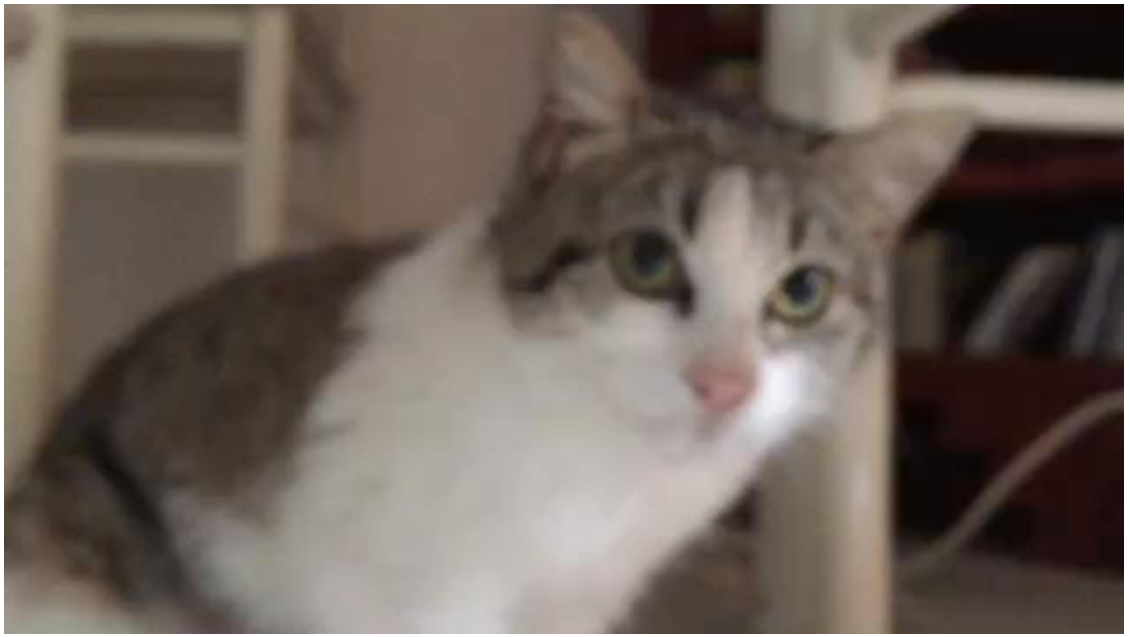
Puglia: 5.3%
Giannelli et al., 2015

Sicilia: 4.3%
Giannelli et al., 2015

Sardegna: 1.8-6.5%
Tamponi et al., 2014; Giannelli et al., 2015



Beraldo et al., 2014; Brianti et al., 2012, 2013; Di Cesare et al., 2014;2015a,b,c; Falsone et al., 2014; Giannelli et al., 2014;2015; Paggi, 1959; Tamponi et al., 2014; Traversa et al., 2014; Varcasia et al., 2015; Veronesi et al., 2015



Troglostrongylus brevior

Aelurostrongylus abstrusus

Capillaria aerophila

Capillaria aerophila: quanto sottostimata?

Research in Veterinary Science 87 (2009) 270–272

Contents lists available at ScienceDirect

Research in Veterinary Science

journal homepage: www.elsevier.com/locate/rvsc

Infection by *Eucoleus aerophilus* in dogs and cats: Is another extra-intestinal parasitic nematode of pets emerging in Italy?

Donato Traversa [a,*], Angela Di Cesare [a], Piermarino Milillo [a], Raffaella Iorio [a,1], Domenico Otranto [b]

[a] Department of Comparative Biomedical Sciences, Faculty of Veterinary Medicine, University of Teramo, Piazza Aldo Moro 45, 64100 Teramo, Italy
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Percentage of clinical signs in the 14 dogs and 8 cats diagnosed with *Eucoleus aerophilus* infection and presenting respiratory clinical signs.

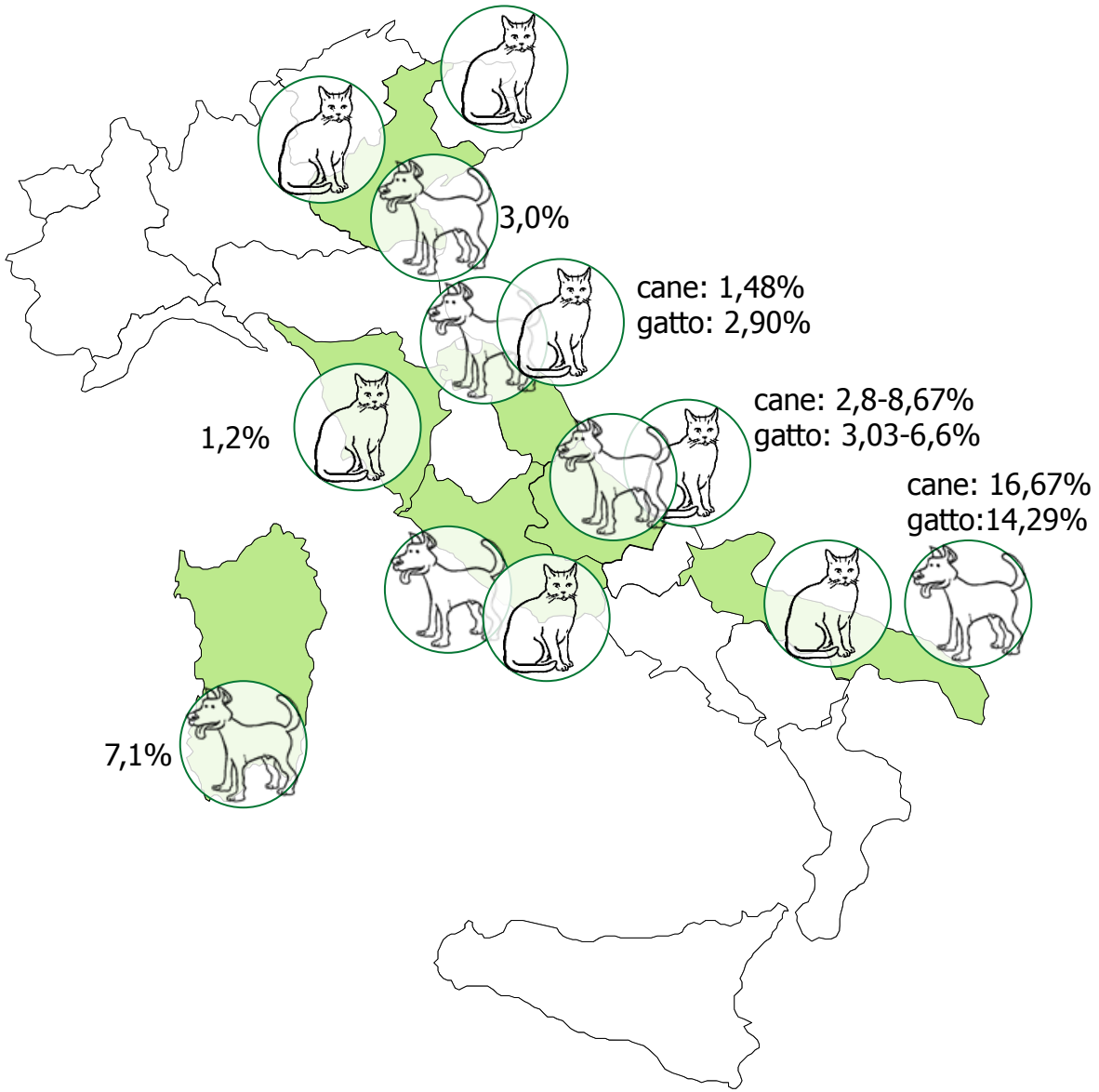
Clinical signs	Number of dogs (=16)	Number of cats (=11)
General distress	14 (87.5%)	8 (72.7%)
Dry cough	10 (71.4%)	6 (75%)
Moist cough	3 (21.4%)	1 (12.5%)
Wheezing	3 (21.4%)	5 (62.5%)
Sneezing	5 (35.7%)	3 (37.5%)
Dyspnoea	1 (7.1%)	0 (0%)
None	2	3

2.8%

5.5%

Singoli casi clinici

Prevalenza variabile



Traversa *et al.*, 2009; 2012; Di Cesare *et al.*, 2011, 2012; Cocco *et al.*, 2012; Frangipane di Regalbono *et al.*, 2012: Riggio et al., 2013

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[b] Department of Veterinary Public Health and Animal Sciences, Faculty of Veterinary Medicine, Bari, Italy

Parasitol Res (2011) ENDOPARASITES

Canine and Feline Infections by Cardio-pulmonary Nematodes in Central and Southern Italy

Angela Di Cesare[1], Giuseppe Castagna[1], Silvana Meloni[1], Piermarino Milillo[1], Stefania Latrofa[2], Domenico Otranto[2], Donato Traversa[1] (✉)

2009-2011

2012

Gatti ~3-15 %

Cani ~1-17 %

Traversa *et al.*, 2009; Di Cesare *et al.*, 2011, 2012; Cocco *et al.*, 2012; Frangipane di Regalbono *et al.*, 2012: Riggio et al., 2013

PATOGENESI

IRRITAZIONE ED INFIAMMAZIONE DELLA MUCOSA

AUMENTO DELLA PRODUZIONE MUCO

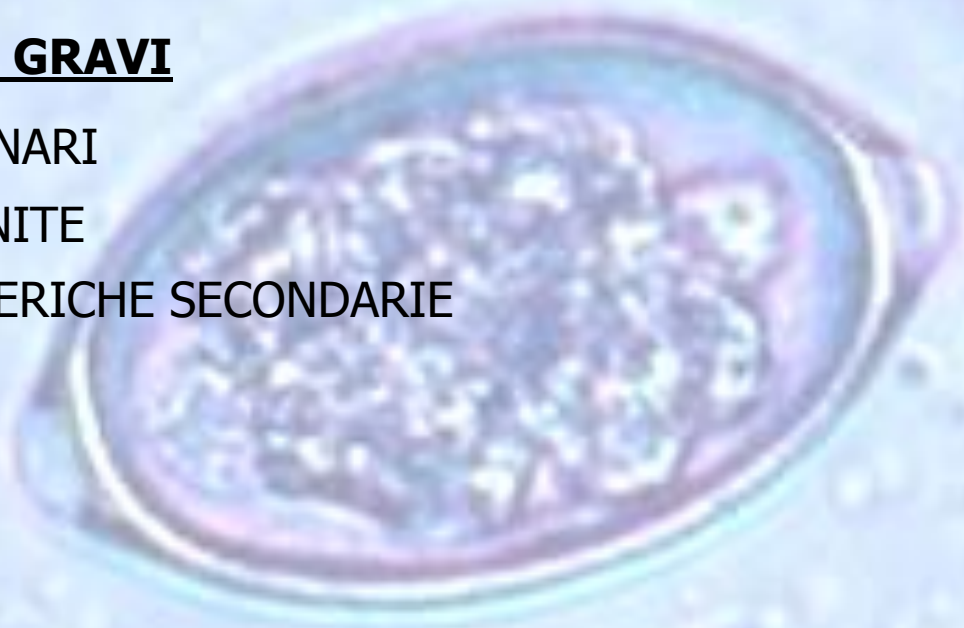
RIDUZIONE LUME TRACHEA E BRONCHI ⟹ ENFISEMA

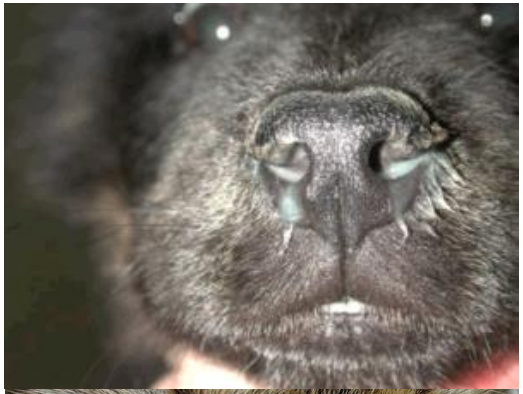
<u>INFESTAZIONI GRAVI</u>

ASCESSI POLMONARI

BRONCOPOLMONITE

INFEZIONI BATTERICHE SECONDARIE





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None	2	3

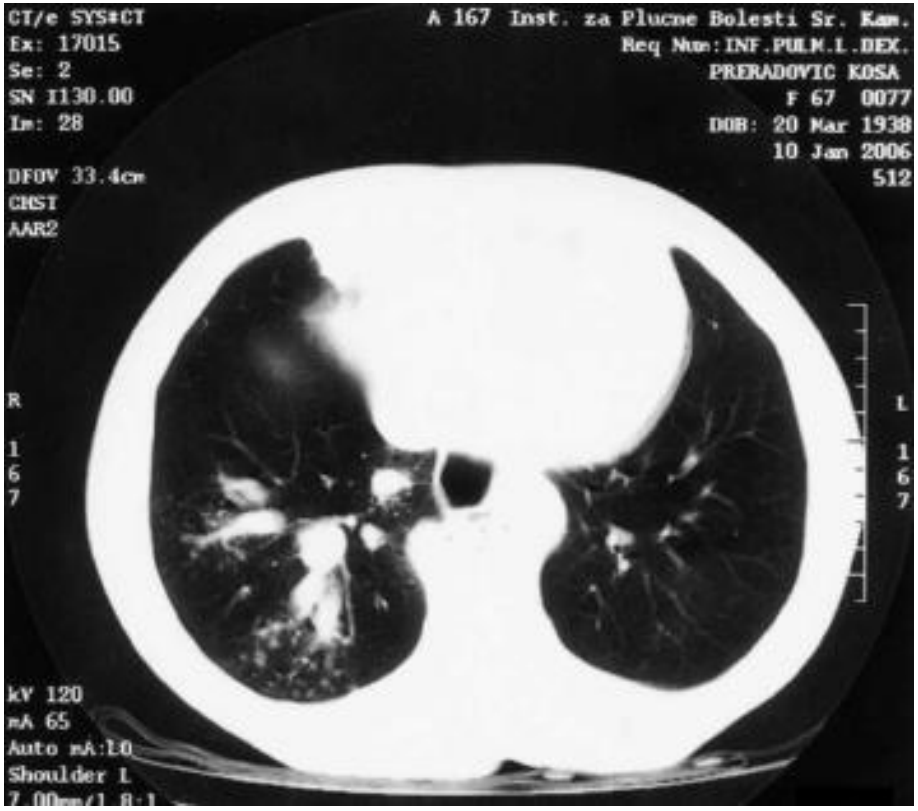
Am. J. Trop. Med. Hyg., 78(1), 2008, pp. 14–16

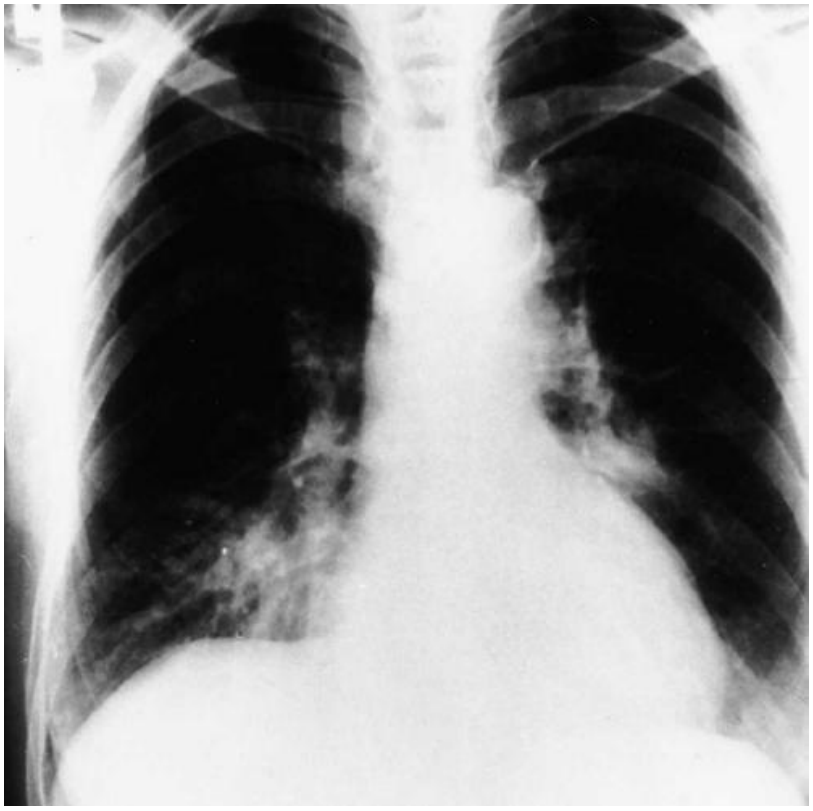
Pulmonary Capillariasis Miming Bronchial Carcinoma

Dušan Lalošević, Vesna Lalošević, Ištvan Klem, Dušica Stanojev-Jovanović, and Edoardo Pozio*

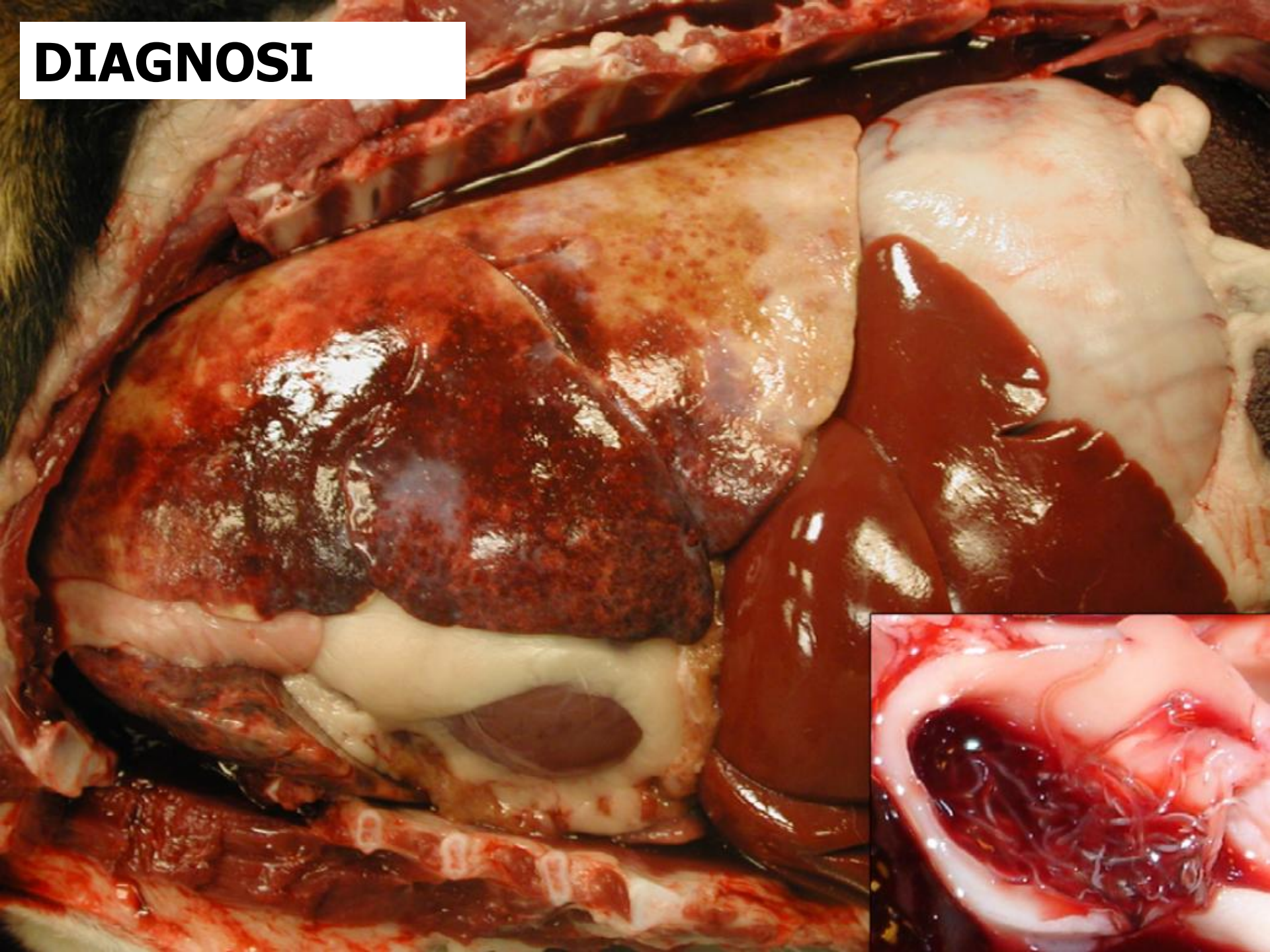
Faculty of Medicine and Clinical Center, University of Novi Sad, Novi Sad, Serbia; Faculty of Agriculture, Department for Veterinary Medicine, University of Novi Sad, Novi Sad, Serbia; Institute for Pulmonary Diseases, Sremska Kamenica, Serbia; Department of Infectious, Parasitic and Immunomediated Diseases, Istituto Superiore di Sanità, Rome, Italy

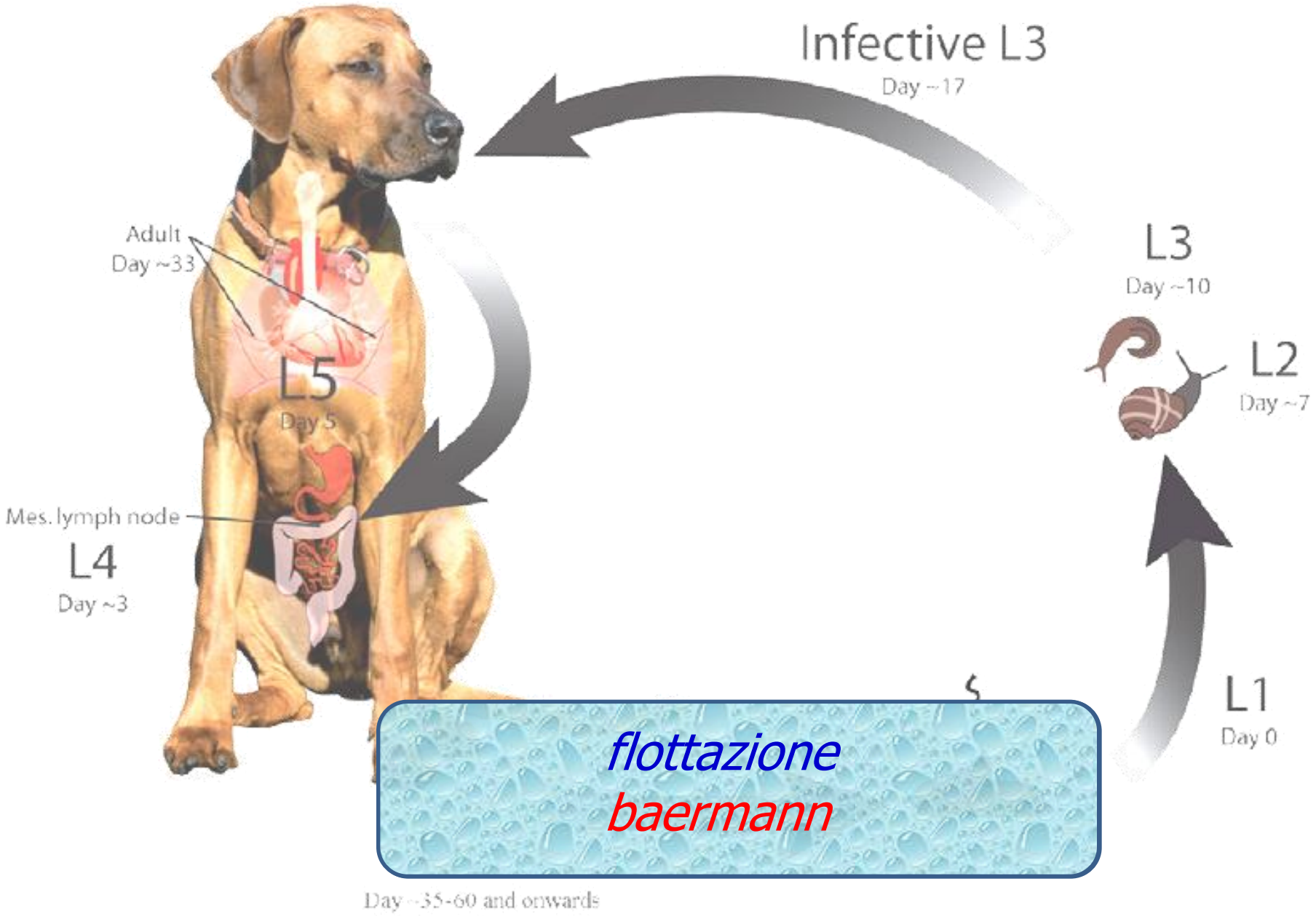
Abstract. Pulmonary capillariasis is a zoonotic disease caused by the cosmopolitan nematode *Capillaria aerophila*, which circulates among wild carnivorous and omnivorous mammals. Only 11 cases have been documented to date. We describe a cryptic case of pulmonary capillariasis in a Serbian woman that resembled a bronchial carcinoma.

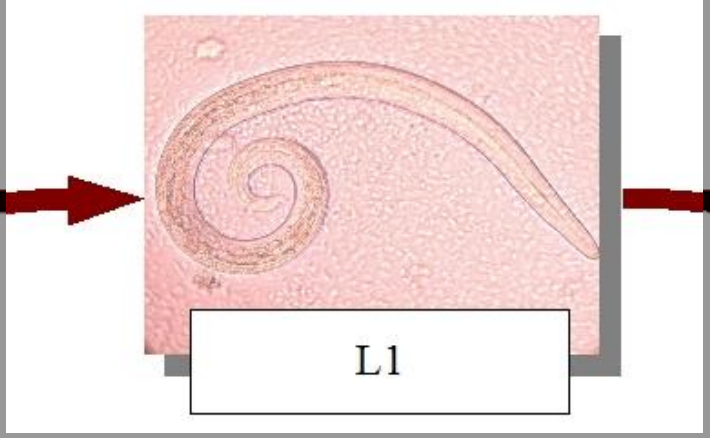


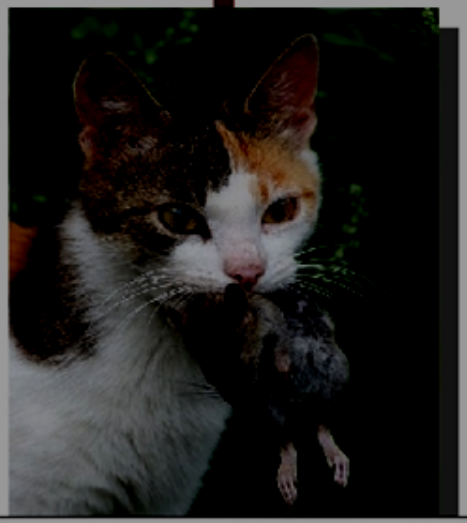


DIAGNOSI



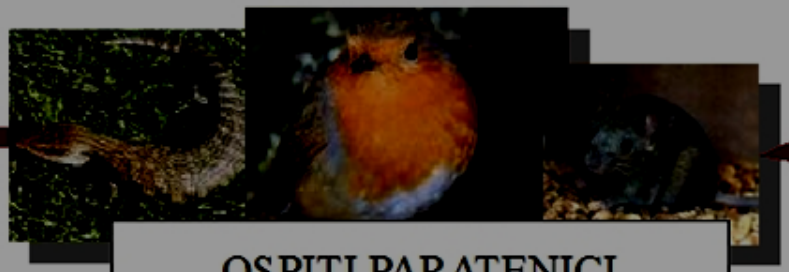

Infective L3
Day ~17
L3
Day ~10
L2
Day ~7
L1
Day 0
Adult
Day ~33
L5
Day 5
Mes. lymph node
L4
Day ~3
flottazione
baermann
Day ~35-60 and onwards





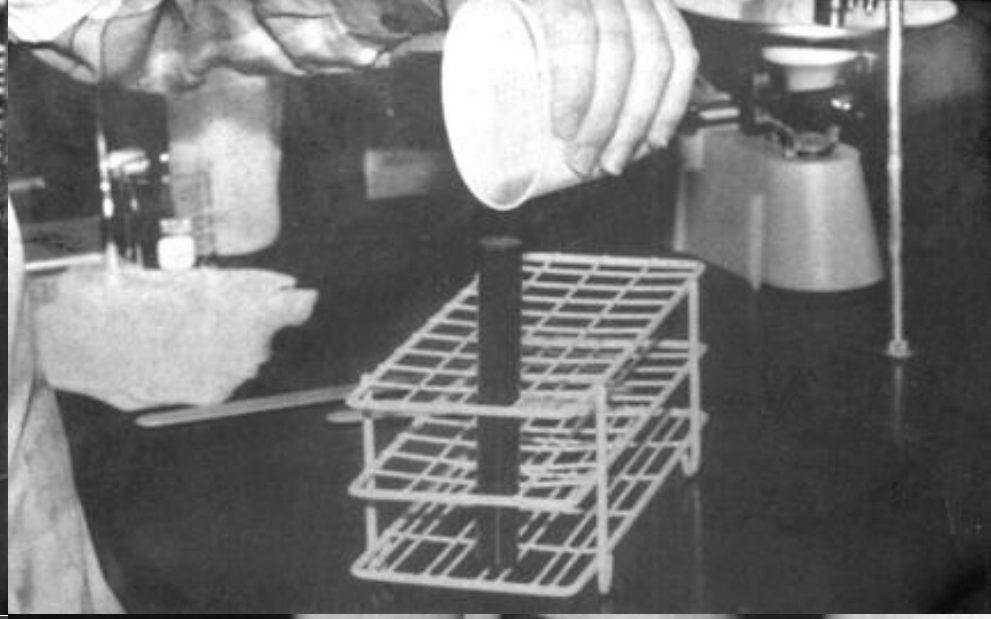
OSPITE DEFINITIVO

OSPITI INTERMEDI



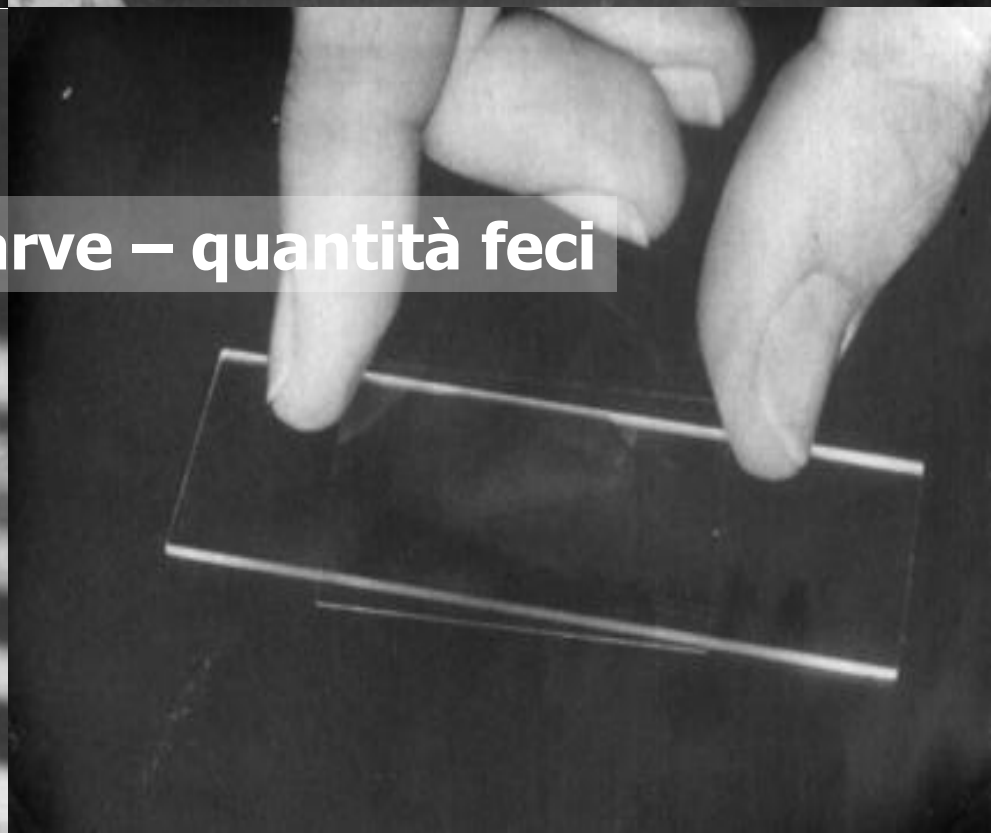
OSPITI PARATENICI

Flottazione



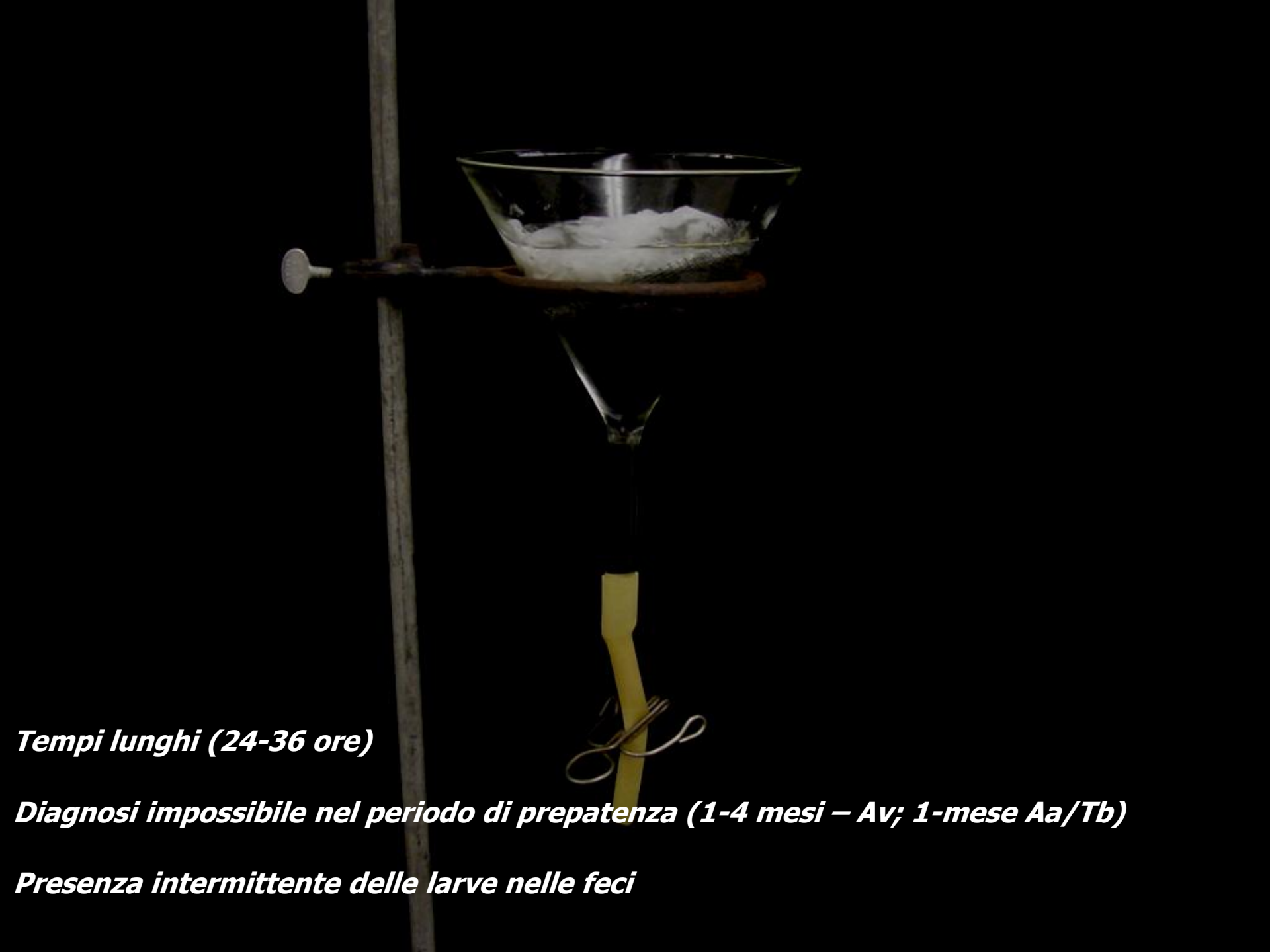
Disidratazione larve

Presenza irregolare delle larve – quantità feci



Baermann – gold standard

Baermann – gold standard

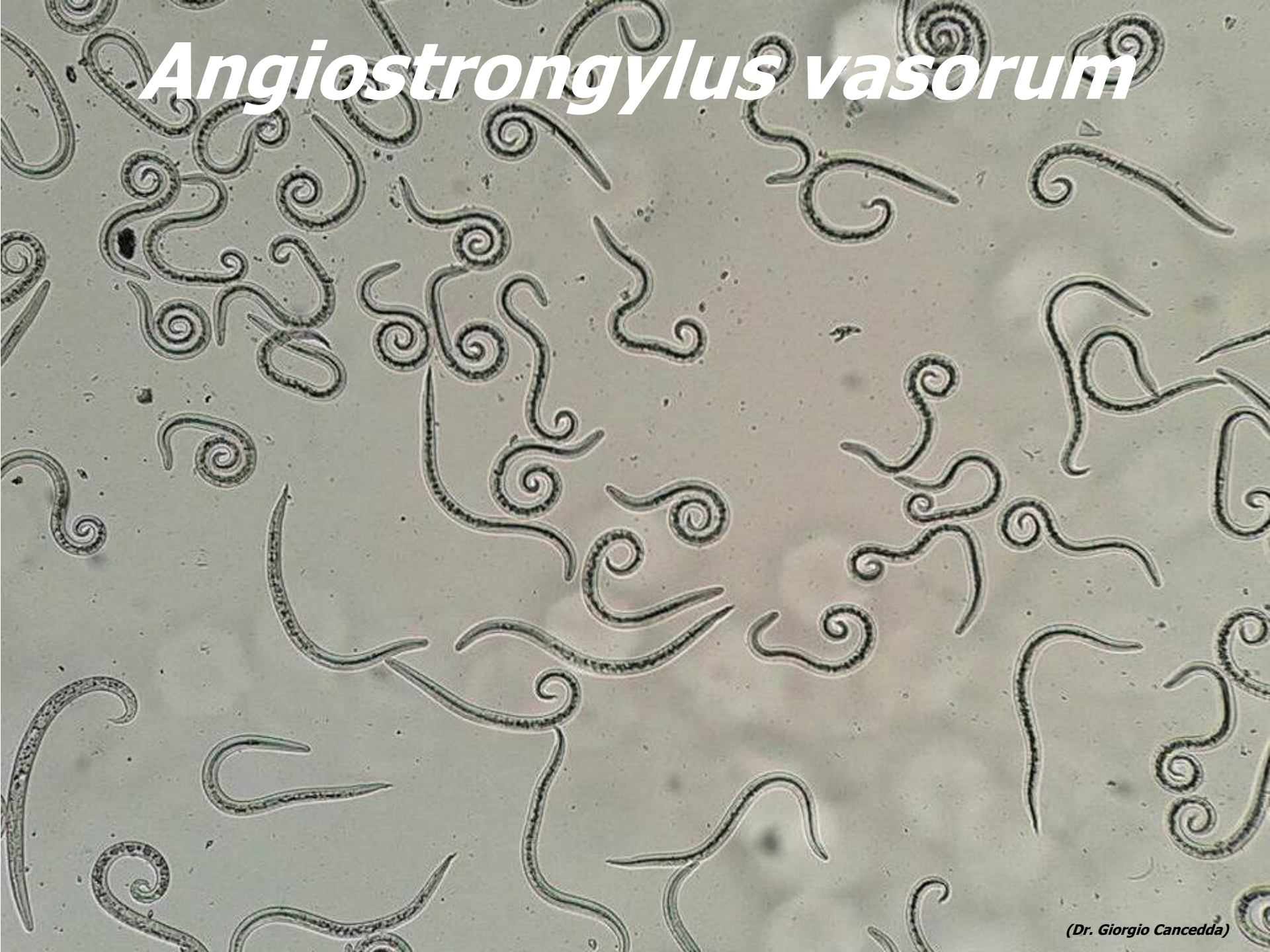


Tempi lunghi (24-36 ore)

Diagnosi impossibile nel periodo di prepatenza (1-4 mesi – Av; 1-mese Aa/Tb)

Presenza intermittente delle larve nelle feci

Angiostrongylus vasorum



(Dr. Giorgio Cancedda)


Lunghezza 310-400 µm


(Dr. Giorgio Cancedda)

Filaroides spp.

Oslerus osleri

Lunghezza 250 µm

Arrotolate

Leggero restringimento

No spina

Filaroides spp.

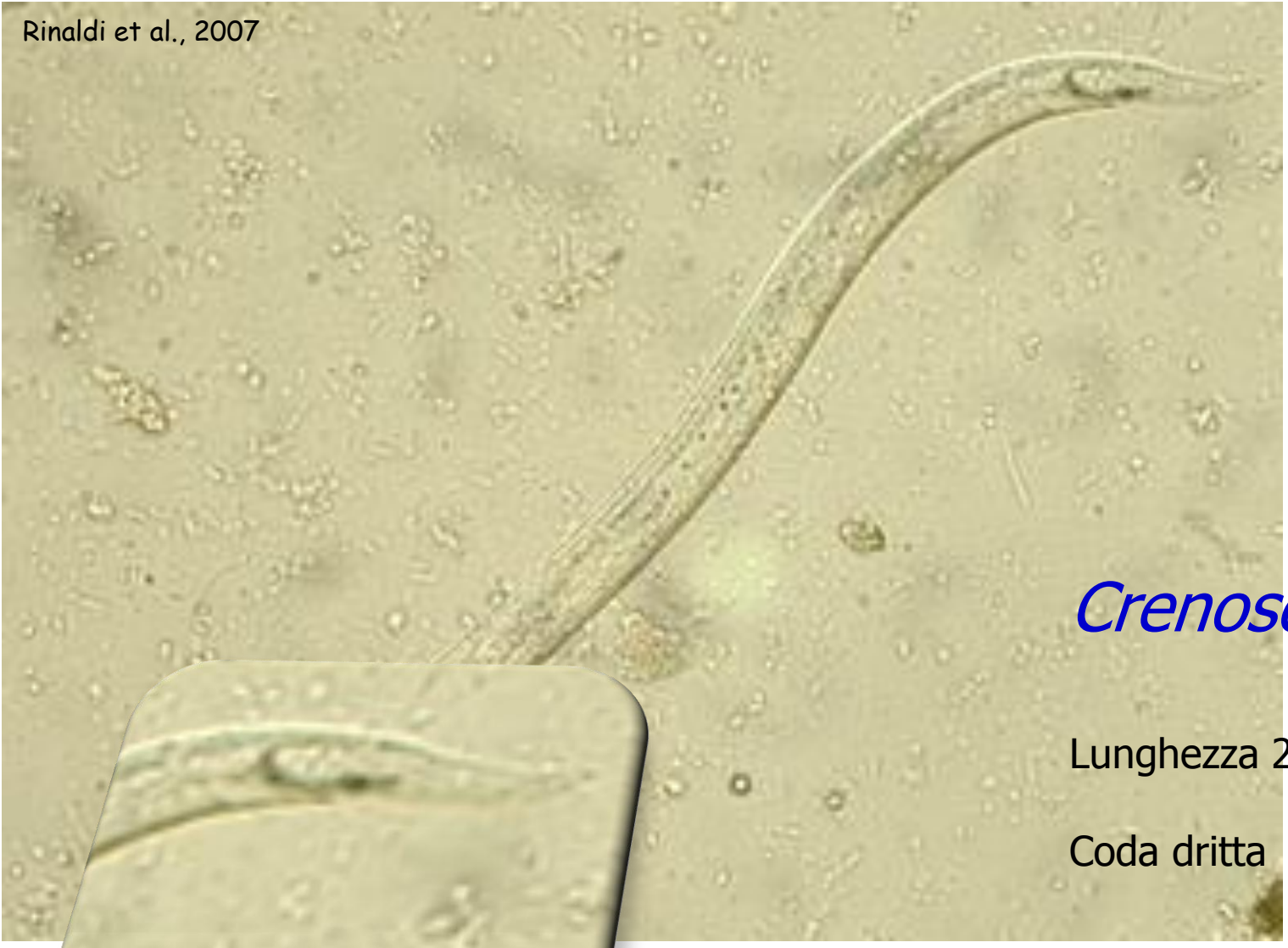
Oslerus osleri

Lunghezza 250 µm

Arrotolate

Leggero restringimento

No spina



Crenosoma vulpis

Lunghezza 246-308 µm

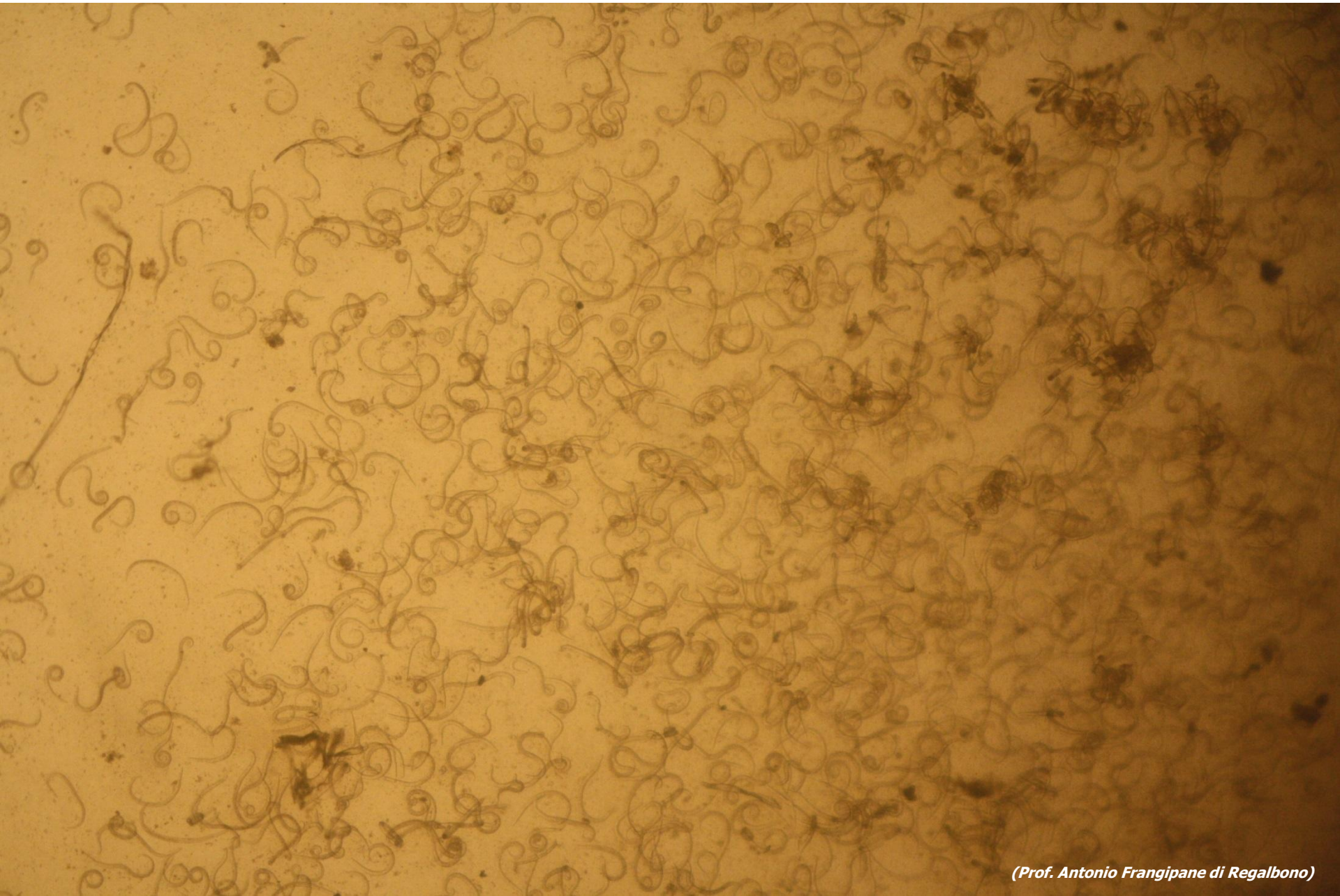
Coda dritta

Crenosoma vulpis

Lunghezza 246-308 µm

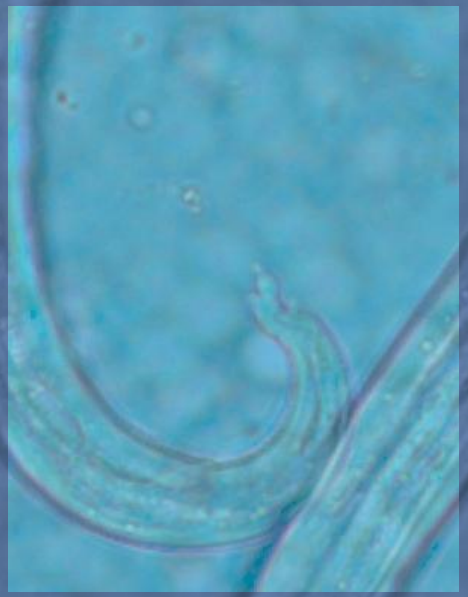
Coda dritta

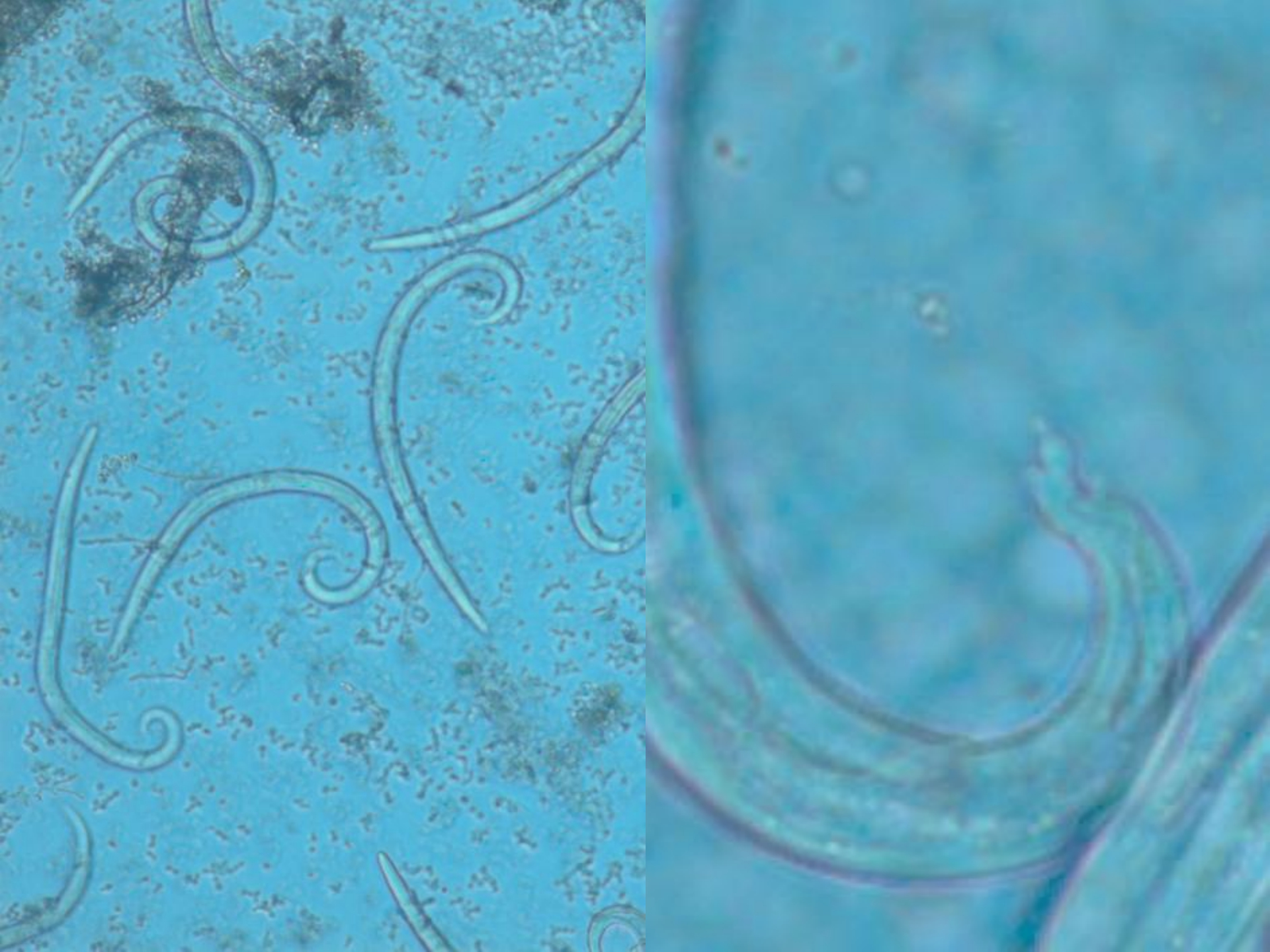
Aelurostrongylus abstrusus



(Prof. Antonio Frangipane di Regalbono)


Lunghezza 360-410 µm





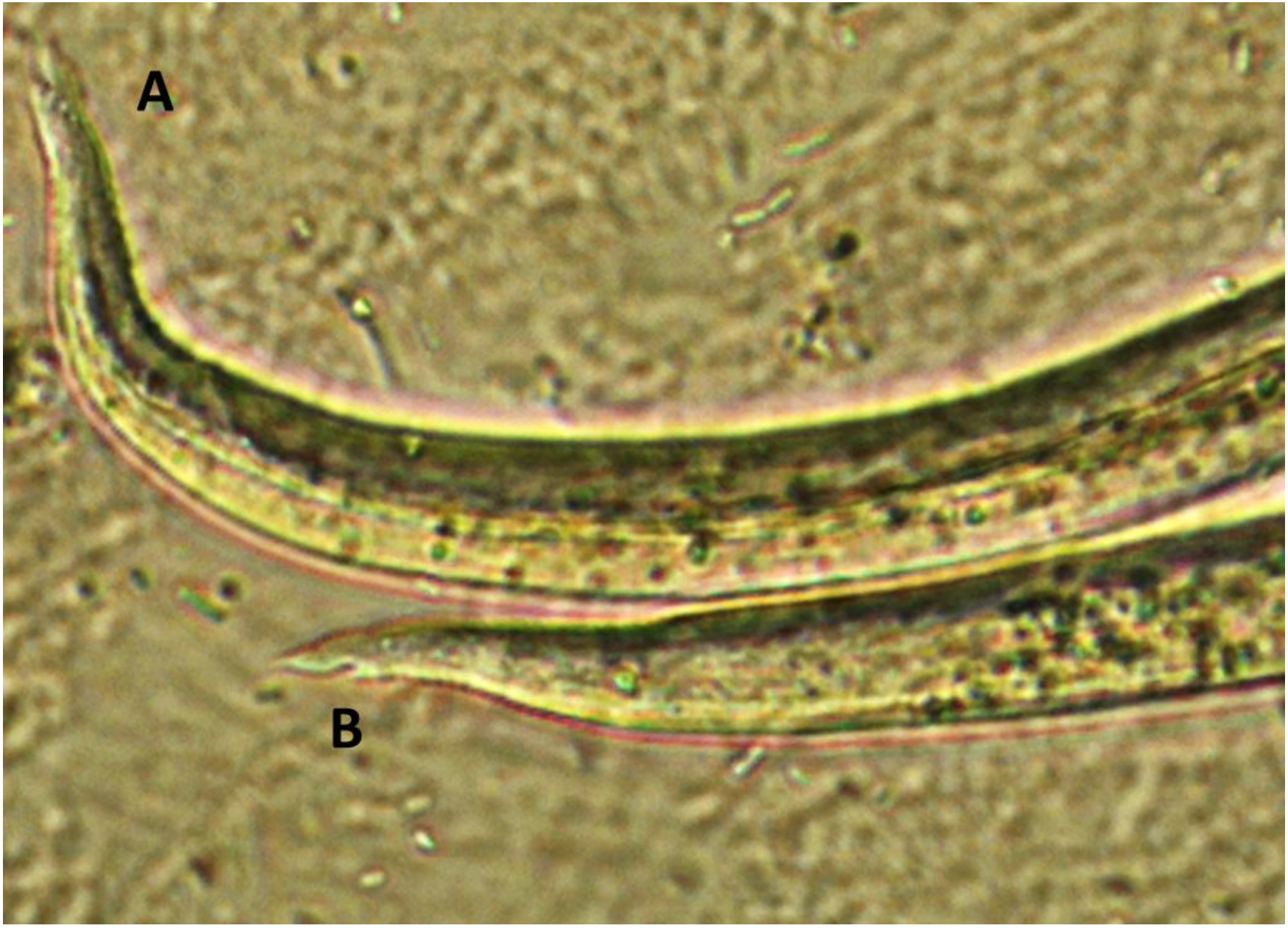

(Dr. Cesare De Tonno)

Troglostrongylus brevior

300-357 μm x 16-19 μm

300-357 μm x 16-19 μm

Infestazioni miste



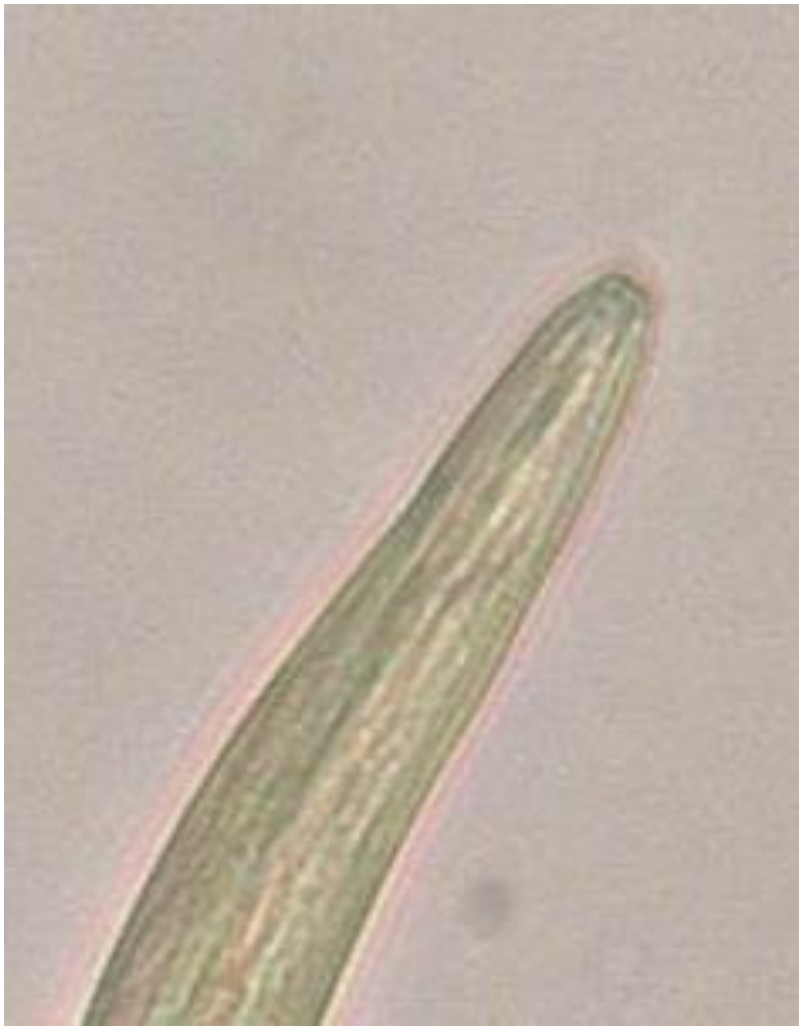

A
B
50 µm

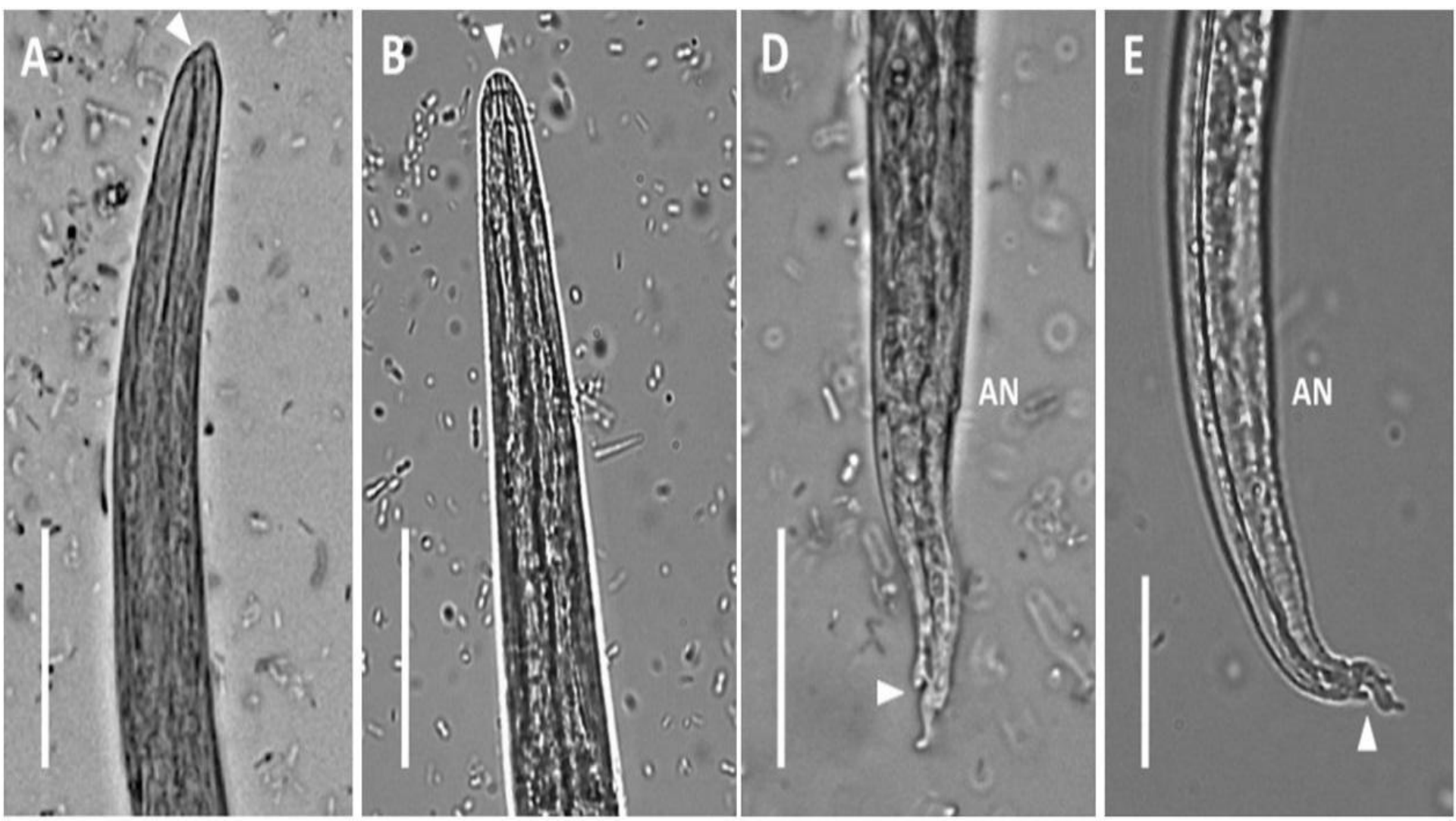
Troglostrongylus brevior

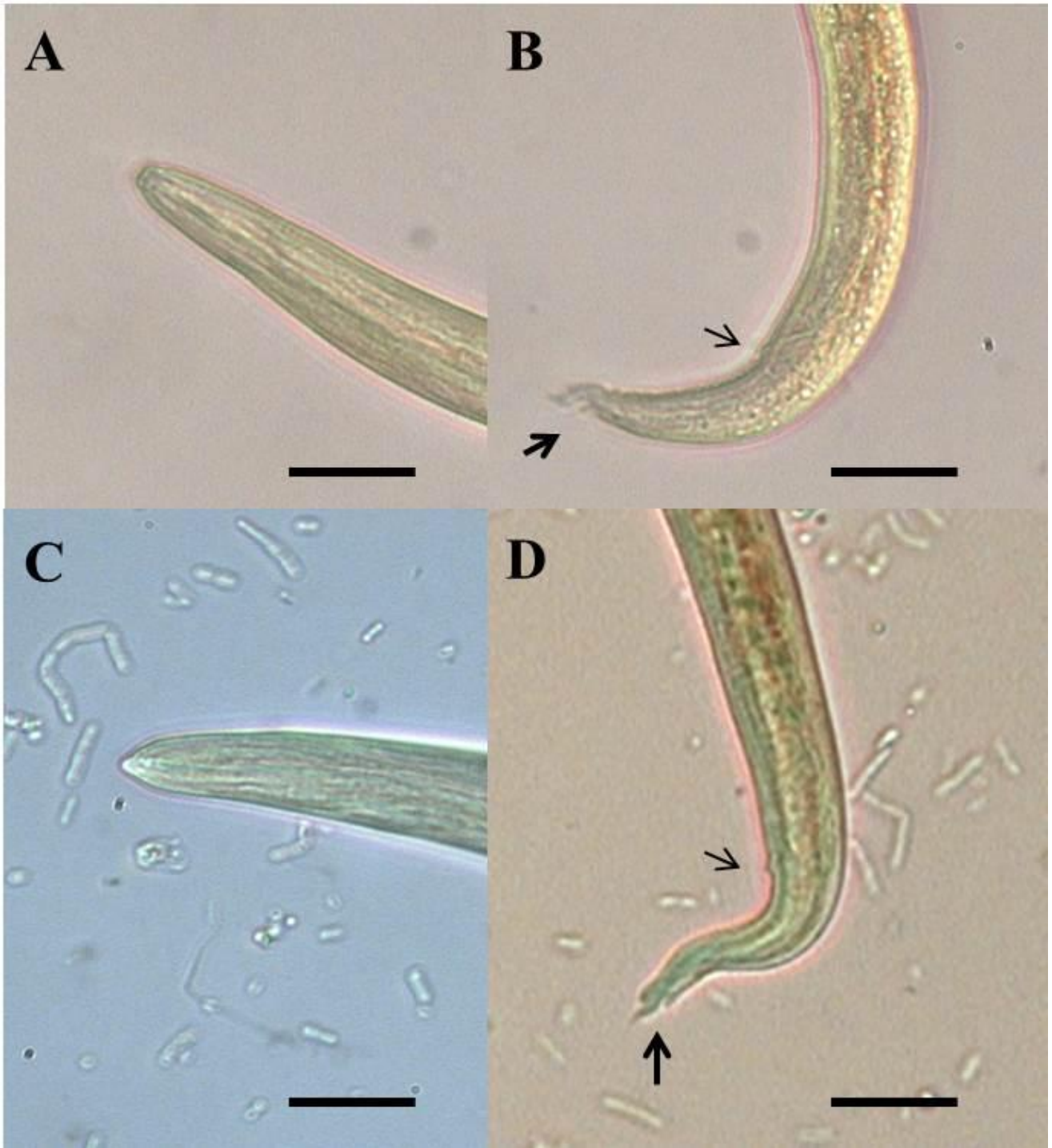
Aelurostrongylus abstrusus

Troglostrongylus brevior

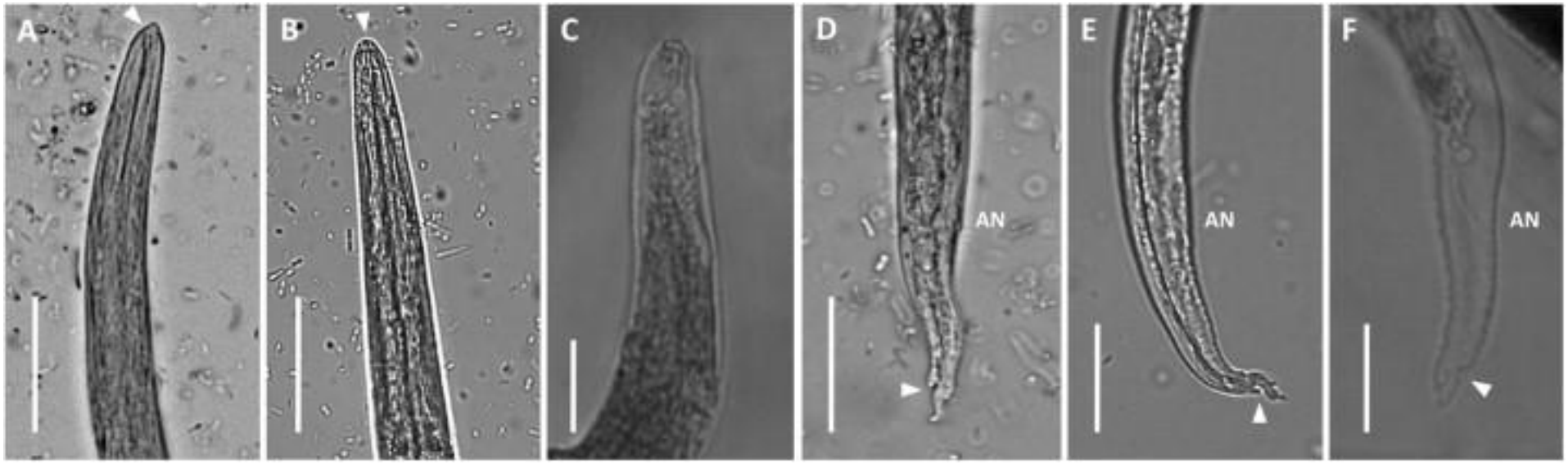
Aelurostrongylus abstrusus




A
B
D
AN
E
AN

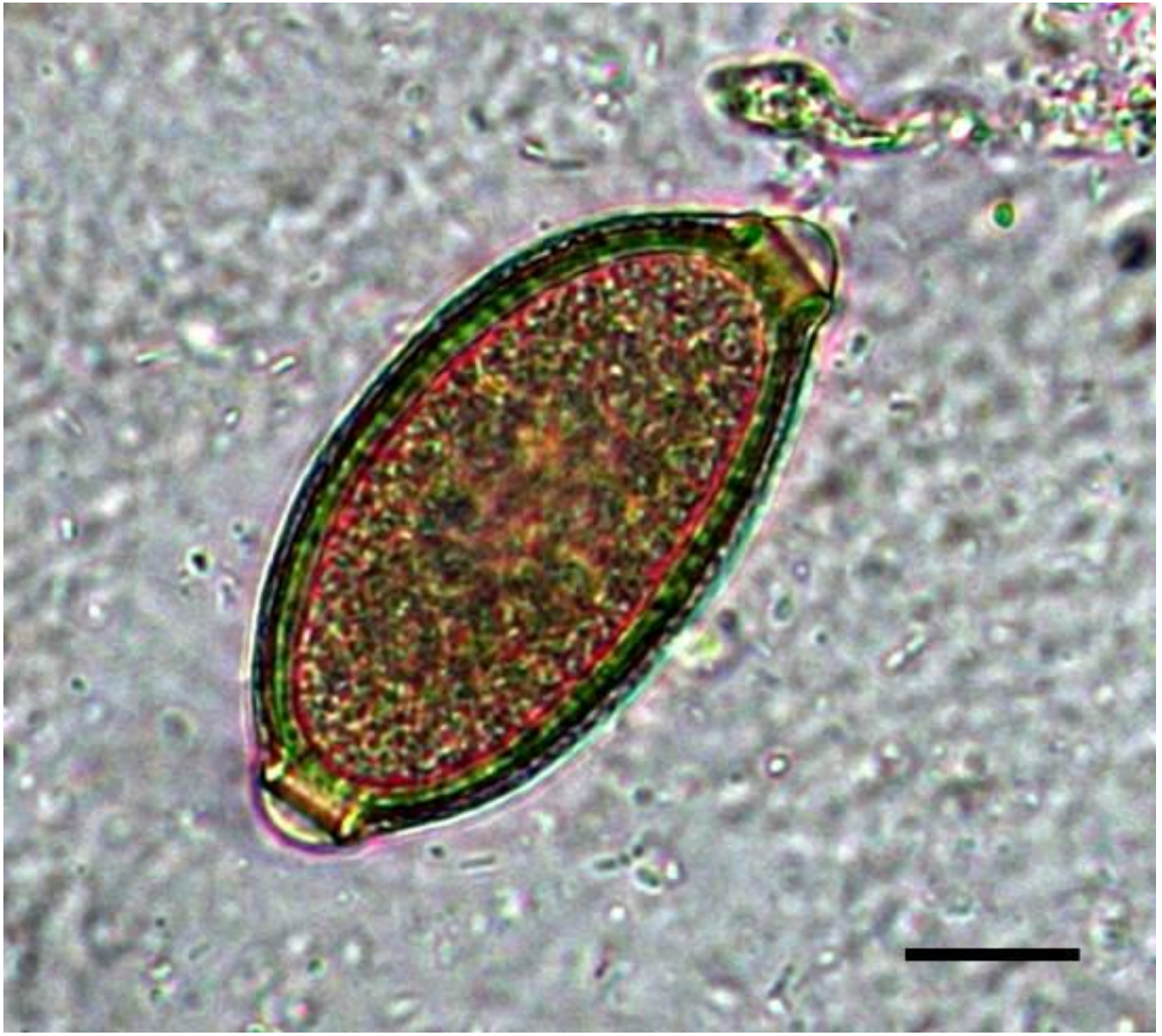

A
B
C
D

Specie	Localizzazione parassiti adulti	L1 (lunghezza x spessore) (µm)
Aelurostrongylus abstrusus	parenchima polmonare	360-415 x 18-19
Troglostrongylus brevior	bronchi, bronchioli	300-357 x 16-19
Oslerus rostratus	sottomucosa bronchiale, spazio subpleurico, parenchima polmonare	335-412 x 18-20
Troglostrongylus subcrenatus	trachea, bronchi	269-317 x 14-19



Nematodi a vita libera

Capillaria aerophila



Parasitol Res (2011) 109:S97–S104 DOI 10.1007/s00436-011-2406-4

New Insights into Morphological and Biological Features of *Capillaria aerophila* (Trichocephalida, Trichuridae)

Donato Traversa[1] (✉), Angela Di Cesare[1], Riccardo P. Lia[2], Giuseppe Castagna[1], Silvana Meloni[1], Josef Heine[3], Katrin Strube[3], Piermarino Milillo[1], Domenico Otranto[2], Oliver Meckes[4], Roland Schaper[3]

[1] Department of Comparative Biomedical Sciences, Faculty of Veterinary Medicine, Teramo, Italy
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[3] Bayer Animal Health GmbH, Germany
[4] Eye of Science, Germany

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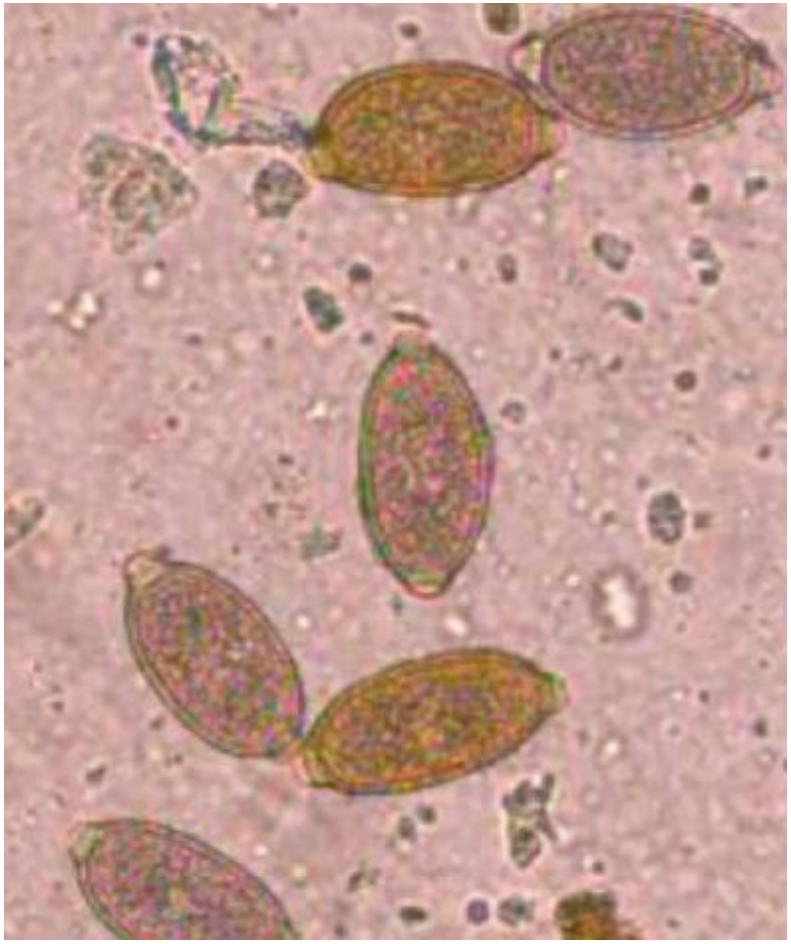
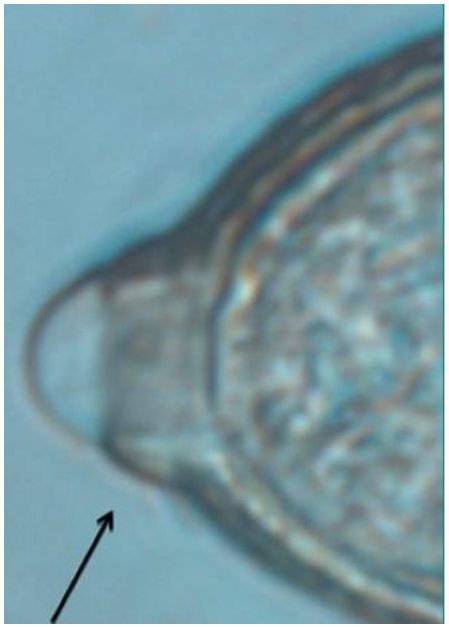
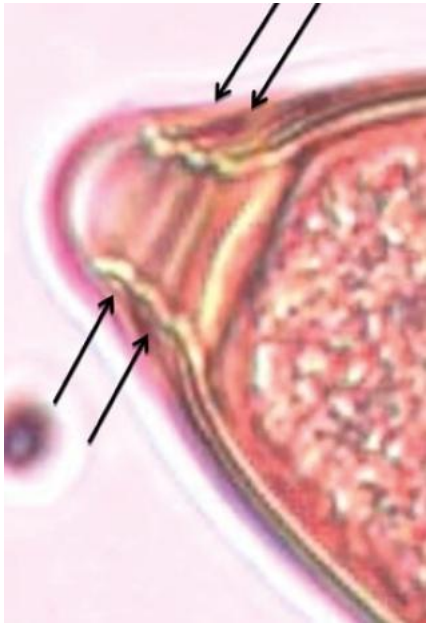


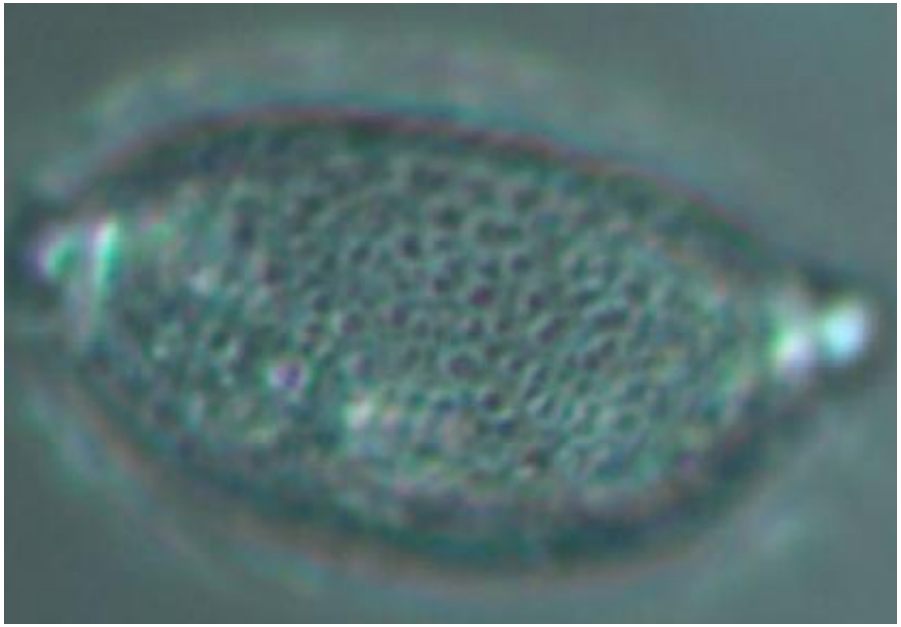
forma di barile, poli asimmetrici, assenza di ispessimenti alla base dei poli, guscio con anastomosi

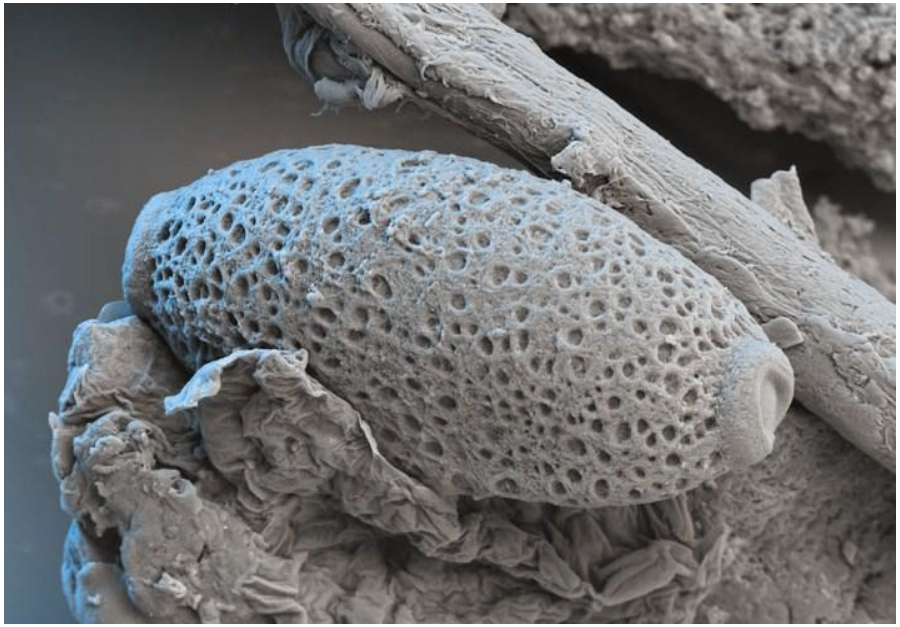
64.91 ± 1.11μm - 65.04 ± 1.50 μm lunghezza

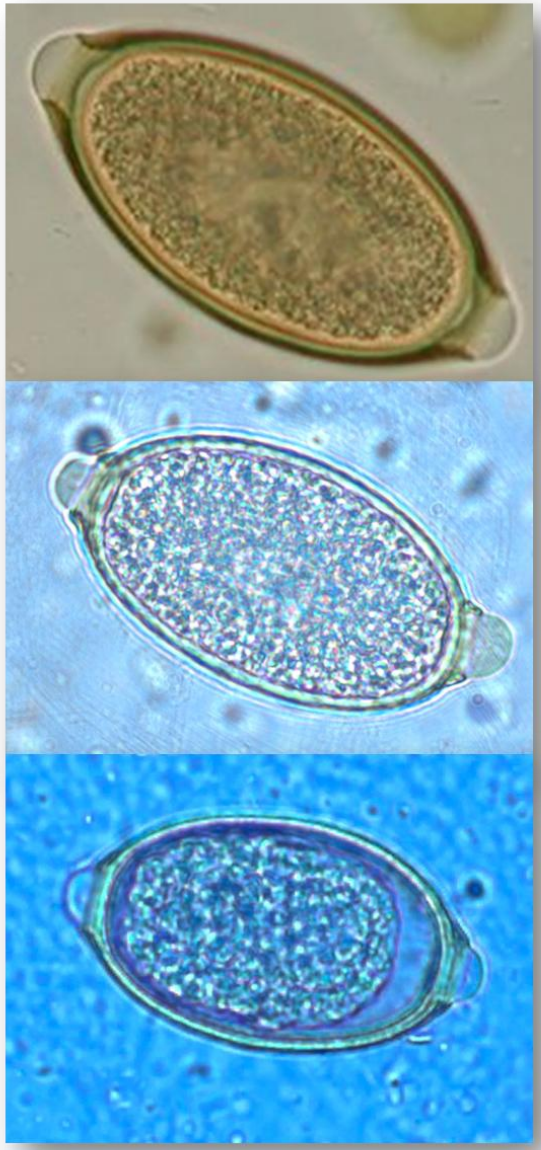
34.89 ± 3.34 μm - 36.96 ± 3.15 μm larghezza

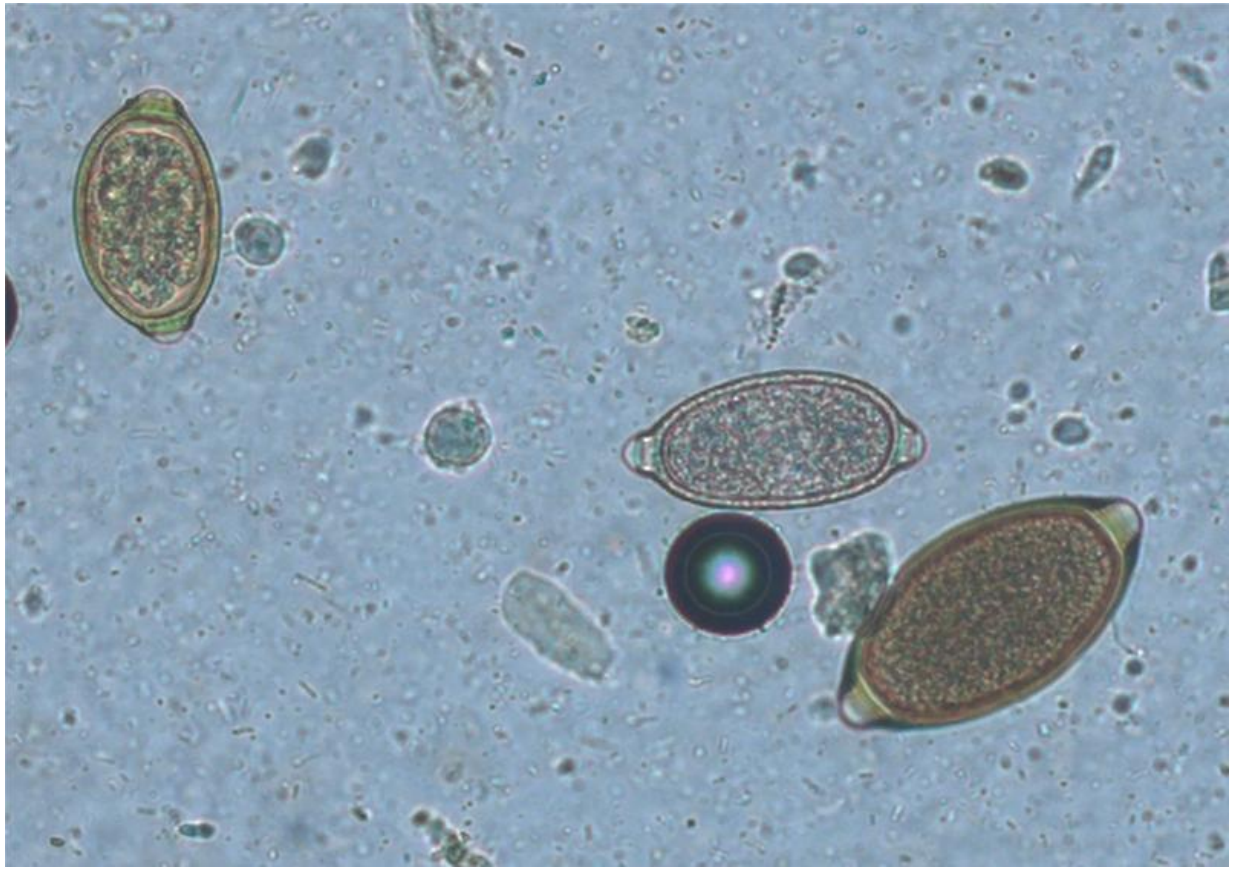


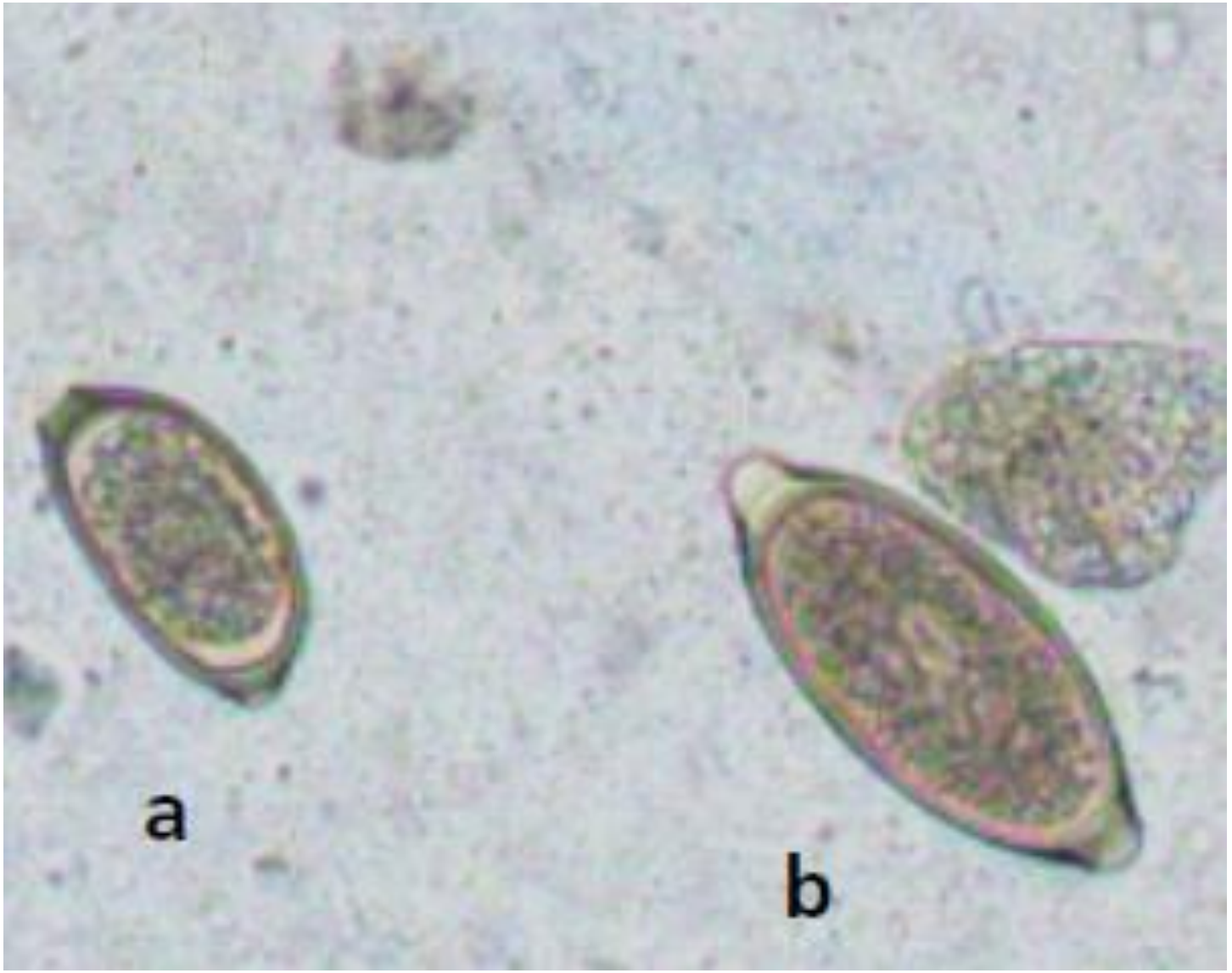











a
b


A te cos'è successo?
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Angiostrongylus vasorum terapia

MILBEMICINA OSSIMA 0.5 mg/kg PO una volta alla settimana per 4 settimane		**84.8%**

Conboy *et al.*, 2004

IMIDACLOPRID 10% / **MOXIDECTINA 2.5%**	1 dose	**85.2%**
IMIDACLOPRID 10% / **MOXIDECTINA 2.5%**	2 dosi (14-30 gg apart)	**100%**
FENBENDAZOLO 25 mg/kg PO per 20 gg consecutivi		**91.3%**

Willesen *et al.*, 2007; Traversa et al., 2013

Angiostrongylus vasorum prevenzione

IMIDACLOPRID 10% / MOXIDECTINA 2.5% Spot on

100 %

Somministrazione mensile

Schnyder *et al.*, 2009

SPINOSAD 45-60 mg/kg / MILBEMICINA OSSIMA 0.75-1 mg/kg Tavolette

98.8 %

Somministrazione mensile

Bohm *et al.*, 2014

Aelurostrongylus abstrusus terapia

Ivermectina (200-400 mcg/Kg)
Selamectina (6-18 mg/Kg)

Efficacia limitata

Necessità di somministrazioni ripetute

Gravi effetti collaterali (IVM)

Kirkpatrick e Megella, *1987*
Blagburn *et al.*, *1987*
Lewis *et al.*, *1994*
Grandi *et al.*, *2005*
Fisher and Shanks, *2008*

Selamectina 45 mg

90 % efficacia (emissione di larve e segni clinici)

Iannino et al., 2013

Fenbendazolo PO

3 giorni consecutivi 50 mg/kg

5 giorni consecutivi 20 mg/kg

15 giorni consecutivi 50 mg/kg

Hamilton *et al.*, *1984*
Schmid and Duwel, *1990*
Barrs *et al.*, *1999*
Grandi *et al.*, *2005*

Aelurostrongylus abstrusus terapia

Singola applicazione spot on di IMIDACLOPRID 10% / MOXIDECTINA 1%	**100%**
Singola applicazione spot on di PRAZIQUANTEL 8.6% / EMODEPSIDE 2.1%	**99.38%**
Somministrazione orale sid di FENBENDAZOLO 18.75% 50 mg/kg per 3 gg	**99.29%**

Traversa *et al.*, 2009a,b

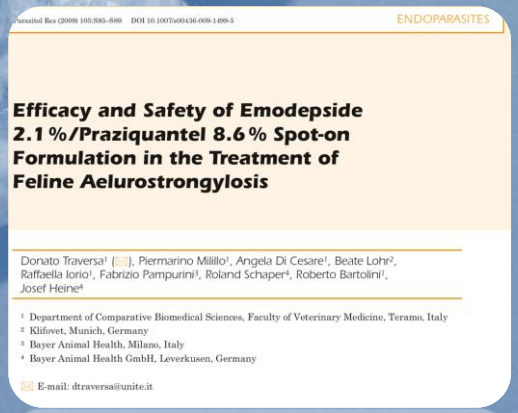
ENDOPARA

Efficacy and Safety of Imidacloprid 10%/Moxidectin 1% Spot-on Formulation in the Treatment of Feline Aelurostrongylosis

Donato Traversa[1] (✉), Angela Di Cesare[1], Piermarino Milillo[1], Beate Lohr[2], Raffaella Iorio[1], Fabrizio Pampurini[3], Roland Schaper[4], Barbara Paoletti[1], Josef Heine[4]

[1] Department of Comparative Biomedical Sciences, Faculty of Veterinary Medicine, Teramo, Italy
[2] Klifovet, Munich, Germany
[3] Bayer Animal Health, Milano, Italy
[4] Bayer Animal Health GmbH, Leverkusen, Germany

✉ E-mail: dtraversa@unite.it



ENDOPARASITES

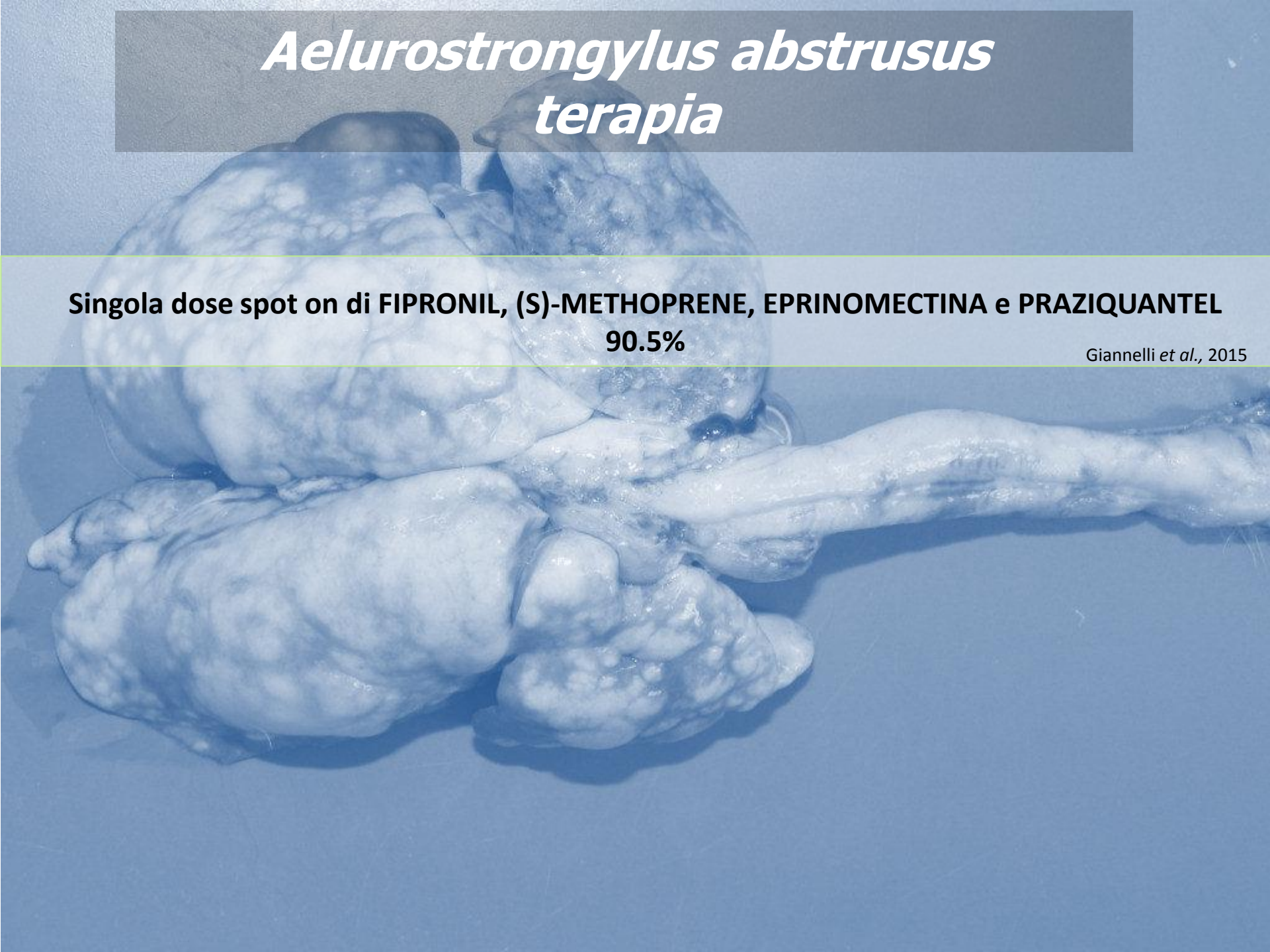
Efficacy and Safety of Emodepside 2.1%/Praziquantel 8.6% Spot-on Formulation in the Treatment of Feline Aelurostrongylosis

Donato Traversa[1] (✉), Piermarino Milillo[1], Angela Di Cesare[1], Beate Lohr[2], Raffaella Iorio[1], Fabrizio Pampurini[3], Roland Schaper[4], Roberto Bartolini[1], Josef Heine[4]

[1] Department of Comparative Biomedical Sciences, Faculty of Veterinary Medicine, Teramo, Italy
[2] Klifovet, Munich, Germany
[3] Bayer Animal Health, Milano, Italy
[4] Bayer Animal Health GmbH, Leverkusen, Germany

✉ E-mail: dtraversa@unite.it

Aelurostrongylus abstrusus terapia



Singola dose spot on di FIPRONIL, (S)-METHOPRENE, EPRINOMECTINA e PRAZIQUANTEL 90.5%

Giannelli *et al.,* 2015

Aelurostrongylus abstrusus terapia e prevenzione

Singola dose spot on di FIPRONIL, (S)-METHOPRENE, EPRINOMECTINA e PRAZIQUANTEL

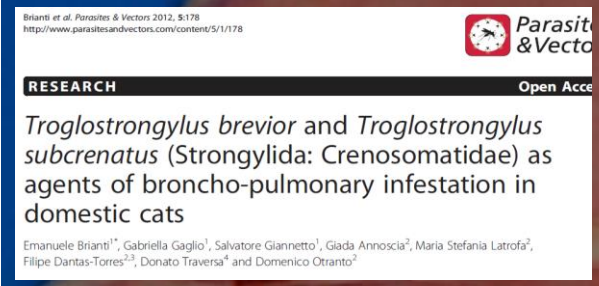
Knaus *et al.*, 2014

Table 2
Larval counts and therapeutic efficacy of the topical combination product against different developmental stages of *Aelurostrongylus abstrusus* in cats.

	Geometric mean[a] *A. abstrusus* larval counts per gram of faeces (range)				Efficacy[b], 60 dpi
	39 dpi	46 dpi	53 dpi	60 dpi	
Control, untreated	33.8a (0–384)	309.1a (0.2–1440)	356.4a (0–2640)	253.1a (0–5200)	–
Treated[c], 4 dpi[d,e]	0b (0)	0.6b (0–4.4)	2.1b (0–37.5)	2.8b (0–98)	98.9%
Treated, 10 dpi[f]	0b (0)	0.9b (0–10.3)	2.1b (0–23.7)	1.8b (0–62)	99.3%
Treated, 14 dpi[g]	0b (0)	0.4b (0–1.9)	4.8b (0.3–198)	21.1b (0.1–564)	91.6%
Treated, 32 dpi[h]	44.0a (1.1–1690)	0.8b (0–8.3)	1.0b (0–3.2)	0.9b (0–12.7)	99.6%
Treated, 4 dpi[e] + 32 dpi[h]	0b (0)	<0.1b (0–0.1)	<0.1b (0–0.3)	<0.1b (0–0.2)	>99.9%

[a] Based on transformation to ln [count +1]).
[b] Efficacy = 100 [(geometric mean untreated (control) group – geometric mean Topical FMEP group)/geometric mean untreated (control) group].
[c] Broadline® = Topical fipronil (8.3% w/v), (S)-methoprene (10% w/v), eprinomectin (0.4% w/v), and praziquantel (8.3% w/v); 0.3 mL, cats ≥0.8–2.5 kg body weight; 0.9 mL, cats >2.5–7.5 kg body weight.
[d] dpi = days post inoculation.
[e] *Aelurostrongylus abstrusus* expected to be third-stage larvae.
[f] *Aelurostrongylus abstrusus* expected to be fourth-stage larvae.
[g] *Aelurostrongylus abstrusus* expected to be immature adults.
[h] *Aelurostrongylus abstrusus* expected to be adults.
(a, b) Two-sided comparison of larval counts of each Topical FMEP group with the Control group per time point: figures with no letter in common are significantly different ($p < 0.001$, but $p = 0.012$ for Topical FMEP, 14 dpi vs. Control at 60 dpi).

Troglostrongylus brevior terapia



Brianti et al. Parasites & Vectors 2012, 5:178
http://www.parasitesandvectors.com/content/5/1/178

Parasit &Vecto

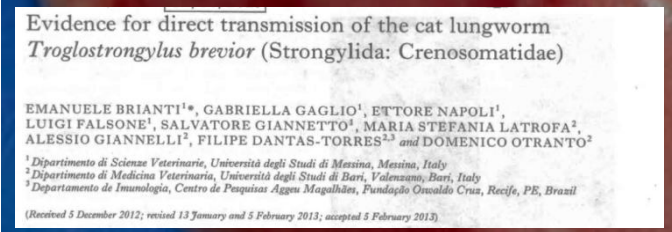
RESEARCH Open Acce

Troglostrongylus brevior and *Troglostrongylus subcrenatus* (Strongylida: Crenosomatidae) as agents of broncho-pulmonary infestation in domestic cats

Emanuele Brianti[1*], Gabriella Gaglio[1], Salvatore Giannetto[1], Giada Annoscia[2], Maria Stefania Latrofa[2], Filipe Dantas-Torres[2,3], Donato Traversa[4] and Domenico Otranto[2]

Gattino 1
Imidacloprid 10%/Moxidectina 1% singola dose
MORTE

Gattino 2
Fenbendazolo 50 mg/kg 1 somministrazione ogni 24 hrs
MORTE



Evidence for direct transmission of the cat lungworm *Troglostrongylus brevior* (Strongylida: Crenosomatidae)

EMANUELE BRIANTI[1]*, GABRIELLA GAGLIO[1], ETTORE NAPOLI[1], LUIGI FALSONE[1], SALVATORE GIANNETTO[1], MARIA STEFANIA LATROFA[2], ALESSIO GIANNELLI[2], FILIPE DANTAS-TORRES[2,3] and DOMENICO OTRANTO[2]

[1] *Dipartimento di Scienze Veterinarie, Università degli Studi di Messina, Messina, Italy*
[2] *Dipartimento di Medicina Veterinaria, Università degli Studi di Bari, Valenzano, Bari, Italy*
[3] *Departamento de Imunologia, Centro de Pesquisas Aggeu Magalhães, Fundação Oswaldo Cruz, Recife, PE, Brazil*

(Received 5 December 2012; revised 13 January and 5 February 2013; accepted 5 February 2013)

Gattino 1
Emodepside 2.6%/Praziquantel 8.6% 2 dosi 21 gg apart
GUARIGIONE

Gattino 2
Imidacloprid 10%/Moxidectina 1% 2 dosi 14 gg apart
GUARIGIONE

Parasitol Res
DOI 10.1007/s00436-013-3690-y

ORIGINAL PAPER

Mixed infection by *Aelurostrongylus abstrusus* and *Troglostrongylus brevior* in kittens from the same litter in Italy

Angela Di Cesare · Antonio Frangipane di Regalbono · Cinzia Tessarin · Matteo Seghetti · Raffaella Iorio · Giulia Simonato · Donato Traversa

2 gattini con infestazione mista

Giorno 0: L1s di Aa + Tb

Giorno 2: Milbemicina ossima 2 mg/Kg

Gattino 1

Giorno 7: L1s di Tb

Giorno 9: morte

Gattino 2

Giorni 4-11: no L1s

Giorno 12: dimissioni

Oggi: in piena salute

Troglostrongylus brevior terapia

Treatment of Troglostrongylus brevior (Metastrongyloidea, Crenosomatidae) in mixed lungworm infections using spot-on emodepside

Angela Di Cesare[1], Raffaella Iorio[1], Paolo Crisi[1], Barbara Paoletti[1], Carmelo Flavio Dimitri[3], Donato Traversa[1*]

Gattino 1, ~7-8 settimane

Troglostrongylus brevior* + *Aelurostrongylus abstrusus
Segni clinici respiratori severi

Emodepside 2.6%/Praziquantel 8.6% 2 dosi **14 gg** apart

Giorni 7 e **14:** segni clinici risolti ma persistenza L1 di Tb

Giorni 21 e 28: segni clinici risolti, assenza L1

Gattino 2, ~8-9 settimane

Troglostrongylus brevior* + *Capillaria aerophila
Segni clinici respiratori severi

Emodepside 2.6%/Praziquantel 8.6% 1 dose

Giorno 7: presente solo tosse, assenza di L1 di Tb e uova di Ca

Giorni 14, 21 e 28: segni clinici risolti, assenza di L1 di Tb e uova di Ca

Troglostrongylus brevior terapia

Singola dose spot on di FIPRONIL, (S)-METHOPRENE, EPRINOMECTINA e PRAZIQUANTEL 100% in cinque gatti

Giannelli *et al.*, 2015

Capillaria aerophila terapia

Singola applicazione spot on di IMIDACLOPRID 10% / MOXIDECTINA 1% 99.79%

Efficacy and safety of imidacloprid 10 %/ moxidectin 1 % spot-on formulation in the treatment of feline infection by Capillaria aerophila

Donato Traversa, Angela Di Cesare, Emanuela Di Giulio, Giuseppe Castagna, Roland Schaper, Gabriele Braun, Beate Lohr, et al.

Parasitology Research
Founded as Zeitschrift für Parasitenkunde

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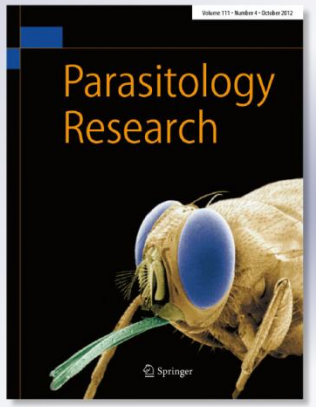
DOI 10.1007/s00436-012-3025-4



Traversa *et al.*, 2012

Capillaria aerophila
terapia

Singola dose spot on di FIPRONIL, (S)-METHOPRENE, EPRINOMECTINA e PRAZIQUANTEL

93.5-99.1%

Knaus *et al.,* 2015


EXIT

Ho dato l'antiparassitario al gatto, ora puoi accompagnarmi in ospedale?