

NOTES TO *MESOCESTOIDES* VAILLANT, 1863 (CESTODA) AND FINDINGS OF *MESOCESTOIDES* SP. PARASITIZING *CANIS FAMILIARIS* (CARNIVORA) IN THE CZECH REPUBLIC

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Abstract

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The partial critical analysis of the situation in systematic-taxonomic arrangement of tapeworms from the genus *Mesocestoides* Vaillant, 1863 was performed. The attention is drawn to a number of problems preventing the uniform opinion on the species value within the genus *Mesocestoides*. The own material of that genus from *Canis familiaris* (gravid segments of cestodes from dog faeces, locality of Jilmoví, southern Moravia) is presented. The study is an appropriate complement to the abstract published by Borkovcová and Tenora (2003).

Mesocestoides, Cestoda, taxonomy, Carnivora, dog

INTRODUCTION

The tapeworms of the genus *Mesocestoides* Vaillant, 1863 in their gravid state parasitize, first of all, Carnivora, Falconiformes, Strigiformes and Primates (including man). Tschertkova and Kosupko (1978) report that their distribution is cosmopolitan. Schmidt (1986) states nearly cosmopolitan distribution. In the Neotropical Region, only a single species is known – *M. michaelsoni* Lönnberg, 1896 in Brasil (parasite of *Canis azarae*). The data on distribution of tapeworms from the genus *Mesocestoides* in the Australian Region are missing (Yamaguti 1959, Schmidt 1986, Beveridge 2003, personal communication).

Within the developmental cycle of tapeworms from the genus *Mesocestoides*, the first and second intermediate hosts are known. Tschertkova and Kosupko (1978) report among the first intermediate hosts Acarina from the family Oribatidae; among the second intermediate hosts, they present numerous vertebrate

species – Amphibia, Reptilia, Aves and Mammalia, including man. Similar set of intermediate hosts is presented in the material of the Minsk Veterinary WEB Centre (2003). In spite of these relatively abundant knowledge on intermediate hosts of the genus *Mesocestoides*, however, Tschertkova and Kosupko (1978) and Rausch (1994) consider the full developmental cycle of individual species from the genus *Mesocestoides* to be not elucidated.

According to other sources, e.g., to Material Ecole Nationale Vétérinaire, Lyon, France (2003), the full development is reported in two species, namely *M. lineatus* (Goetze, 1782) and *M. litteratus* (Batsch, 1786). Dog, cat and fox are presented as their hosts. In the case of *M. lineatus*, the first intermediate hosts are Acarina from the family Oribatidae (with developmental stage of cysticeroid), the second intermediate hosts are reported small mammals, birds and reptiles (with developmental stage of tetrathyridium). In the

case of *M. litteratus*, the first intermediate hosts are coprophagous beetles and the second ones are birds. The opinion published in Lyon (2003) was taken over by Borkovcová and Tenora (2003) into their abstract.

MATERIAL AND METHODS

Gravid segments of *Mesocestoides* sp. were obtained from the excrements of 2 dogs, locality Jilmoví, southern Moravia, Czech Republic (lgt. Borkovcová, det. Tenora).

Sezame-like segments, sized on the average 2.7-3.00 x 1.7-1.9 mm, contained cyst with solid cover inside. Cyst measured on the average 0.7-0.9 x 0.05-0.06 mm, eggs stored inside, 0.028 x 0.024 mm. Segments has not lateral sexual openings. In volume of 40 ccm of excrements the number of specimens found varied from a few to hundreds. After washed in distilled water, some segments were stained with borax carmine. Part of segments was backligned by glycerin water in 1 : 3 ratio.

The author had also the material from the Institute of Parasitology of the Czech Academy of Sciences, České Budějovice, available:

- 1) Inv. no. 285, *Mesocestoides* sp., host *Vulpes vulpes*, locality Zemplén, Baksa, Hungary, lgt. 24.I.1993, 3 slides, cestodes stained with borax carmine.
- 2) Inv. no. 222, *Mesocestoides didelphus* Tschertkova et Kosupko, 1977, host *Didelphus virginiana*, locality New Orleans, USA, lgt. VI. 1987, 6 slides, cestodes stained with borax carmine.

RESULTS

A) Systematics, taxonomy and determination of Cestoda from the genus *Mesocestoides*.

At present, the genus *Mesocestoides* represents the set of more than 20 species (Sprehn 1932, Witenberg 1934, Joyeux and Baer 1936, Neveu-Lemaire 1936, Voge 1955, Yamaguti 1959, Sawada and Kugi 1973, Tschertkova and Kosupko 1978, Loos-Frank 1980, Yanchev and Petrov 1985, Schmidt 1986, Etges 1991, Sato et al. 1999). Numerous amount of the species described is subject frequently to systematic-taxonomical discussions. According to various authors (see the list above), several species are considered to be nomen nudum, species inquirenda or synonym. Not univocal is also the opinion on the typus generis in the genus *Mesocestoides*. Of the above authors only Tschertkova and Kosupko (1978) consider the species *M. lineatus* (Goetze, 1782), parasite in mammals, to be the typus generis; the other authors present the species *M. ambiguus* (Vaillant, 1863), parasite in *Viverra zibetha* (= *Genetta genetta*) as the typus generis.

From the genus *Mesocestoides*, Tschertkova and Kosupko (1978) report the following species as dog parasites: *M. lineatus* (Goetze, 1782), *M. litteratus*

(Batsch, 1786), *M. ambiguus* (Vaillant, 1863) - only experimentally, *M. caestus* (Cameron, 1925), *M. corti* (Hoepli, 1925), *M. tenuis* (Meggitt, 1931), *M. zacharovae* Tschertkova et Kosupko, 1975 - only experimentally, *Mesocestoides* sp. Tschertkova, Ilyasov, Yusupov, 1975 - only experimentally. Opinions on the taxonomic value of those species and on their distribution differ (cf. Sprehn 1932, Witenberg 1934, Joyeux and Baer 1936, Neveu-Lemaire 1936, Voge 1955, Yamaguti 1959, Tschertkova and Kosupko 1978, Loos-Frank 1980, Schmidt 1986, Coombs and Crompton 1991).

The modern conception of species criteria are presented by Tschertkova and Kosupko (1978). These authors consider for establishing the taxon of species value the following criteria to be decisive: 1) cirrus length and shape of genital bursa, 2) displacement of testes on the not contracted well fixed material, 3) shape of female genital organs and their situation with respect to lower margins of segments. As well, ecology and geography of individual species should be taken in account. Using these criteria, meanwhile only 2 species, namely *M. lineatus* and *M. litteratus*, can be considered to be parasites of *Canis familiaris* under European conditions; perspective, above all, *M. zacharovae*.

Contrary to Tschertkova and Kosupko (1978) the authors Gubanyi and Eszterbauer (1998) use the length of cirrus pouch and maximum diameter of testes for the distinguishing of *M. lineatus* and *M. litteratus*.

From the hitherto literature sources (see above), the host specificity of the genus *Mesocestoides* is often determined with great difficulties. This circumstance is the most obvious in the species *M. lineatus*. Tschertkova and Kosupko (1978) report in this species more than 50 hosts (including the second intermediate hosts). They remind of that a number of presented definitive hosts is included in the list only conditioned. They also refer, e.g., to the communication by Kontrimavichus (1969) who found that the hosts of the family Mustelidae are not typical hosts of *M. lineatus*. Similar data are presented by Sato et al. (1999). The contrary is given, e.g., by Foreyt and Lagerquist (1993).

B) Recent discoveries of tapeworms from the genus *Mesocestoides*.

Earlier findings of tapeworms from the genus *Mesocestoides* were presented summarily in reviews, compendia, books and publications, e.g. Coombs and Crompton (1991), Joyeux and Baer (1936), Neveu-Lemaire (1936), Schmidt (1986), Sprehn (1932), Tschertkova and Kosupko (1978), Voge (1955), Witenberg (1934), Yamaguti (1959).

Recent discoveries from different hosts determined

as *Mesocestoides* sp. are published, e.g. by the following authors: Balicka-Ramisz et al. (2003), Ballek et al. (1992), Biserkov and Konstadinova (1998), Calvete et al. (1998), Engh et al. (2003), Fuentes et al. (2002), Ganzorig et al. (1998), Gilliland and Muzzall (1999, 2002), Goldberg et al. (1998), Guberti et al. (1993), Guillot and Green (1992), Hubbart et al. (1993), Lassnig et al. (1998), Literák et al. (2004), Loos-Frank and Zeyhle (1982), Manios et al. (2002), Manke and Stoye (1998), Mayen-Pena and Salgado-Maldonado (1998), Mcallister et al. (1995), Millan et al. (2003), Niskisch-Rosenegk et al. (1999), Papadopoulos et al. (1997), Patton and Rabinowitz (1994), Pence et al. (1980, 1984, 2003), Pfeiffer et al. (1997), Rajkovič-Janje et al. (2002), Rodriguez et al. (2003), Schoffel et al. (1991), Schultz et al. (1992), Schuster et al. (1997), Segovia et al. (2001, 2003), Thiess et al. (2001), Torres et al. (1998, 2001), Wessbecher et al. (1994), Woodroof and Rutherford (1995) and others.

Recent discoveries of the genus *Mesocestoides* on the level of species are presented, e.g., by Andras (2001) - *M. litteratus*, Andras and Peter (2002) - *M. litteratus*, Conn (1985, 1988 a,b) - *M. lineatus*, Foreyt and Lagerquist (1993) - *M. lineatus*, Fuentes et al. (2003) - *M. ? variabilis*, Gubanyi and Eszterbauer (1998) - *M. lineatus*, *M. litteratus*, Jordi and Marchand (2001) - *M. litteratus*, Kapel and Nansen (1996) - *M. lineatus*, Loos-Frank (1990) - more species, Magi et al. (1999) - *M. melesi*, Mcallister et al. (1992) - *M. lineatus*, Miquel et al. (1999) - *M. litteratus*, Ohtomo et al. (1983) - *M. lineatus*, Pence et al. (2003) - *M. lineatus*, Segovia et al. (2003) - *Mesocestoides* sp. aff *litteratus*, Shoop et al. (1991) - *M. variabilis*, Siles-Lucas and Hemphill (2002) - *M. corti*, Skirmison et al. (1993) - *M. canislagopodis*, Štefančíková et al. (1994) - *M. lineatus*, Terenina et al. (1999) - *M. vogae*, Torres et al. (1998) - *M. litteratus*, Willingham et al. (1996) - *M. lineatus*, and others.

Only very few studies are devoted to recent discoveries of *Mesocestoides* parasitizing dogs. Those are, e.g., publication by Barutzki and Schaper (2002) - *Mesocestoides* sp., Al - Quaoud et al. (2003) - *Mesocestoides* sp., Bourdeau and Beugnet (1993) - *Mesocestoides* sp., Caruso et al. (2003) - *Mesocestoides* sp., El-Shehabi et al. (1999) - *Mesocestoides* sp., Epe et al. (1991) - *Mesocestoides* sp., Kulisič et al. (1998) - *M. lineatus*, Parker (2002) - *M. corti*, Stern et al. (1987) - *Mesocestoides* sp. Also Borkovcová and Tenora (2003) and Dvořák and Borkovcová (2004) report *Mesocestoides* sp., the material is considered conditionally for to be included in *M. lineatus*. The disadvantage of the recent discoveries consists in the fact, that the most of descriptions of the findings of the *Mesocestoides* - species are missing. Also the critical comment, or the source of the species-determination is absent.

A specific attention deserves the description of the new species, namely:

- *M. leptothylacus* Loos-Frank, 1980, host *Vulpes vulpes*, Germany. The species is related to the species *M. litteratus* considered by the author to be nomen dubium. After Premier (1983) the species *M. leptodactylus* is syn. of *M. litteratus*. After Gubanyi and Eszterbauer (1988), likely wrong, the species *M. leptodactylus* is syn. of *M. lineatus*.
- *M. melesi* Yanchev et Petrov, 1985, host *Meles meles*, Bulgaria. The species is related (also with its host) to the species *M. angustatus* (Rudolphi, 1918). This species is described insufficiently (Joyeux and Baer, 1936) and according to Tschertkova and Kosupko (1978), it is a synonym of *M. lineatus*.
- *M. vogae* Etges, 1991, hosts: laboratory mammals. The species was described from the finding of asexually proliferative tetrahyridium. Hrková et al. (2002) and Dítětová et al. (2003) consider *M. vogae* to be a synonym of *M. corti* Hoeppli, 1925.
- *M. paucitesticulus* Sawada et Kugi, 1973, hosts *Vulpes vulpes japonica* and *Nyctereus procyonides*, Japan (Sawada and Kugi, 1973, Kugi, 1983). Besides the hosts *Martes melampus* is known (Sato et al. 1999). In Tschertkova and Kosupko, 1975 syn. of *M. lineatus*.
- Also the validity (or the conspecificity) and the specificity (the parasit of Carnivora and ? man) of *M. variabilis*, are not clear (compare in Müller 1927, 1928, Gleason and Healy 1967, Tschertkova and Kosupko 1975, Coombs and Crompton 1991, Fuentes et al. 2002, 2003).

CONCLUSION

The partial critical analysis of systematics and taxonomy in the genus *Mesocestoides* shows that many problems dealing with the species determination are very questionable. From the criteria presented by Tschertkova and Kosupko (1978), it is evident that determination of the species from the genus *Mesocestoides* is possible only on the basis of knowledge in morphology and anatomy of mature segments.

As to parasites in *Canis familiaris*, it has been revealed hitherto that, under European conditions, 2 species of the genus *Mesocestoides*, namely *M. lineatus* and *M. litteratus*, (perspectively also *M. zacharovae*), can be found.

In the Czech Republic are known gravid tapeworms of the genus *Mesocestoides* from various carnivorous species, the findings from dog are absent determination is limited to the species *Mesocestoides lineatus* (see the set of studies in Prokopič 1965 and Staněk, 1980). Borkovcová (1999) similar to the previous authors reports also negative findings in

dogs. Only Svobodová and Svoboda (1995) assume that *M. lineatus* and *M. litteratus* parasitize dogs in the Czech Republic.

The first concrete data on parasitisation by tapeworms of the genus *Mesocestoides* in dogs in the Czech Republic are presented by Borkovcová and Tenora (2003) and Dvořák and Borkovcová (2004). These authors designate their findings - gravid segments in dog faeces - with the name *Mesocestoides* sp. with that, likely, the species *M. lineatus* is con-

cerned. The own material examined in the present study is determined as *Mesocestoides* sp. (see Material and methods).

The species determination in tapeworms of the genus *Mesocestoides* will be possible only after the new material is gained (complete tapeworm strobilae). Further on, it is necessary according to possibilities, to use the methods of molecular biology, as, e.g., Olson and Caira (1999), Crosbie et al. (2000), Olson et al. (2001), or Literák et al. (2004) have performed.

SOUHRN

Poznámky k rodu *Mesocestoides* Vaillant, 1863 (tasemnice) a nálezy parazita druhu *Mesocestoides* sp. u psa domácího v České republice

Dílčí kritický rozbor systematiky a taxonomie rodu *Mesocestoides* ukazuje, že determinace druhů je velmi problematická.

Na základě kritérií, která uvádějí Tschertkova a Kosupko, (1978) je zřejmé, že determinace druhů rodu *Mesocestoides* je možná jen na základě znalostí morfologie a anatomie hermafroditních článků.

Pokud se týká parazitů psa domácího, ukazuje se, že do současné doby, v evropských podmínkách, je možno se setkat se dvěma druhy rodu *Mesocestoides*, a to *M. lineatus* a *M. litteratus*, perspektivně také *M. zacharovae*.

V České republice jsou známy gravidní tasemnice rodu *Mesocestoides lineatus* (viz soubor prací v Prokopič, 1965, Staněk, 1963, 1980, Svatoš 1963). V těchto publikacích však nálezy tasemnic rodu *Mesocestoides* u psů chybí. Také Borkovcová (1999) hlásí negativní zjištění u psa domácího. Jen Svobodová a Svoboda (1995) předpokládají, že u domácích psů v České republice cizopasí *M. lineatus* a *M. litteratus*.

První konkrétní údaje o parazitaci tasemnic rodu *Mesocestoides* u psů v České republice uvádějí Borkovcová a Tenora (2003) a Dvořák a Borkovcová (2004). Jmenovaní autoři označují své nálezy - gravidní články v trusu psů - jménem *Mesocestoides* sp. s tím, že se jedná pravděpodobně o druh *M. lineatus*. Vlastní materiál studovaný v této práci (viz metodika a materiál) je determinován *Mesocestoides* sp.

Druhá determinace tasemnic rodu *Mesocestoides* bude možná až po získání nového materiálu (úplných strobil tasemnice). V dalším je nutné, podle možností, využít metod molekulární biologie, jak provedl např. Olson and Caira (1999), Crosbie et al. (2000), Olson et al. (2001), nebo Literák et al. (2004).

Při nálezu tasemnic rodu *Mesocestoides* u psů v České republice přichází také v úvahu revidovat jejich český název. Kratochvíl a Bartoš a spolupracovníci (1954) uvádějí pro druh *M. lineatus* český název „tasemnice norčí“. Faktem je, že u norků v České republice tasemnice rodu *Mesocestoides* nebyly zjištěny a také celosvětově je jejich zjištění u norků velmi dubiosní. Navrhujeme, aby vzhledem ke značné pestrosti hostitelů tasemnice *M. lineatus* bylo české jméno „tasemnice norčí“ nahrazeno jménem „tasemnice šelmi“. Tím bude vyjádřeno i ev. širší spektrum jejich hostitelů.

Mesocestoides sp., tasemnice, taxonomie, pes

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