Rev. Inst. Med. trop. São Paulo
39 (2): 123-127, março/abril, 1997

BERTIELLOSIS IN MAN: A REVIEW OF CASES

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SUMMARY

The presence of *Bertiella mucronata* and *Bertiella studeri* (Cestoda: Anoplocephalidae) in humans is reviewed, and international infection rates and a bibliography included. Taxonomic, biological, epidemiological, pathological, diagnostic, control, prevention and therapeutic aspects of the zoonosis are analyzed, and the increase in zoonotic potentiality of the parasitosis is discussed.

KEYWORDS: *Bertiella mucronata*; *Bertiella studeri*; Anoplocephalidae; Human cases; Review; Zoonotic potentiality.

INTRODUCTION

The genus *Bertiella* is very heterogeneous and includes cestodes parasitizing Marsupialia, Dermoptera, Rodentia and Primates in Africa, Asia, South America and Australia. Twenty-nine species were reported by SCHMIDT[47] of which *B. studeri* and *B. mucronata* are known to infect man. In the Philippines, AFRICA & GARCIA[3] found dogs infected by *Bertiella*. BLANCHARD[8] described *Bertia studeri* from two non-human primates; *Simia satyri* and *Troglodites niger*. STILES & HASSAL[49] revised the generic name of *Bertia* to *Bertiella*. MEYNER[39] identified *Taenia (Bertia) mucronata* in a small monkey (*Alouatta caraya* = *Mycetus niger*) from Paraguay. The natural hosts in Africa and Asia for *B. studeri* are *Simya satyrus, Anthropithecus troglodytes, Hylobates hoolock, Cercophithecus pygerythrus, C. schmidti, C. neglectus, C. sabaeas, C. mona mona, C. sabaensis, C. aethiops cynosusus, Cynomolgus sinicus, C. fascicularis, Troglodytes niger, Macaca cynomolgus, M. mulatta, M. rhesus, M. fascicularis, Pan spp., Papio ursinus and P. doghera*. In South America the non-human primate hosts of *B. mucronata* are *Alouatta carayá, Callicebus personatus nigrifrons, Cebus apella fatuellus, C. capuchinus and Callithrix sagui*[13,20,25].

DENEGRI[20] analyzed the differences between human and monkey (*A. caraya*) *B. mucronata* isolates which he compared with *B. studeri*, elaborating on the geographic distribution of both species.

HUMAN CASES

BLANCHARD[9] described the first human case in an 8 year old female from Mauritius Island parasitized by *B. (satyri) studeri*, confirming his previous suspicion[8]. CRAM[17] found *B. mucronata* in three non human primates of the genus *Pan*, from three different regions of Africa, and in a human case from Spain. CRAM [17] noted that human infection may result from imported animals for exhibition or laboratory purposes (cited by STUNKARD [50]). CRAM[17] and CAMERON[14] consider *Bertiella* as endemic to the West Indies, although the time and manner of its introduction are uncertain.

Table I summarizes the human cases reported to now due to *B. studeri* and *B. mucronata* with the corresponding geographical distribution. The data in Table I show the high prevalence of *B. studeri* in relation to *B. mucronata*. Up to the present moment, 44 cases of B.(=*satyri*) *studeri*, 7 cases of *B. mucronata* and 4 cases of inspecific *Bertiella* have been reported worldwide. The geographical distribution of *B. studeri* is the eastern hemisphere, a sole exception being those cases cited by CAMERON[14] from St. Kitts Island (primates present on St. Kitts Island are known to be African, not American in origin) and STUNKARD et al.[51] in a child in Minnesota, the latter considered to be the first autochthonous case in the United States of America. Recently, GALAN-PUCHADES et al.[28] reported the first case of human bertiellosis in Spain. The geographical distribution of *B.mucronata* is South America, with three cases in Argentina, two in Brazil and one case each in Cuba and Paraguay[26].

In contrast to most cases of *B. studeri* infections reported in man have occurred in adults, not in children.

BIOLOGICAL CYCLE

Helminths belonging to the family Anoplocephalidae are heterotoxenic parasites that require and intermediate host to com-

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TABLE 1
Records of human cases of *Bertiella* infection, age of infected individuals, and geographical distribution.

Geographical location	Age (Years)	Species	References
Eastern hemisphere			
Mauritius	8	*B. studeri*	Blanchard, 1913 [9]
India	2	*B satyri*	Chandler, 1925 [18]
India	?	*B satyri*	Mukerji, 1927 [40]
India	?	*B satyri*	Sharma, 1930 [48]
India	?	*B satyri*	Sharma, 1930 [48]
India	?	*B satyri*	Sharma, 1930 [48]
India	8	*B. studeri*	Maplestone, 1930 [37]
Sumatra	?	*B. studeri*	Joyeux & Dollfus, 1931 [32]
Mauritius	8	*B. studeri*	Adams & Webb, 1933[2]
Mauritius	4	*B. studeri*	Adams & Webb, 1933 [2]
Mauritius	7	*B. studeri*	Adams, 1935 [1]
Philippines	8	*B. studeri*	Africa & Garcia, 1935 [3]
India	5	*B. studeri*	Maplestone & Riddle, 1936 [38]
India	8	*B. studeri*	Roy, 1938 [45]
Indonesia	7	*B. studeri*	Bonne, 1940 [11]
East Africa	8	*B. studeri*	Buckley & Fairley, 1950 [12]
Indonesia	4	*B. studeri*	Lie Kian Joe, 1961 [36]
Indonesia	3,5	*B. studeri*	Lie Kian Joe, 1961 [36]
Singapore	6	*B. studeri*	Desowitz et al, 1961 [24]
Yemen	?	*B. studeri*	Fogh & Sertin, 1967 [27]
Great Britain	6	*Bertiella sp.*	Thompson et al, 1967 [53]
Padang, West Sumatra	6.5	*B. studeri*	Kwo & Koh, 1968 [35]
Medan, North Sumatra	7	*B. studeri*	Kwo & Koh, 1968 [35]
Medan, North Sumatra	6	*B. studeri*	Kwo & Koh, 1968 [35]
Selat Pandjang, Sumatra	14	*B. studeri*	Kwo & Koh, 1968 [35]
Medan, North Sumatra	5	*B. studeri*	Kwo & Koh, 1968 [35]
Medan, North Sumatra	6	*B. studeri*	Kwo & Koh, 1968 [35]
Congo	young	*Bertiella sp.*	Jones et al., 1971 [31]
Moscow, Russia	25	*B. studeri*	Imamkuliev et al., 1983 [30]
India	29	*Bertiella sp.*	Subbannayya et al., 1984 [52]
Thailand	26	*B. studeri*	Bhaibulaya, 1985 [7]
Saudi Arabia	28	*Bertiella sp.*	Bolbol, 1985 [10]
Gabon	2	*B. studeri*	Richard-Lenoble et al, 1986 [44]
West Bengal, India	9	*B. studeri*	Bandyopadhyay & Manna, 1987[6]
Lampug, Indonesia	8	*B. studeri*	Kosin & Kosin, 1992 [34]
Bangka, South Sumatra	5	*B. studeri*	Kosin & Kosin, 1992 [34]
South Kalimantan, Indonesia	3,5	*B. studeri*	Kosin & Kosin, 1992 [34]
Kalimantan, South Sumatra	children	*B. studeri*	Kosin & Kosin, 1992 [34]
Palembang, South Sumatra	children	*B. studeri*	Kosin & Kosin, 1992 [34]
Bengkulu, South Sumatra	children	*B. studeri*	Kosin & Kosin, 1992 [34]
Bengkulu, South Sumatra	children	*B. studeri*	Kosin & Kosin, 1992 [34]
Jambi, South Sumatra	children	*B. studeri*	Kosin & Kosin, 1992 [34]
North Sumatra, Indonesia	3	*B. studeri*	Kagei et al., 1992 [33]
North Sumatra, Indonesia	adult male	*B. studeri*	Kagei et al., 1992 [33]
Orissa, India	4	*B. studeri*	Panda & Panda, 1994 [41]
Valencia, Spain	33	*B. studeri*	Galan-Puchades et al., 1995 [28]
Western hemisphere			
Cuba	young	*B. mucronata*	Cram, 1928 [17]
St. Kitts Island	young	*B. studeri*	Cameron, 1929 [14]
Brazil	29	*B. mucronata*	Pessoa, 1930 [42]
Argentina	46	*B. mucronata*	Bacigalupo, 1949 [4]
Paraguay	29	*B. mucronata*	D' Alessandro et al., 1963 [19]
Minnesota, USA	5	*B. studeri*	Stunkard et al., 1964[51]
Brazil	?	*B. mucronata*	Costa et al., 1967 [16]
Argentina	45	*B. mucronata*	Feldman et al., 1983 [26]
Argentina	2	*B. mucronata*	Garaguso & Mendez, 1983, [29]

plete their life-cycle. The intermediate hosts are oribatid mites, important members of the soil fauna with a worldwide distribution. DENEGRI[23] gives a list of oribatid mites which serve as the intermediate hosts of 14 genera and 27 species of anoplocephalid tapeworms.

With respect to the genus *Bertiella*, STUNKARD[50] experimentally infected two species of oribatid mites; *Scheloribates laevigatus* and *Galumna* spp, with the eggs of *B. studeri* obtained from a non human primate (*Macacus rhesus*) from India. When the infected mites were fed on *Macacus cynomolgus*, no adult cestodes were obtained.

DENEGRI[21,22] reported the experimental infection of two species of the family Oribatulidae, *Dometorina suramericana* and *Scheloribates atahualpensis*, with oncospheres of *B. mucronata* from man. *D. suramericana* showed a marked infection rate (18.1%) while in *S. atahualpensis*, the infection rate was only 0.6%, providing the definition of a potential biotope: "where components of the biological cycle of a parasite are not living together per se, but where, if introduced, each may survive to produce isolated phenomena (of parasitism) first, which thereafter generalizes if the "triggering"causes were to continue".

EPIDEMIOLOGY

Human infections due to *Bertiella* are usually accidental, in most cases, the patients have been in contact with monkeys either as pets or in the zoo. BAER[5] in his paper "The origin of human tapeworms" refers to *B.studeri*, arguing that this parasite is mainly from sub-tropical climates although such climates are not fundamental for completion the life cycle. BAER suggests that *Bertiella* may be the only tapeworm to have been acquired by the prehominid ancestor of man and found in present day primates.

The opinion of BAER has been confirmed by FELDMAN et al.[26] and GARAGUSO & MENDEZ[29] who reported *Bertiella* in areas where the howler monkey (*Alouatta caraya*) is not present. DENEGRI[21] demonstrated that *B. mucronata* cysticercoids undergo development in orbatid mites found in the living premises of a patient. This study determined the epidemiological chain of this parasitosis.

SANTA CRUZ et al.[46] reported the parasitism of *Alouatta carayá* from the Argentinian Primate Center (CAPRIM, located in San Cayetano, Corrientes Province, Argentina). This work detected 29.4% infection (from a total of 74 A. *caraya* captured) by *B. mucronata* in agreement with DENEGRI[20] . The latter noted that *B. mucronata* may be transmitted to human beings especially when parasitized monkeys arrive from the northern part of the country, due to specific circumstances (as in the case of FELDMAN el al.[26], accidentally).

Thirty years before, in Bella Vista (Corrientes Province, Argentina) POPE[43] found a 7% rate of infection (from a total of 84 howler monkeys examined) by *B. mucronata*.

DISEASE IN MAN

The infection in man apparently produces no overt symptoms although patients sometimes show episodes of abdominal pain, intermittent diarrhea, non-specific gastroenteritis, constipation, loss of appetite and weight, and general fatigue. In rare instances, the patient may complain of severe, recurrent abdominal pain with intermittent vomiting. Abdominal pain, loss of appetite and intermitent diarrhea often occur in children[34]. In one case, FELDMAN et al.[26] described a patient that presented nervousness, hypertension, tachycardia, gastrointestinal indisposition and anal pruritus. All these symptoms disappear with appropriate therapy.

DIAGNOSIS

The diagnosis of *Bertiella* is based on (i) the identification of gravid proglottids and (ii) egg morphology. Gravid proglottids are several times wider than long, and are shed in groups of about 2 dozen at a time. The intermittent evacuations of worm segments in the feces caused the patients to seek medical treatment. Free eggs from the gravid segments or stool are 40-46 µm long and 36-40 µm wide in *B. mucronata*, and 49-60 µm long and 40-46 µm wide in *B. studeri*. The eggs of *Bertiella* have a characteristic pyriform apparatus measuring 22-24 µm in length by 16-18 µm in width in *B. mucronata*, and 25-30 µm in length by 18-28 µm in width in *B. studeri*[20].

CONTROL AND PREVENTION

The control and prevention of this zoonosis are difficult since the intermediate hosts (oribatid mites) are cosmopolitan with a wide range of distribution[21,23]. DENEGRI[20] has warned that the introduction of monkeys from where *Bertiella* is endemic and with which humans keep close contact, are the cause of parasite spreading. He also suggested an epidemiological inquiry in humans to ascertain the true prevalence of this parasitosis.

TREATMENT

Various antihelminthic agents are effective against *Bertiella*. Quinacrine[34] given in a dosage for cestode treatment will promote evacuation of the whole tapeworm with the scolex. Other antihelminthics used for *Bertiella* are niclosamide (1-2g) given orally[7,10,28,29,34,41] , praziquantel (10 mg/kg, single dose[26,34]) and albendazole[34].

Praziquantel causes destruction of the parasite surface, producing lethal vacuolization[26].

DISCUSSION

Since the first finding of *Bertiella* in man (1913[9]), 55 cases have been registered. There has been a constant increase, in the number of cases, not only in tropical and subtropical regions, but at nearly all latitudes, suggesting the importance of the zoonosis for which biochemists, epidemiologists, physicians and sanitarians must be prepared.

A single characteristic, the presence of Anoplocephalid eggs eliminated in the feces, in addition to study of the bio-ecological conditions, allows the diagnosis.

Another alarming epidemiological fact is that first described by POPE[43] , and later by COPPO et al.[15] and SANTA CRUZ et al.[46], that the parasitosis produced by *B. mucronata* in howler monkeys has increased 420% in only 30 years. An obvious question is: will human cases have increased at the same rate? Up to now the answer is negative. However, most described cases come from individual records given by physicians, and have not undergone proper epidemiological studies. We believe that the available data do not provide a true picture of the parasitosis in man and we suggest epidemiological inquiries to test this hypothesis.

RESUMEN

Bertielliosis en el hombre: revisión de casos

En este trabajo se hace una revisión de los casos humanos parasitados por *Bertiella mucronata* y *Bertiella studeri* (Cestoda: Anoplocephalidae), que incluye la casuística internacional y bibliografia actualizada. Se analizan varios aspectos de esta zoonosis como son: taxonomia, ciclo biológico, epidemiología, patologia, diagnóstico, control, prevención y terapéutica. Se discuten aspectos relacionados con la potencialidad zoonótica creciente de esta parasitosis.

ACKNOWLEDGEMENTS

The authors thank Dr. A. Criado and Dra. C. Sutton for reading this manuscript and providing linguistic assistance.

REFERENCES

1. ADAMS, A. - A fourth case of human infestation with *B. studeri* (Cestoda) in Mauritius. **Ann. trop. Med. Parasit., 29**: 361-362, 1935.

2. ADAMS, A & WEBB, L. - Two further cases of human infestation with *Bertiella studeri* (Blanchard, 1891) Stiles & Hassall, 1902, with some observation on the probable synonymy of specimens previously recorded from man. **Ann. trop. Med. Parasit., 27**: 471-475, 1933.

3. AFRICA, C. & GARCIA, E. - The occurrence of *Bertiella* in man, monkey and dog in the Philippines. **Philipp. J. Sci., 56**: 1-11, 1935.

4. BACIGALUPO, J. - Primer caso humano de *Bertiella sp.* en Sud América. **Rev. Soc. mex. Hist. nat., 10**: 177-183, 1949.

5. BAER, J. - The origin of human tapeworm. **J Parasit., 10**: 127-134, 1940.

6. BANDYOPADHYAY, A & MANNA, B. - The pathogenic and zoonotic potentiality of *Bertiella studeri*. **Ann. trop. Med. Parasit., 81**: 465-466, 1987.

7. BHAIBULAYA, M. - Human infection with *Bertiella studeri* in Thailand. **Southeast Asian J. trop. Med. publ. Hlth., 16**: 505-507, 1985.

8. BLANCHARD, R. - Sur les helminthes des primates anthropoides. **Mem. Soc. Zool. France, 4**: 186-196, 1891.

9. BLANCHARD, R. - *Bertiella satyri* de l'Orang-outang, est aussi parasite de l'homme. **Bull. Acad. Méd. (Paris)., 89**: 186-296, 1913.

10. BOLBOL, A. - Bertiella sp. infection in man in Saudi Arabia. **Ann. trop. Med. Parasit., 79**: 643-644, 1985.

11. BONNE, C. - Over *B studeri* (Blanchard, 1891), *B. satyri*, (Stiles and Hassall, 1902), *B. satyri* (Blanchard, 1891). **Geneesk. T. Ned.-Ind., 80**: 2222-2230, 1940.

12. BUCKLEY, J. & FAIRLEY, N.- Demonstration of a cestode, *Bertiella*: a rare parasite in man and recorded for the first time as a human infection in Africa. **Trans. roy. Soc. trop. Med. Hyg., 44**: 2, 1950.

13. CABRERA, A. - Los monos de la Argentina. **Physis, 16**: 1-28, 1939.

14. CAMERON, T. - A new record of the occurrence of a tapeworm of the genus *Bertiella* in man. **J. Helmint., 7**: 231-234, 1929.

15. COPPO, J.; MORIENA, R. & LOMBARDERO, O. - El parasitismo de los primates del CAPRIM. **Acta Zool. Lilloana, 35**: 9-12, 1979.

16. COSTA, H.; CORREA, L. & BRENER, Z. - Novo caso humano de parasitismo por *Bertiella mucronata* (Meyner, 1895), Stiles & Hassall, 1902 (Cestoda-Anoplocephalidae). **Rev. Inst. Med. trop. S. Paulo, 9**: 95-97, 1967.

17. CRAM, E. - A species of the cestode genus *Bertiella* in man in chimpanzee in Cuba. **Amer. J. trop. Med., 8**: 339-345, 1928.

18. CHANDLER, A. - New records of *B. satyri* (Cestoda) in man apes. **Parasitology, 17**: 421-425, 1925,

19. D'ALESSANDRO, A.; BEAVER, P. & MAS PALLARES, R. - *Bertiella* infection in man in Paraguay. **Amer. J. trop. Med. Hyg., 12**: 193-198, 1963.

20. DENEGRI, G. - Consideraciones sobre sistemática y distribución geográfica del género *Bertiella* Stiles & Hassall, 1902 (Cestoda-Anoplocephalidae) en el hombre y en primates no humaos. **Neotrópica., 31**: 55-63, 1985.

21. DENEGRI, G. - Desarrollo experimental de *Bertiella mucronata* Meyner, 1895 (Cestoda-Anoplocephalidae) de origen humano en su huésped intermediario. **Zbl. Vet.-Med., 32**: 498-504, 1985.

22. DENEGRI, G. - Movilidad *in vitro* y poder infestante de oncósferas de *Bertiella mucronata* (Cestoda-Anoplocephalidae) de orígen humano. **Rev. ibér. Parasit., 46**: 59.61, 1986.

23. DENEGRI, G. - Review of oribatid mites as intermediate hosts of tapeworms of the Anoplocephalidae. **Exp. appl. Acariol., 17**: 567-580, 1993.

24. DESOWITZ, R.; WONG, H. & FERNANDO, M. - Thr first record of human infection with *B. studeri* in Malaya. **J. Helminth., 35**: 207-208, 1961.

25. DUNN, F. - Acanthocephalans and Cestodes of South American monkeys and marmosets. **J. Parasit., 49**: 717-722, 1963.

26. FELDMAN, R.; DENEGRI, G.; AVOLIO, J. & CANTU, N. - Nuevo caso humano de teniasis por *Bertiella mucronata* Meyner, 1895 (Cestoda-Anoplocephalidae) en la Argentina. I. Diagnóstico y tratamiento. **Acta bioquim. clín. lat.-amer., 17**: 571-578, 1983.

27. FOGH, S. & SERTIN, A. - **Index-Catalog med. vet. Zool., 20**: 1976.

28. GALAN-PUCHADES, M.; FUENTES, M. & MAS-COMA, S. - Parasitismo importado en Valencia: primer caso de Bertiellosis humana en España. In: CONGRESO IBÉRICO DE PARASITOLOGÍA, 4., S. de Compostela, España, 1995. **Resúmenes**. p. 197-198.

29. GARAGUSO, P. & MENDEZ, O. - Primer caso argentino de parasitismo humano por *Bertiella mucronata* (Meyner, 1895). In: CONGRESO LATINOAMERICANO DE PARASITOLOGÍA, 6., S. Paulo, 1983. **Resumos**. p. 232.

30. IMAMKULIEV, K.D.; ALEKSEEVA, M.I.; GORBUNOVA, Y & BELIKOVA, G.G. - Bertielliasis: description of an imported case in USSR. **Med. Parazit. (Mosk.), 4**: 77-78, 1983.

31. JONES, R..; HUNTER, H. & VAN ROOYEN, C.E. - *Bertiella* infestation in a Nova Scotia child formerly resident in Africa. **Canad. med. Ass. J., 104**: 612, 1971.

32. JOYEUX, Ch. & DOLLFUS, R. - Un nouveau cas de *B. studeri* (R. Bl.) chez l'homme. **C.R. Soc. Biol. (Paris), 107**: 35-36, 1931.

33. KAGEI, N.L.; PURBA, Y. & SAKAMOTO, O. - Two cases of human infection with *Bertiella studeri* in North Sumatra, Indonesia. **Jap. J. trop. Med. Hyg., 20**: 166-168, 1992.

34. KOSIN, E. & KOSIN, L. Helminthic zoonosis in Indonesia. **Yonsei Rep. trop. Med., 23**: 81-88, 1992.

35. KWO, E. & KOH, I. - Six more cases of human infection with *Bertiella studeri* in Sumatra, Indonesia. **Yonsey Rep. trop. Med., 23**: 81-88, 1968.

36. LIE KIAN, J. - Inst. for Med. Res., Kuala Lumpur, Fed. of Malaya, 1961. Personal Communication to R.S. Desowitz.

37. MAPLESTONE, P. - A new case of *B. studeri* in a human. **Indian med. Gaz., 65**: 189-193, 1930.

38. MAPLESTONE, P. & RIDDLE, J. - Infection with *B. studeri*. **Indian med. Gaz., 71**: 81, 1936.

39. MEYNER, R. - Anatomie und histologie zweizr never Taenien artendes subgenus *Bertia*. **Z. Nat. Leips, 68**: 1-106, 1895.

40. MUKERJI, A. - The incidence of helminthic infestations in the Carmichael Hospital for Tropical Diseases, Calcuta. **Indian med. Gaz., 62**: 695-696, 1927.

41. PANDA, D.N. & PANDA, M.R. - Report of *Bertiella studeri* (Blanchard, 1891), an anoplocephalid, from a child. **Ann. trop. Med. Parasit., 88**: 451-452, 1994.

42. PESSOA, S. - Sobre um caso de parasitismo humano por cestoide anoplocephalideo do genero *Bertiella*. **Bol. Soc. Med. Cirurg., 14**: 158-162, 1930.

43. POPE, B.L. - Some parasites of the howler monkey of northern Argentina. **J. Parasit, 52**: 166-168, 1966.

44. RICHARD-LENOBLE, D.; KOMBILA, M.; MAGANGA, M. & AFFRE, G. - *Bertiella* infection in a Gabon-born girl. **Amer. J. trop. Med. Hyg., 35**: 134, 1986.

45. ROY, S. - *B. studeri*, a natual tapeworm parasite of monkeys in a Hindu child. **Indian med. Gaz., 73**: 346, 1938.

46. SANTA CRUZ, A.; GOMEZ, L.; de ROTT, M. et al. - El parasitismo en *Alouatta carayá y Saimiri boliviensis* ingresados al "Centro Argentino de Primates". **Rev. Med. vet. (B. Aires). 76**: 150-152, 1995.

47. SCHMIDT, G.D. - **CRC Handbook of tapeworm identification**. Boca Raton, CRC Press, 1986.

48. SHARMA, A. - Helminthic infections in Shilong. **Indian med. Gaz., 65**: 200-203, 1930.

49. STILES, C. & HASSALL, A. - *Bertiella* new name for this cestodes genus *Bertia* Blanchard, 1891. **Science, 16**: 402, 1902.

50. STUNKARD, H. - The morphology and life history of the cestode *Bertiella studeri*. **Amer. J. trop. Med., 20**: 305-332, 1940.

51. STUNKARD, H.; KOIVASTIK, T. & HEALY, G. - Infection of child in Minnessota by *Bertiella studeri* (Cestoda-Anoplocephalidae) **Amer. J. top. Med. Hyg., 13**: 402-409, 1964.

52. SUBBANNAYYA, K.; ACHYUTHA ROA, K.; SHIVANANDA, P. et al - *Bertiella* infection in an adult male in Karnataka. A case-report. **Indian J. Path. Microbiol.**, 27: 269-271, 1984.

53. THOMPSON, C.D.; JELLARD, C.H. & BUCKLEY, J.J. - Human infection with a tapeworm, *Bertiella* sp. probably of African origin. **Brit. med. J., 254**: 659, 1967.

Recebido para publicação em 11/01/1996
Aceito para publicação em 24/04/1997