

**MANSONELLA (E.) ROTUNDICAPITA SP.N. AND
MANSONELLA (E.) LONGICAPITA SP.N.**
(Filarioidea : Onchocercidae) from Venezuelan capybaras,
Hydrochoerus hydrochaeris

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SUMMARY. *Mansonella (E.) longicapita* sp. n. and *Mansonella (E.) rotundicapita* sp. n., two filarial nematodes from the dermis of Venezuelan capybaras, are described. The two species can be distinguished on the size of the spicules (*M. longicapita* 327 and 139 μm , ratio of 2.3 : 1 ; *M. rotundicapita* 405 and 120 μm , ratio of 3.4 : 1), the degree of lateral elongation of the cephalic shield and in the size and configuration of the microfilaria. The microfilaria of *M. rotundicapita* is large (280 μm long), and in specimens fixed in 2% formalin, the posterior end of the body is bent in a shepherd's crook, while the microfilaria of *M. longicapita* is short (195 μm long) and when similarly fixed, assumes a gently curved attitude. Within the subgenus *M. (Esslingeria)*, the species *M. longicapita* and *M. rotundicapita* are intermediate in size. Morphologically they resemble *M. streptocerca* and *M. rodhaini* most closely, but can be distinguished on size, spicule morphology, and microfilarial morphology.

***Mansonella (E.) rotundicapita* n.sp. et *Mansonella (E.) longicapita* n.sp.
Filaire-Mématode) du capybara (*Hydrochoerus hydrochaeris*) au Vénézuéla**

RÉSUMÉ. *Mansonella (Esslingeria) longicapita* n. sp. et *Mansonella (E.) rotundicapita* n. sp., deux filaires du derme de Capybara (*Hydrochoerus hydrochaeris*) du Venezuela, sont décrites. Les deux espèces sont distinctes par la longueur des spicules (*M. longicapita* : 327 et 139 μm , ratio de 2.3 : 1 ; *M. rotundicapita* : 405 et 120 μm , ratio de 3.4 : 1), par le degré d'élongation latérale du bouclier céphalique et par la taille et la morphologie des microfilaires. La microfilaire de *M. rotundicapita* est grande (280 μm de long), et, dans les exemplaires fixés au formol à 2%, la région caudale du corps est recourbée en crochet; la microfilaire de *M. longicapita* est plus courte (197 μm de long) et a une queue peu recourbée. Parmi les espèces de sous-genre *M. (Esslingeria)*, *M. longicapita* et *M. rotundicapita* présentent une taille intermédiaire. Du point de vue morphologique, ces 2 espèces sont particulièrement proches de *M. streptocerca* et *M. rodhaini*, mais elles s'en distinguent par la taille plus grande et par la morphologie des spicules et des microfilaires.

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Accepté le 5 décembre 1983.

Introduction

In the course of histological studies of the skin of capybara, *Hydrochoerus hydrochaeris*, one of us observed the presence of two types of microfilariae in the upper and middle dermal layers (Campo-Aasen, 1977a, b). These microfilariae were recognized as being different from those already described from the capybara, namely *Cruorifilaria tubero cauda* Eberhard, Morales and Orihel, 1976 and *Yatesia hydrochoeris* (Yates and Jorgenson, 1983).

In some microsections of skin, the presence of adult worms was noted as well. It was believed that these adults were probably the parental forms of the microfilariae seen in the skin biopsies. However, necropsies of infected animals up to that time had failed to yield adult worms which produced the undescribed microfilariae.

When the opportunity arose, systematic necropsies were performed on a number of infected animals. As a result, representative collections of both species of microfilariae and adult worms were made. The present report describes the parasites and provides names for them, *Mansonella rotundicapita* sp. n. *Mansonella longicapita* sp. n.

Materials and methods

Capybaras trapped on Finca El Frio, Apure State, in the southwestern plains region (llanos) of Venezuela were housed at the Veterinary School of the Central University of Venezuela in Maracay. The animals were of both sexes and ranged in age from juveniles (6 mo) to aged adults.

Multiple skin biopsies, approximately 0.5 cm in diameter, were taken from the head, ears, neck and upper back of each animal. A portion of these biopsies were soaked in tap water for one hour, the solution was then centrifuged and the sediment either fixed in 2% formalin or spread on slides, dried and fixed in 90% ethyl alcohol. Microfilariae fixed in 2% formalin were spread on slides and air dried as above. All slides were subsequently stained in hematoxylin using standard procedures.

Adult worms were recovered by soaking the skin and carcass in 0.85% saline solution. The latter was filtered through fine mesh bolting cloth, the trapped material washed into large petri dishes and examined with a dissecting microscope. Adult worms were fixed in glacial acetic acid, transferred to 70% alcohol containing 5% glycerine and then cleared by gradual evaporation into pure glycerine.

Drawings were made with the aid of a Leitz drawing device. Measurements are in micrometers unless otherwise stated, range followed by the mean.

Mansonella (E.) rotundicapita sp. n. (fig. 1-9)

General: Onchocercidae (Leiper, 1911) Chabaud and Anderson, 1959; Onchocercinae Leiper, 1911; *Mansonella* (Faust, 1929) Orihel and Eberhard, 1982; subgen. *Esclinigeria* (Chabaud and Bain, 1976). With characters of the genus and subgenus. Adult

worms small, slender, tapered appreciably only at posterior extremity. Anterior end bluntly rounded. Annular swellings typically present on anterior end; number and location variable. Tail of moderate length in both sexes. Cuticle smooth except for *area rugosa* in males. Cephalic plate with major axis lateral, bearing eight circumoral papillae: two lateroventral and two laterodorsal positioned at corners of cephalic plate in outer circle and four in inner circle, two lateroventral and two laterodorsal (*fig. 2*). Amphids outside cephalic plate, in line with inner circle of papillae. Vulva in mid-esophageal region.

Male (6 complete specimens, 12 posterior ends): Body 19 to 26 (22) mm long, maximum diameter 60 to 80 (72). Nerve ring 160 to 190 (173) and base of esophagus 640 to 940 (810) from anterior end. Posterior end of body coiled in one to two turns. Tail 80 to 125 (98) long, tapered and flattened dorsoventrally at tip (*fig. 5, 6*). Left spicule 370 to 460 (405) long, relatively simple in structure, tubular with rounded capitulum on proximal end, twisted at its midpoint and ending distally in a beveled point (*fig. 5*). Right spicule 105 to 140 (120) long; slender and tubular in nature with a knobbed proximal end, undulating mid- and distal section, the latter ends in an obtusely bent angle (*fig. 5*). Spicules extruded in nearly every specimen. Spicule ratio 3.4 : 1. Pericloacal papillae number 10, typically four pair in line lateral to cloaca and one pair in ventral midline immediately posterior to cloaca (*fig. 5, 6*). Two additional pairs on tail, one pair close to pericloacal papillae, the second two-thirds of distance to tip of tail (*fig. 5, 6*). *Area rugosa* well developed,¹ covering ventral surface of body from cloaca anteriorly for about 0.5 mm (*fig. 5*).

Female (9 complete specimens): Body 33 to 50 (44) mm long, maximum diameter 84 to 180 (120). Anterior end to nerve ring 171 to 198 (195), vulva 458 to 608 (535), base of esophagus 627 to 988 (802) (*fig. 1*). Ovejector large, ovoid, heavy muscular coat with prominent furrows in outer layer (*fig. 1*); lumen straight, cavernous. Vagina long, muscular and typically directed posteriorly. Coiled ovaries generally not extending to level of anus. Tail 120 to 180 (154) long, tapered, flexed ventrad; bears four terminal papillae, outer two more pointed than inner two (*fig. 3, 4*).

Microfilaria (40 specimens): Preserved in 2% formalin, dried on slide and stained in hematoxylin, 220 to 293 (278) long by 3 to 4 in diameter. Anterior end bluntly rounded, posterior end tapered slightly. Caudal extremity in dorsoventral view bilobed, bearing two protuberances (*fig. 9*); in lateral view extremity appears to bear a single protuberance (*fig. 7, 8*). Posterior end characteristically coiled in form of shepherd's crook (*fig. 7*). Cuticle with transverse striations. Cephalic space long, anterior-most seven to ten nuclei large, elongate, tending to be in single row. Posteriorly, nuclear column reduced to single row of five to seven nuclei; terminal nucleus round. Nuclear column extends almost to tip of tail. Location of characteristic landmarks expressed as distance from anterior end: cephalic space 13 to 18 (15), nerve ring 69 to 75 (72), excretory pore 87 to 103 (95), R-1 cell 195 to 223 (211), anal pore 180 to 258 (240).

Microfilariae fixed in alcohol and stained with hematoxylin are typically straight or loosely coiled. Body 243 to 290 (263) long by 4 to 5 in diameter.

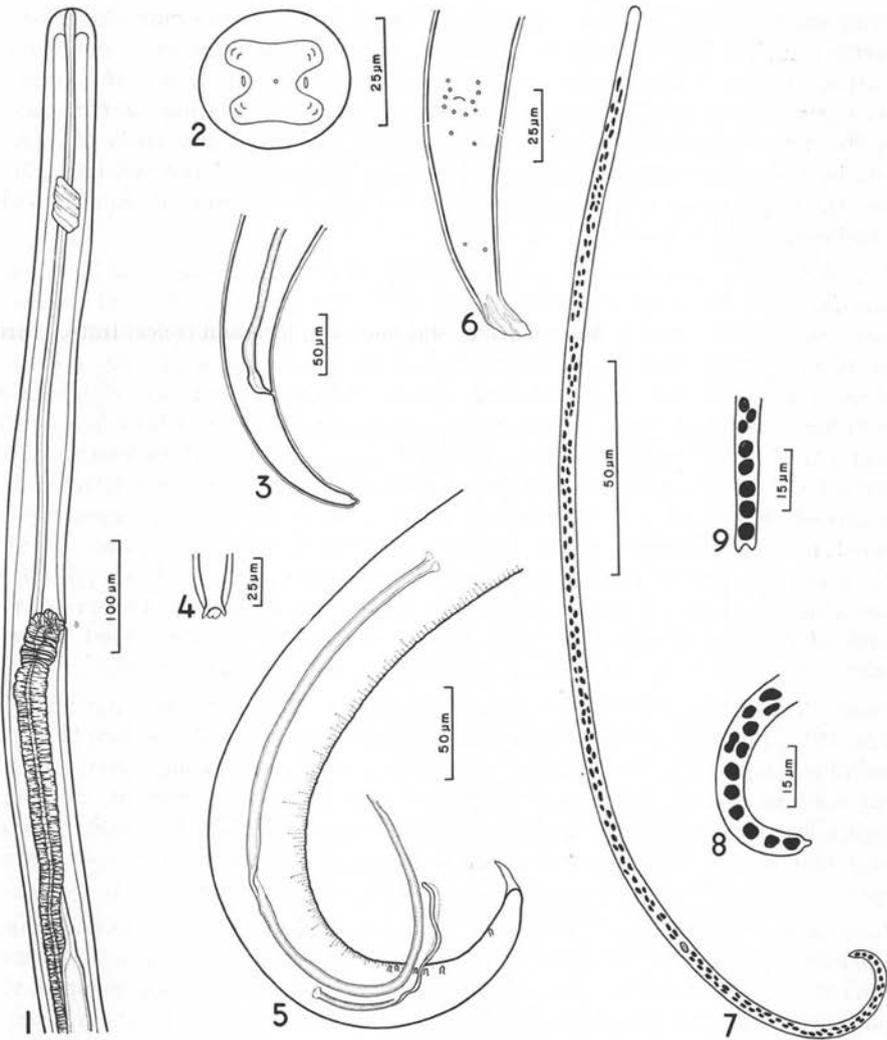


FIG. 1 to 9. — *Mansonella (E.) rotundicapita* sp. n. 1. Female anterior end, lateral view. 2. *En face*. 3. Female posterior end, lateral view. 4. Posterior extremity of female tail, ventral view. 5. Male posterior end, lateral view. 6. Male tail, ventral view. 7. Microfilaria from 2% formalin concentration stained with hematoxylin. 8. Microfilaria tail, lateral view. 9. Microfilaria tail, ventral view.

Diagnosis : *Mansonella (E.) rotundicapita* is distinguished from the other members in the subgenus by a combination of characters, including the size and shape of the spicules, the dorsoventrally flattened male tail and the size of the adults (male 19 to 26 mm, female 33 to 50 mm). The most distinctive feature of the species is the

large microfilaria which has an exceptionally long cephalic space and small terminal protuberances on the tail.

Host : *Hydrochoerus hydrochaeris* Linnaeus, 1776 ; capybara, chiguire.

Site of Infection : Adults in dermis ; microfilariae in skin.

Type Locality : Apure State, Venezuela.

Specimens Deposited : Holotype, male, USNM Helm. Coll. No. 77983

Allotype, female USNM Helm. Coll. No. 77984

Paratypes (one male, one female), USNM Helm. Coll. No. 77985

Microfilariae : one slide 2% formalin concentrate, USNM Helm. Coll. No. 77985.

Etymology : The species name is derived from the Latin "rotundus" and "capit" and refers to the round or circular capitulum (head) of the left spicule.

Mansonella (E.) longicapita sp. n. (fig. 10-17)

General : Onchocercidae (Leiper, 1911) Chabaud and Anderson, 1959 ; Onchocercinae Leiper, 1911 ; *Mansonella* (Faust, 1929) Orihel and Eberhard ; subgen. *Esslingeria* (Chabaud and Bain, 1976). With characters of the genus and subgenus. Adult worms small, slender, tapering appreciably only in posterior end. Anterior extremity blunt, slight neck-like constriction in dorsoventral view (fig. 11). Annular swellings typically present on anterior end ; variable in number and location. Tail moderately long in both sexes. Cuticle smooth, except for *area rugosa* in male. Cephalic plate with major axis lateral bearing eight circumoral papillae : two lateroventral and two laterodorsal at corners of cephalic plate in outer circle and four in inner circle, two lateroventral and two laterodorsal (fig. 12). Amphids in line with inner papillae but outside cephalic plate (fig. 12). Vulva in mid-esophageal region.

Male (3 complete specimens, 6 posterior ends) : Body 21 to 25 (23) mm long, maximum diameter 32 to 61 (53). Nerve ring 170 to 180 (175) and base of esophagus 420 to 505 (457) from anterior end. Posterior end of body coiled in one to two turns. Tail 65 to 93 (81) long, tapered and flattened dorsoventrally at tip (fig. 15, 16). Left spicule 308 to 347 (327) long ; simple in structure, tubular with long, drawn out capitulum on proximal end, twisted at its mid-point and distally ending in a beveled point (fig. 16). Right spicule 123 to 161 (139) long, slender, with faint, elongate capitulum proximally, wavy midsection and ending distally in a barbed head (fig. 16). Spicule ratio 2.3 : 1. Pericloacal papillae number 10 to 11, typically with four pair lateral to cloaca and one pair in ventral midline immediately posterior to cloaca ; an additional papilla occasionally present in the pericloacal group (fig. 15). Two pairs of papillae on tail, one just posterior to pericloacal papillae, the other two-thirds of

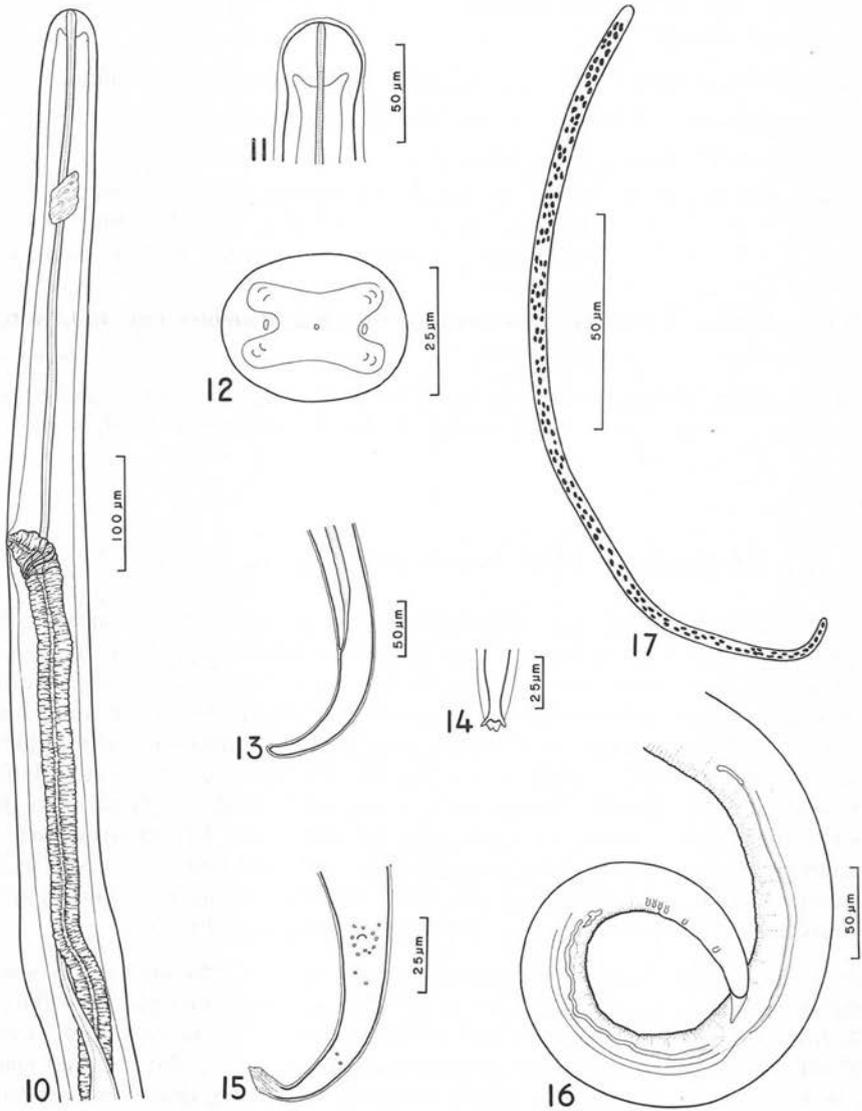


FIG. 10 to 17. — *Mansonella (E.) longicapita* sp. n. 10. Female anterior end, lateral view. 11. Female anterior extremity, ventral view. 12. *En face*. 13. Female posterior end, lateral view. 14. Posterior extremity of female tail, ventral view. 15. Male tail, ventral view. 16. Male posterior end, lateral view. 17. Microfilaria from 2% formalin concentration stained with hematoxylin.

distance to tip of tail (*fig. 15, 16*). *Area rugosa* well developed, covering ventral surface of body from cloaca anteriorad for about 0.5 mm (*fig. 16*).

Female (1 complete specimen, 1 anterior end) : Body 39 mm long, maximum diameter 83 to 105 (94). Anterior end to nerve ring 170 to 180 (175), vulva 510 to 580 (550) and base of esophagus 890 to 950 (920) (*fig. 10*). Ovejector large, ovoid, heavy muscular coat with striking oblique furrows in outer layer ; relatively simple lumen. Vagina long, muscular, typically directed posteriad. Ovaries highly coiled but not extending into region of anus. Tail 140 long, tapered, bent ventrad ; bears four terminal papillae, of which inner two are more rounded (*fig. 13, 14*).

Microfilaria (40 specimens) : Preserved in 2% formalin, dried on slides and stained with hematoxylin, 176 to 225 (197) long by 4 to 6 in diameter (*fig. 17*). Anterior end bluntly rounded, body tapers gradually toward tail. Tail bluntly rounded, bent in gentle curve. Nuclear column dispersed, typical landmarks not well delineated. Posteriorly, nuclear column reduced to single row of 5 to 7 nuclei ; terminal nucleus rounded. Nuclear column extends to tip of tail. Location of characteristic landmarks expressed as distance from anterior end : cephalic space 3 to 8 (5), nerve ring 43 to 73 (61), excretory pore 75 to 83 (77), anal pore 140 to 190 (160).

Alcohol fixed microfilariae 180 to 217 (196) long by 5 to 7 in diameter. Body typically straight or slightly bent. Tail gently curved.

Diagnosis : Within the subgenus, adults of *Mansonella* (E.) *longicapita* most closely resemble *M. rotundicapita* in general size as well as in mensural characteristics such as length of the esophagus, position of the vulva, and length and shape of the female tail. Other features, such as the more laterally elongate cephalic shield, the smaller spicule ratio, the long capitulum on the left spicule, and the smaller microfilaria distinguish *M. longicapita* from *M. rotundicapita*.

Host : *Hydrochoerus hydrochaeris* Linnaeus, 1776 ; capybara, chiguire.

Site of Infection : Adults in dermis ; microfilariae in skin.

Type Locality : Apure State, Venezuela.

Specimens Deposited : Holotype, male, USNM Helm. Coll. No. 77986

Allotype, female, USNM Helm. Coll. No. 77987

Paratypes (one male), USNM Helm. Coll. No. 77988

Microfilariae : one slide 2% formalin concentrate, USNM Helm. Coll. No. 77988

Entomology : The species name is derived from the Latin "*longus*" and "*capit*" and refers to the elongate capitulum or head of the left spicule.

Discussion

The subgenus *Esslingeria*, characterized by the lateral orientation of the cephalic papillae, relatively long spicules and the structure of the microfilaria tail (in which the nuclei extend to the tip), has been considered to be confined to man and anthro-

poïd apes. It has been viewed typically as an African group, with the exception of *M. perstans* which occurs in people in South America. The addition of the species *M. rotundicapita* and *M. longicapita* to the subgenus brings the number of known species to seven and broadens considerably the host and geographic range of the subgenus.

Within the subgenus *Esslingeria*, the adults of *M. rotundicapita* and *M. longicapita* are intermediate in size; *M. streptocerca* and *M. rodhaini* are smaller while *M. perstans*, *M. vanhoofi* and *M. leopoldi* are larger. *M. rotundicapita* most closely resembles *M. streptocerca* in certain morphologic features, including the microfilaria. The two are distinct, however, in that the tail of the male *M. streptocerca* is not flattened dorsoventrally and its left spicule is shorter (350 vs 400 μm). In the female, the vulva is near the base of the esophagus in *M. streptocerca* but midesophageal in *M. rotundicapita*. The microfilaria of *M. streptocerca* is considerably shorter than that of *M. rotundicapita* (210 vs 280 μm). The microfilariae are similar in body shape with tails characteristically bent into the shape of a shepherd's crook. In both, the nuclear column begins and ends with a single row of nuclei. The last feature is more pronounced in the anterior end of *M. streptocerca* than in *M. rotundicapita*. However, the number of nuclei in single file in the anterior and posterior ends of *M. streptocerca* is about twice that in *M. rotundicapita*, and the cephalic space in *M. rotundicapita* is two to three times longer than in *M. streptocerca*. Both species of microfilariae have small protuberances on the tip of the tail. This was originally noted in the microfilariae of *M. streptocerca* by Macfie and Corson (1922) and Peel and Chardome (1946). Orihel (1984) has observed that these protuberances are paired, not single. This feature does not seem to be widely recognized, although, if one notes the micrographs provided by Van den Berghe *et al.* (1964), Ash and Orihel (1981) and Orihel (1984) for *M. streptocerca*, the terminal protrusions are clearly illustrated.

Mansonella longicapita is most closely related to *M. rotundicapita*, but differs significantly in a number of morphological features. The most striking is in the structure of the proximal end of the left spicule. In *M. longicapita*, the capitulum or head is elongated, whereas in *M. rotundicapita* the proximal end of the spicule is swollen and knob-like. Moreover, the microfilaria of the two species are different. That of *M. longicapita* is the shortest in the subgenus, averaging less than 200 micrometers in length. The tail does not typically coil into a tight shepherd's crook, nor do the nuclei in the anterior end tend to be in single file. The nuclear column is reduced to a single row posteriorly which does extend to the tip of the tail, much as in *M. rotundicapita*.

The presence of both adults and microfilariae of *M. rotundicapita* and *M. longicapita* in the dermis is not unusual among species in the subgenus *Esslingeria*. Both *M. streptocerca* and *M. rodhaini* are found in the skin of man and chimpanzee.

The description of the two species in the present report brings the total number of filariae recognized in capybaras to four. *Cruorifilaria tubero cauda* was the first described species (Eberhard *et al.*, 1976); the adults occur in the blood vessels of the kidney, heart and lungs and the microfilariae circulate in the blood. A second

species *Yatesia hydrochoeris*, has been described from skeletal muscle fascia (Yates and Jorgenson, 1983). Its microfilariae appear to be skin dwellers. The adults and microfilariae of *C. tubero cauda* and *Y. hydrochoeris* are readily distinguished morphologically from the two species of *Mansonella* described herein.

ACKNOWLEDGEMENTS : This study was supported by program project grant AI 16315-03 (ICIDR) NIAID/NIH and Consejo Nacional de Investigaciones Cientificas y Tecnologicas (CONICIT) No. S1-1162. The authors wish to thank Dr. Luis Sanchez Araujo, Dean, Veterinary School, Central University of Venezuela, Maracay, Venezuela, for use of facilities at the Veterinary School and his support of the project.

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